LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),
An ISO 21001:2018,14001:2015,50001:2018 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Ms. T. VINEETHA
Course Name & Code : Discrete Mathematics & Graph Theory & 23FE11
L-T-P Structure : **3-1-0** **Credits:** 3
Program/Sem/Sec : B.Tech/III/A **A.Y.:** 2026-27
Regulations : R23

PREREQUISITE: Mathematics courses of first year of study.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- 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 (COs): At the end of the course, student will be able to

CO1	Construct mathematical arguments using logical connectives and quantifiers and verify them. **(Apply- L3)**
CO2	Demonstrate the basic terminology of functions, relations, lattices and their operations. **(Understand -L2)**
CO3	Illustrate the basic principles/techniques to solve different combinatorial problems and linear recurrence relations**.(Apply- L3)**
CO4	Demonstrate the different types of graphs.**(Understand -L2)**
CO5	Apply the properties of graphs to solve the graph theory problems in computer science**.(Apply- L3)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1													
CO2	3	2	1												
CO3	3	3	1	1											
CO4	3	3	1												
CO5	3	3	1	1											1
1 - Low			**2 –**Medium						**3 -** High						

TEXTBOOKS:

T1 Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.

T2 Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.

T3 Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill

REFERENCE BOOKS:

R1	Discrete Mathematics for Computer Scientists and Mathematicians, J. L.Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
R2	Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
R3	Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.
R4	Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: MATHEMATICAL LOGIC

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Propositional Calculus: Statements and Notations, Connectives	1	13-07-2026		TLM1	
2.	Well Formed Formulas, Truth Tables	1	14-07-2026		TLM1	
3.	Tutorial on : Statements and Notations, Connectives,TruthTables	1	15-07-2026		TLM3	
4.	Tautologies, Equivalence of Formulas, Duality Law	1	17-07-2026		TLM1	
5.	Tautological Implications, Normal Forms,	2	18-07-2026 21-07-2026		TLM1	
6.	Theory of Inference for Statement Calculus, Consistency of Premises,	1	22-07-2026		TLM1	
7.	Tutorial on : Theory of Inference for Statement Calculus, Consistency of Premises	1	24-07-2026		TLM3	
8.	Indirect Method of Proof, Predicate Calculus: Predicates	1	25-07-2026		TLM1	
9.	Predicative Logic, Statement Functions	1	28-07-2026		TLM1	
10.	Variables and Quantifiers	1	29-07-2026		TLM1	
11.	Tutorial on : Predicates, Predicative Logic, Statement Functions,	1	31-07-2026		TLM3	
12.	Free and Bound Variables	1	01-08-2026		TLM1	
13.	Inference Theory for Predicate Calculus	1	04-08-2026		TLM1	
14.	Tutorial on Unit 1/ Activity	1	05-08-2026		TLM3	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: SET THEORY

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Sets: Operations on Sets	1	07-08-2026		TLM1	
16.	Principle of Inclusion-Exclusion	1	08-08-2026		TLM1	
17.	Relations: Properties, Operations	1	11-08-2026		TLM1	
18.	Tutorial on Practice the sets and Relations Problems	1	12-08-2026		TLM3	
19.	Partition and Covering,	1	14-08-2026		TLM1	

20.	Transitive Closure, Equivalence,	1	18-08-2026		TLM1	
21.	Compatibility and Partial Ordering, Hasse Diagrams	1	19-08-2026		TLM1	
22.	Tutorial on Transitive Closure, Equivalence,Hasse Diagrams	1	22-08-2026		TLM3	
23.	Functions: Bijective, Composition, Inverse,	1	26-08-2026		TLM1	
24.	Permutation, and Recursive Functions,	1	28-08-2026		TLM1	
25.	Tutorial on Functions& Recursive Functions	1	29-08-2026		TLM3	
26.	Lattice and its Properties & Activity	2	01-09-2026 02-09-2026		TLM1	
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		

UNIT-III: COMBINATORICS AND RECURRENCE RELATIONS:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
27.	Basis of Counting, Permutations, Permutations with Repetitions	1	05-09-2026		TLM1	
28.	Circular and Restricted Permutations, Combinations,	1	11-09-2026		TLM1	
29.	Tutorial on Permutations, Combinations,	1	12-09-2026		TLM3	
30.	Restricted Combinations	1	15-09-2026		TLM1	
31.	Binomial and Multinomial Coefficients and Theorems.	1	16-09-2026		TLM1	
32.	Tutorial on Binomial and Multinomial Coefficients and Theorems.	1	18-09-2026		TLM3	
33.	Recurrence Relations: Generating Functions, Function of Sequences,	1	19-09-2026		TLM1	
34.	Partial Fractions, Calculating Coefficient of Generating Functions	1	22-09-2026		TLM1	
35.	Recurrence Relations, Formulation as Recurrence Relations	1	23-09-2026		TLM1	
36.	Tutorial on Partial Fractions, Recurrence Relations	1	25-09-2026		TLM3	
37.	Solving Recurrence Relations by Substitution and Generating Functions	1	26-09-2026		TLM1	
38.	Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations	1	29-09-2026		TLM1	
39.	Tutorial on UNIT III/ Activity	1	30-09-2026		TLM3	
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: Graph Theory:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
40.	Basic Concepts, Graph Theory and its Applications	1	03-10-2026		TLM1	
41.	Subgraphs, Graph Representations: Adjacency and Incidence Matrices	1	06-10-2026		TLM1	
42.	Isomorphic Graphs,	1	07-10-2026		TLM1	
43.	Paths and Circuits	1	09-10-2026		TLM1	
44.	Tutorial on Graphs/ Activity	1	10-10-2026		TLM3	
45.	Eulerian and Hamiltonian Graphs,	1	13-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 6				**No. of classes taken:**		

UNIT-V: Multi Graphs

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Multigraphs,	1	14-10-2026		TLM1	
47.	Bipartite and Planar Graphs	1	16-10-2026		TLM1	
48.	Tutorial on Bipartite and Planar Graphs	1	17-10-2026		TLM3	
49.	Euler's Theorem	1	27-10-2026		TLM1	
50.	Graph Colouring	1	28-10-2026		TLM1	
51.	Covering	1	30-10-2026		TLM1	
52.	Tutorial on Graph Colouring, Euler Theorem	1	31-10-2026		TLM3	
53.	Chromatic Number	1	03-11-2026		TLM1	
54.	Spanning Trees, Prim's and Kruskal's Algorithms	2	04-11-2026 06-11-2026		TLM1	
55.	BFS Spanning Trees.	1	07-11-2026		TLM1	
56.	Tutorial on UNIT V/ Activity	1	10-11-2026		TLM3	
57.	DFS Spanning Trees	1	11-11-2026		TLM1	
No. of classes required to complete UNIT-V: 14				**No. of classes taken:**		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Pigeon Hole Principle	1	10-11-2026		**TLM1**	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I,II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To inculcate algorithmic thinking, formulation techniques and visualization, leading to problem solving skills using different programming paradigms.
PSO 2	To inculcate an ability to analyze, design and implement data driven applications into the students
PSO 3	Develop an ability to implement various processes/methodologies/practices employed in design, validation, testing and maintenance of software products.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Ms. T. Vineetha**	**Mrs. B. Swathi**	**Dr. D. Venkata Subbaiah**	**Dr. S. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: K.ESWAREE DEVI

Course Name & Code : UHV 2 – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT -20HS01
L-T-P Structure : **2-1-0** **Credits: 3**
Program/Sem/Sec : II B.Tech., III-Sem, A-Sec **A.Y.: 2026-27**

PRE-REQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES(CEO):

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

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Describe the terms like Natural Acceptance, Happiness and Prosperity (L2)
CO2	Identify one's self, and one's surroundings (family, society nature) (L2)
CO3	Relate human values with human relationship and human society. (L2)
CO4	Illustrate the need for universal human values and harmonious existence (L2)
CO5	Develop as socially and ecologically responsible engineers (L3)

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

CO	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	3	-	-	-	-	-	-	-
CO3	-	-	-	-	-	2	-	3	2	-	-	-	-	-	-
CO4	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	2	3	-	-	-	1	-	-	-

TEXTBOOKS:

T1 Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

REFERENCE BOOKS:

R1 Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

R2 Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

R3 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi**.**

R4 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

R5 Small is Beautiful - E. F Schumacher.

R6 Slow is Beautiful - Cecile Andrews.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and need of Value Education.	1	13/07/26		TLM1	
2.	Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)	1	14/07/26		TLM1	
3.	Understanding Value Education	1	15/07/26		TLM2	
4.	Practice Session PS1 Sharing about Oneself	1	17/07/26		TLM6	
5.	self-exploration as the Process for Value Education	1	20/07/26		TLM2	
6.	Continuous Happiness and Prosperity – the Basic Human Aspirations	1	21/07/26		TLM1	
7.	Practice Session PS2 Exploring Human Consciousness	1	22/07/26		TLM1	
8.	Happiness and Prosperity – Current Scenario	1	24/07/26		TLM1	
9.	Method to Fulfill the Basic Human Aspirations	1	27/07/26		TLM1	
10.	Practice Session PS3 Exploring Natural Acceptance	1	28/07/26		TLM6	
11.	Activity Based Learning	1	29/07/26			
No. of classes required to complete UNIT-I: 11				**No. of classes taken:**		

UNIT-II

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
12.	Understanding Human being as the Co-existence of the self and the body.	2	31/07/26 & 03/08/26		TLM2	
13.	Distinguishing between the Needs of the self and the body	1	04/08/26		TLM2	
14.	Practice Session PS4 Exploring the difference of Needs of self and body.	1	05/08/26		TLM2	
15.	The body as an Instrument of the self	2	07/08/26 & 10/08/26		TLM1	
16.	Understanding Harmony in the self	1	11/08/26		TLM2	
17.	Practice Session PS5 Exploring Sources of Imagination in the self	1	12/08/26		TLM6	
18.	Harmony of the self with the body	2	14/08/26 & 17/08/26		TLM2	
19.	Programme to ensure self-regulation and Health	1	18/08/26		TLM1	
20.	Practice Session PS6 Exploring Harmony of self with the body	1	19/08/26		TLM2	
21.	Activity Based Learning	1	21/08/26			
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)						

UNIT-III

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Harmony in the Family – the Basic Unit of Human Interaction	1	24/08/26		TLM2	
23.	'Trust' – the Foundational Value in Relationship	2	25/08/26 & 28/08/26		TLM1	
24.	Practice Session PS7 Exploring the Feeling of Trust	1	31/08/26		TLM6	
25.	'Respect' – as the Right Evaluation	1	01/09/26		TLM1	
26.	Other Feelings, Justice in Human-to-Human Relationship	1	02/09/26		TLM1	
27.	Practice Session PS8 Exploring the	1	11/09/26		TLM6	

	Feeling of Respect					
28.	Understanding Harmony in the Society	1	15/09/26		TLM1	
29.	Vision for the Universal Human Order	1	16/09/26		TLM1	
30.	Practice Session PS9 Exploring Systems to fulfil Human Goal	1	18/09/26		TLM6	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT-IV

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31.	Understanding Harmony in the Nature	2	21/09/26 & 22/09/26		TLM2	
32.	Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature	2	23/09/26 & 25/09/26		TLM2	
33.	Practice Session PS10 Exploring the Four Orders of Nature	1	28/09/26		TLM6	
34.	Realizing Existence as Co-existence at All Levels	2	29/09/26 & 30/09/26		TLM2	
35.	The Holistic Perception of Harmony in Existence	1	05/10/26		TLM2	
36.	Practice Session PS11 Exploring Co-existence in Existence.	1	06/10/26		TLM6	
37.	Activity Based Learning	1	07/10/26			
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
38.	Natural Acceptance of Human Values	2	09/10/26 & 12/10/26		TLM2	
39.	Definitiveness of (Ethical) Human Conduct	2	13/10/26 & 14/10/26		TLM2	
40.	Practice Session PS12 Exploring Ethical Human Conduct	1	16/10/26		TLM2	
41.	A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order	2	26/10/26 & 27/10/26		TLM2	
42.	Competence in Professional Ethics	2	28/10/26 & 30/10/26		TLM2	
43.	Practice Session PS13 Exploring Humanistic Models in Education	1	02/11/26		TLM6	
44.	Holistic Technologies, Production Systems and Management Models-Typical Case Studies	2	03/11/26 & 04/11/26		TLM2	
45.	Strategies for Transition towards Value-based Life and Profession	2	06/11/26 & 09/11/26		TLM2	
46.	Practice Session PS14 Exploring Steps of Transition towards Universal Human Order	1	10/11/26		TLM6	
47.	Activity Based Learning	1	11/11/26			
No. of classes required to complete UNIT-V: 16				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Pollution-Human Role	1	30/10/26		TLM2			
2.	Mutual-Enrichment	1	02/11/26		TLM2			
No. of classes		2			No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.

PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**K.Eswaree Devi**	**Dr.B.Srinivasa Rao**	**Dr.B.Srinivasa Rao**	**Dr. Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(An Autonomous Institution since 2010)
Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),
An ISO 21001:2018, 14001:2015, 50001:2018 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Ms. Md. Sajeena
Course Name & Code **:** DL&CO 23IT01
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : II B.Tech., III-Sem, A-Sec **A.Y.: 2026-27**

Prerequisites:
Course Objectives: The main objectives of the course is to

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

COURSE OUTCOMES (COs): At the end of the course, students will be able to

CO1	Evaluate digital number systems and use Boolean algebra theorems, Properties and Canonical forms for digital logic circuit design. **(Understand- L2)**
CO2	Design Sequential logic circuits and understand basic functional blocks a computer system . **(Apply- L3)**
CO3	Understand computer architecture and Data representation to perform computer arithmetic operations and processor organization. **(Understand- L2)**
CO4	Analyze the memory hierarchy in a computer system. **(Understand- L2)**
CO5	Understand the I/O operations and the interfaces **(Understand-L2)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

CO	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	1	-	-	-	-	-	-	-	-	-	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-

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

Reference Books:

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Number systems, Logic gates and Boolean algebra, Combinational circuits

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to DLD	1	14-07-2026		TLM1	
2.	Number systems	1	15-07-2026		TLM1	
3.	Different Number systems	1	16-07-2026		TLM1	
4.	Conversions of one number to another number	2	18-07-2026 21-07-2026		TLM1	
5.	Data Representations	1	22-07-2026		TLM1	
6.	Binary codes	2	23-07-2026 25-07-2026		TLM1	
7.	Basic Logic gates and Universal gates	2	28-07-2026 29-07-2026		TLM1	
8.	Boolean Logic functions	2	30-07-2026 01-08-2026		TLM1	
9.	K-Maps Simplications	2	04-08-2026 05-08-2026		TLM1	
10.	Combinational circuits, Desing Decoder and Multiplexers	1	06-08-2026		TLM1	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: Sequential Logic Circuits, Basic structure of computer, Computer generations

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Introduction to sequential circuits,	1	08-08-2026		TLM1	
12.	Flip-flops(RS,J,T,D),	2	11-08-2026 12-08-2026		TLM1	
13.	Master slave flip-flop	1	13-08-2026		TLM1	
14.	Conversion of flip-flops, Truth & excitation tables	2	18-08-2026 19-08-2026		TLM1	
15.	Registers	1	20-08-2026		TLM1	
16.	counters	1	22-08-2026		TLM1	
17.	Basic structure of computer	1	25-08-2026		TLM1	
18.	Bus structure	1	27-08-2026		TLM1	
19.	Multi processors and multi computers	1	29-08-2026		TLM1	
20.	Computer generations	1	01-09-2026		TLM1	
21.	Von- Neumann Architecture	1	02-09-2026		TLM1	
22.	Activity Based Learning	1	03-09-2026		TLM1	
No. of classes required to complete UNIT-II: 14				**No. of classes taken:**		
MID-1 Examinations From 07-09-2026 to 09-09-2026						

UNIT-III: Data Representation, Processor Organization

S. No.	Topics to be covered	No. of Classes	Tentative Date of	Actual Date of	Teaching Learning	HOD Sign

		Required	Completion	Completion	Methods	Weekly
23.	Signed Number representation	1	05-09-2026		TLM2	
24.	Addition and Subtraction of Signed Numbers	1	10-09-2026 12-09-2026		TLM2	
25.	Design of Fast Adders	1	15-09-2026		TLM2	
26.	Multiplication of Positive Numbers	1	16-09-2026		TLM2	
27.	Signed-operand Multiplication	1	17-09-2026		TLM2	
28.	Fast Multiplication	1	19-09-2026		TLM2	
29.	Integer Division,	1	22-09-2026		TLM2	
30.	Floating-Point Numbers and Operations	1	23-09-2026		TLM2	
31.	Processor Organization of Fundamental Concepts	1	24-09-2026		TLM2	
32.	Execution of a Complete Instruction	1	26-09-2026		TLM2	
33.	Multiple-Bus Organization	1	29-09-2026		TLM2	
34.	Hardwired Control	1	30-09-2026		TLM2	
35.	Micro programmed Control	1	01-10-2026		TLM2	
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: Memory organization, Virtual Memories

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Memory organization	1	03-10-2026		TLM2	
37.	Semiconductor RAM Memories	1	06-10-2026		TLM2	
38.	Concept of memory hierarchical organization	1	07-10-2026		TLM2	
39.	Read-Only Memories, Speed, Size and Cost	1	08-10-2026		TLM2	
40.	Cache memory	1	10-10-2026		TLM2	
41.	Virtual Memories	1	13-10-2026		TLM2	
42.	Memory Management Requirements, Secondary Storage	2	14-10-2026 15-10-2026		TLM2	
No. of classes required to complete UNIT-IV: 8				**No. of classes taken:**		

UNIT-V: Input/output Organization: & Peripheral devices, DMA

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
43.	Input/Output Organization: Accessing I/O Devices	1	17-10-2026		TLM2	
44.	Interrupts	1	27-10-2026		TLM2	
45.	Processor Examples	1	28-10-2026		TLM2	
46.	Interface Circuits	1	29-10-2026		TLM2	
47.	Peripheral devices –I/O sub-systems	1	31-10-2026		TLM2	
48.	I/O device interface	1	03-11-2026		TLM2	
49.	I/O transfers-program controlled	1	04-11-2026		TLM2	
50.	Interrupt driven	1	05-11-2026		TLM2	
51.	DMA	1	07-11-2026		TLM2	
52.	Activity Based Learning	1	10-11-2026		TLM2	
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		
MID-1 Examinations From 12-11-2026 to 14-11-2026						

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actually Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	Error Correction Code Addressing Modes	1	11-11-2026		TLM2	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineer**ing 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Ms. Md. Sajeena**	**Dr. Ch.Venkata Narayana**	**Dr .D.Venkata Subbaiah**	**Dr. S. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.N V NAIK
Course Name & Code : ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS & 23CS04
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE/III /A **A.Y.:** 2026-27

PREREQUISITE: Data Structures

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course is to

1. Provide knowledge on advance data structures frequently used in Computer Science domain
2. Develop skills in algorithm design techniques popularly used
3. Understand the use of various data structures in the algorithm design

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Identify the characteristics of an algorithm, analyze its time and space complexity and construct balanced binary trees. **(Apply-L3)**
CO2	Understand Heap structures and graph terminology to perform various operations on non-linear data structures. **(Understand-L2)**
CO3	Apply Divide and Conquer, Greedy algorithm and dynamic programming for solving problems**. (Apply - L3)**
CO4	Analyze the backtracking and branch-and-bound search methods on optimization problems **(Apply - L3)**
CO5	Summarize the importance of NP-Hard and its applications. **(Understand-L2)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	-	-	-		3	3	3
CO2	2	2	-	-	-	-	-	-	-	-	-	-	3	3	3
CO3	2	2	3	-	-	-	-	-	-	-	-	-	3	3	1
CO4	2	2	3	-	-	-	-	-	-	-	-	-	3	2	3
CO5	2	2	-	1	-	-	-	-	-	-	-	-		-	-
1 - Low			**2 –**Medium						**3 -** High						

TEXTBOOKS:

T1 Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2ndEdition Universities Press

T2 Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition University Press

REFERENCE BOOKS:

R1 Data Structures and program design in C, Robert Kruse, Pearson Education Asia

R2 An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

R3 The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth,

Addison-Wesley, 1997.

R4 Data Structures using C & C++: Langsam, Augenstein &Tanenbaum, Pearson, 1995 Algorithms + Data Structures & Programs: N.Wirth, PHI

R5 Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.

R6 Data structures in Java: Thomas Standish, Pearson Education Asia

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction, AVL Tree, B-Tree

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and CO discussion	1	13-07-2026		TLM1	
2.	Introduction to Algorithm-Characteristics	1	14-07-2026		TLM1	
3.	Pseudo code specifications-Sample Algorithms	1	15-07-2026		TLM1	
4.	Tutorial on writing algorithms using Pseudo Code	1	16-07-2026		TLM3	
5.	Algorithm Analysis- Time and Space Complexity	2	18-07-2026 20-07-2026		TLM1	
6.	Tutorial on finding space & time complexity of algorithms	1	21-07-2026		TLM3	
7.	Asymptotic Notations	2	22-07-2026 23-07-2026		TLM1	
8.	AVL Tree Operations	3	25-07-2026 27-07-2026 28-07-2026		TLM1	
9.	B-Tree operations	3	29-07-2026 30-07-2026 01-08-2026		TLM1	
10.	Tutorial on AVL Tree and Trees	1	03-08-2026		TLM3	
No. of classes required to complete UNIT-I: 16				**No. of classes taken:**		

UNIT-II: Heap Tress, Graphs, Divide and Conquer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Heap Trees (Priority Queue) - Introduction	1	04-08-2026		TLM1	
12.	Max Heap, Min Heap Construction-operations	1	05-08-2026		TLM1	
13.	Implementation of Heap Tree	1	06-08-2026		TLM1	
14.	Tutorial on Heap Tree Construction	1	08-08-2026		TLM3	
15.	Graph Terminology	1	10-08-2026		TLM1	
16.	Representations of Graphs	1	11-08-2026		TLM1	
17.	Basic Search and Traversal Techniques – DFS	1	12-08-2026		TLM1	
18.	BFS – Example, Implementation	1	13-08-2026		TLM1	
19.	Connected Components, Biconnected Components	3	17-08-2026 18-08-2026 19-08-2026		TLM1	
20.	Divide and Conquer General Method	2	20-08-2026 22-08-2026		TLM1	
21.	Finding Max and Min	2	22-08-2026 24-08-2026		TLM1	
22.	Merge Sort	2	25-08-2026 27-08-2026		TLM1	
23.	Quick sort	2	29-08-2026 31-08-2026		TLM1	

24.	Strassen' Matrix Multiplication	2	01-09-2026 02-09-2026		TLM1	
25.	Tutorial on Divide and Conquer Problems	1	05-09-2026		TLM3	
No. of classes required to complete UNIT-II: 22				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)						

UNIT-III: Greedy Method:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Introduction to Greedy Method	1	10-09-2026		TLM1	
27.	Job Sequencing with dead Lines	1	12-09-2026		TLM1	
28.	Knapsack Problem	1	12-09-2026		TLM1	
29.	Minimum Cost Spanning Tree- Kruskal Algorithm	2	15-09-2026 16-09-2026		TLM1	
30.	Tutorial on different knapsack problem instances	1	17-09-2026		TLM3	
31.	Prims Algorithm	1	19-09-2026		TLM1	
32.	Single Source Shortest Path	2	21-09-2026 22-09-2026		TLM1	
33.	Tutorial on analysis of prims & kruskal's algorithm	1	23-09-2026			
34.	Optimal Storage on tapes	1	24-09-2026		TLM1	
35.	Huffman Coding	1	26-09-2026		TLM1	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Dynamic Programming

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Introduction to Dynamic Programming	1	28-09-2026		TLM1	
37.	All pairs shortest path	1	29-09-2026		TLM1	
38.	Tutorial on Tabular & Memorization methods in Dynamic Programing	1	30-09-2026		TLM3	
39.	Bellman Ford Algorithm	1	01-10-2026		TLM1	
40.	0/1 knapsack problem	2	03-10-2026 05-10-2026		TLM1	
41.	Tutorial on Analysis of Bellman Ford & Floyd Warshall Algorithms	1	06-10-2026		TLM3	
42.	Optimal binary search tree	2	07-10-2026 08-10-2026		TLM1	
43.	String editing	2	10-10-2026 12-10-2026		TLM1	
44.	Travelling salesperson problem	1	13-10-2026		TLM1	
45.	Tutorial on Analysis of OBST	1	14-10-2026		TLM3	
No. of classes required to complete UNIT-IV: 13				**No. of classes taken:**		

UNIT-V: Back tracking & Branch and bound

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Backtracking Introduction	1	15-10-2026		TLM1	
47.	N-queens Problem	1	17-10-2026		TLM1	
48.	Graph Coloring	1	26-10-2026		TLM1	
49.	Tutorial on Analysis of N-Queens	1	27-10-2026		TLM3	
50.	Sum of subsets problem	1	28-10-2026		TLM1	
51.	Introduction to Branch and Bound	1	29-10-2026		TLM1	
52.	0/1 Knapsack-LCBB, FIFOBB	3	31-10-2026 02-11-2026 03-11-2026		TLM1	
53.	Tutorial on 0/1 Knapsack	1	04-11-2026			
54.	Travelling Salesperson Problem -LC Search	2	05-11-2026 07-11-2026		TLM1	
55.	Introduction to P and NP	1	09-11-2026		TLM1	
56.	NP-Complete Problems	1	10-11-2026		TLM1	
57.	Revision	1	11-11-2026		TLM1	
No. of classes required to complete UNIT-V: 15				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Np-Hard Problems	1	01-11-2025					
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5

II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. N V NAIK**	**Dr. D.Srinivasa rao**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),
An ISO 21001:2018,14001:2015,50001:2018 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.N V NAIK
Course Name & Code **:** ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB & 23CS53
L-T-P Structure **: 0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE/III/A **A.Y.:** 2026-27

PREREQUISITE: DATA STRUCTURES LAB

COURSE EDUCATIONAL OBJECTIVE:
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 (CO):
CO1: Implement balanced binary trees, heaps and graph traversals using arrays and linked list. **(Apply-L3)**
CO2: Implement Various Sorting Techniques. **(Apply - L3)**
CO3: : Implement optimization problems using greedy, dynamic programming, backtracking and branch-and-bound techniques. **(Apply - L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	1	-		-	-	-	-	-	-		3	3	3
CO2	-	2	1	-		-	-	-	-	-	-	-	3	3	3
CO3	-	2	1	-		-	-	-	-	-	-	-	3	3	3
CO4	-	-	-	-	-	-	-	2	2	2	-	-		-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	BST	03	16-07-2026		
2.	AVL tree	03	23-07-2026		
3.	B-Tree	03	30-07-2026		
4.	Heap Construction	03	06-08-2026		
5.	BFT & DFT	03	13-08-2026		
6.	Finding Biconnected Components	03	20-08-2026 27-08-2026		
7.	Finding Max and Min	03	03-09-2026		
8.	Merge sort, Quick sort	03	10-09-2026		
9.	Single source shortest path	03	17-09-2026		
10.	Job sequencing with dead lines	03	24-09-2026		
11.	0/1 knapsack -Dynamic Programming	03	01-10-2026		
12.	N-queens Problem	03	08-10-2026		
13.	Travelling Sales person Problem-Branch and bound	03	15-10-2026		
14.	Practice lab	03	29-10-2026		
15.	Internal Exam	03	05-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. N V NAIK**	**Dr. D.Srinivasa Rao**	**Dr. Y.V.B Reddy**	**Dr. S.Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. N SRINIVASARAO
Course Name & Code : OBJECT ORIENTED PROGRAMMING THROUGH JAVA & 23CS05
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE/III/A **A.Y.:** 2026-27

PREREQUISITE: Introduction to Programming

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course is to:

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

COURSE OUTCOMES (COs): At the end of the course, students will be able to

CO1	Identify the syntax and semantics of java programming language and basic concepts of Java. **(Understand-L2)**
CO2	Understand the basic concepts of object-oriented programming **(Understand-L2)**
CO3	Develop reusable programs using the concepts of inheritance, polymorphism, and interfaces. **(Apply-L3)**
CO4	Apply the concepts of packages, exception handling & I/O streams to develop secure, error free, and efficient applications. **(Apply-L3)**
CO5	Design multithreaded and GUI based applications which mimic the real word scenarios. **(Apply-L3)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	2	2	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	2	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	2	3	3
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	3	3
CO5	3	2	-	-	-	-	-	-	-	-	-	2	2	2	2
1 - Low			**2** –Medium								**3** - High				

TEXTBOOKS:

T1 JAVA one step ahead, Anitha Seth, B. L. Juneja, Oxford.
T2 Joy with JAVA, Fundamentals of Object-Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
T3 JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

REFERENCE BOOKS:

R1 The complete Reference Java, 11thedition, Herbert Schildt, TMH
R2 Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Object Oriented Programming, Data Types, Variables, Introduction to Operators and Control Statements

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and CO discussion	1	13/07/2026		TLM1	
2.	Basic concepts, Principles	1	14/07/2026		TLM1	
3.	Program Structure in Java	2	16/07/2026 17/07/2026		TLM1	
4.	Command Line Arguments, User Input to Programs.	2	18/07/2026 20/07/2026		TLM1	
5.	Data Types, Variables	2	21/07/2026 23/07/2026		TLM1	
6.	Static Variables and Methods, Attribute Final	2	24/07/2026 25/07/2026		TLM1	
7.	Introduction to Operators	2	27/07/2026 28/07/2026		TLM1	
8.	Control Statements	2	30/07/2026 31/07/2026		TLM1	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Classes and Objects, Constructors and Methods and String Handling in Java

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
9.	Classes and Objects	1	01/08/2026		TLM1	
10.	Class Declaration and Modifiers, Class Members	1	03/08/2026		TLM1	
11.	Declaration of Class Objects, Assigning One Object to Another	1	04/08/2026		TLM1	
12.	Access Control for Class Members, Accessing Private Members of Class.	1	06/08/2026		TLM1	
13.	Constructors and Methods Introduction	1	07/08/2026		TLM1	
14.	Defining Methods, Constructor Methods for Class	2	08/08/2026 10/08/2026		TLM1	
15.	Overloaded Constructor Methods	1	11/08/2026		TLM1	
16.	Overloaded Methods, Nested Classes	2	13/08/2026 14/08/2026		TLM1	
17.	Passing Arguments by Value and by Reference, Keyword this	1	17/08/2026		TLM1	
18.	Class Objects as Parameters in Methods, Access Control	1	18/08/2026		TLM1	
19.	Recursive Methods, Nesting of Methods, Attributes Final and Static	2	20/08/2026 21/08/2026		TLM1	
20.	String Handling in Java, String class	2	22/08/2026 24/08/2026		TLM1	
21.	StringTokenizer, StringBuffer classes	2	25/08/2026 27/08/2026		TLM1	
No. of classes required to complete UNIT-II: 18				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)						

UNIT-III: Arrays, Inheritance and Interfaces

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Introduction to Arrays	1	28/08/2026		TLM1	
23.	Operations on Array Elements	1	29/08/2026		TLM1	
24.	Sorting & Searching values in Arrays	1	31/08/2026		TLM1	
25.	Two & Three-Dimensional Arrays and Vectors	2	01/09/2026 03/09/2026		TLM1	
26.	Inheritance and Polymorphism	2	05/09/2026 10/09/2026		TLM1	
27.	Method overloading & overriding, abstract classes	2	11/09/2026 12/09/2026		TLM1	
28.	Interface concepts	1	15/09/2026		TLM1	
29.	Functional Interfaces, Annotations	1	17/09/2026		TLM1	
No. of classes required to complete UNIT-III: 11				**No. of classes taken:**		

UNIT-IV: Packages and Java Library, Exception Handling and Java I/O, File

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
30.	Packages and Java Library Introduction	1	18/09/2026		TLM1	
31.	Packages related concepts	2	19/09/2026 21/09/2026		TLM1	
32.	Wrapper Classes, Auto-boxing and Auto-unboxing	1	22/09/2026		TLM1	
33.	Java util Classes and Interfaces	1	24/09/2026		TLM1	
34.	Exception Handling Hierarchy & keywords	2	25/09/2026 26/09/2026		TLM1	
35.	Generating user defined exception	2	28/09/2026 29/09/2026		TLM1	
36.	Java I/O streams and Files	2	01/10/2026 03/10/2026		TLM1	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Multithreaded Programming, Java Collections and Java FX GUI

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Multithreaded Programming	1	05/10/2026		TLM1	
38.	Thread life cycle, naming, priories of the threads, states	2	06/10/2026 08/10/2026		TLM1	
39.	Synchronization & Inter-thread communication	2	09/10/2026 10/10/2026		TLM1	
40.	Java Collections & Hierarchy	2	12/10/2026 13/10/2026		TLM1	
41.	List, Set Interfaces	1	15/10/2026		TLM1	
42.	Map Interface with examples	2	16/10/2026 17/10/2026		TLM1	
43.	Java FX, Overview of AWT & Swings API	2	26/10/2026 27/10/2026		TLM1	
44.	Event handling	1	29/10/2026		TLM1	
45.	Layouts, mouse events	1	30/10/2026		TLM1	
46.	Revision	1	31/10/2026		TLM1	
No. of classes required to complete UNIT-V: 15				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text book followed	HOD Sign Weekly
1.	Java new features	2		02/11/2026 03/11/2026	TLM1			
2.	Realtime applications examples	3		05/11/2026 06/11/2026 07/11/2026	TLM1			
3.	Java JDBC	2		09/11/2026 10/11/2026	TLM1			
No. of classes required to complete - 07				No. of classes taken:				
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
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PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
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PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. N. Srinivasa Rao**	**Dr. Y.V.B Reddy**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. N. SRINIVASARAO
Course Name & Code **:** OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB & 23CS54
L-T-P Structure **: 0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE/III/A **A.Y.:** 2026-27

PREREQUISITE: Computer Programming Lab

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the 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.
- Construct Threads, Event Handling, implement packages, Java FX GUI.

COURSE OUTCOMES (CO):

CO1: Implement basic concepts of the java programming language. **(Apply-L3)**
CO2: Implement object-oriented programming concepts and exception handling **(Apply- L3)**
CO3: Design multithreaded and GUI based applications. **(Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	2	-	-	-	-	-	-	2	2	2	-
CO2	3	2	2	-	2	-	-	-	-	-	-	2	2	2	2
CO3	3	2	2	-	2	-	-	-	-	-	-	2	2	2	2
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	Exercise – 1	03	17/07/2026		
2.	Exercise – 2	03	24/07/2026		
3.	Exercise – 3	06	31/07/2026 07/08/2026		
4.	Exercise – 4	06	14/08/2026 21/08/2026		
5.	Exercise – 5	03	28/08/2026		
6.	Exercise – 6	03	11/09/2026		
7.	Exercise – 7	06	18/09/2026 25/09/2026		
8.	Exercise – 8	03	09/10/2026		
9.	Exercise – 9	06	16/10/2026 30/10/2026		
10.	Internal Exam	03	06/11/2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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PROGRAMME SPECIFIC OUTCOMES (PSOs):

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Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. N. Srinivasa Rao**	**Dr. Y.V.B Reddy**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: D. Jyothi
Course Name & Code : PYTHON PROGRAMMING **(SOC)** & 23CSS1
L-T-P Structure : **0-1-2** **Credits:** 2
Program/Sem/Sec : B.Tech /CSE/III/A **A.Y.:** 2026-27

PREREQUISITE: INTRODUCTION TO PROGRAMMING

COURSE EDUCATIONAL OBJECTIVE:
The main objectives of the course are to

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

COURSE OUTCOMES (CO):
CO1: Implement the core programming concepts of Python programming language**. (Apply-L3)**
CO2: Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries **(Apply-L3)**
CO3: Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications**. (Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO2	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO3	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S.NO	Topic to be covered	Number of Hours	Tentative Date of Completion	Actual Date of Completion	HOD Signature
1.	**UNIT-1:** Introduction, Course Outcomes, Introduction to Python, Installation, Variables, Data types.	3	13-07-2026		
2.	Reading Input, Print output, Comments	1	15-07-2026		
3.	Types of operators, Working on operators, Sample Programs, Type Conversion	3	20-07-2026		
4.	Control statements – if, else, nestedif, elif	1	22-07-2026		
5.	Loop statements, Programs on Loop statements	3	27-07-2026		
6.	pass, continue and break	1	29-07-2026		
7.	Exception Handling	3	03-08-2026		
8.	Programs on exception handling.	1	05-08-2026		
9.	**UNIT-2:** Function Definition and Calling the function, return Statement and void Function	3	10-08-2026		
10.	Scope and Lifetime of Variables,	1	12-08-2026		
11.	Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments, sample programs.Strings Introduction, Basic String Operations	3	17-08-2026		
12.	Accessing Characters in String by Index Number, String Slicing and Joining.	1	19-08-2026		
13.	String Methods, Formatting Strings., Sample Programs on strings ,Creating Lists, Basic List Operations,	3	24-08-2026		

14.	Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement., Programs on Lists **Unit-3:** Introduction to Dictionaries, Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries,	3	31-08-2026		
15.	Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement. Sample programs on dictionaries.	1	02-09-2026		
16.	Creating Tuples, Basic Tuple Operations, tuple() Function.	1	16-09-2026		
17.	Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Sample Programs on tuples.,Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function	3	21-09-2026		
18.	Sets, Set Methods, Frozenset., Sample Programs on sets, tuples.	1	23-09-2026		
19.	**Unit-4**: Introduction to files, Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files	3	28-09-2026		
20.	Pickle Module	1	30-09-2026		
21.	Reading and Writing CSV Files, Python os and os.path Modules. Sample programs.	3	05-10-2026		
22.	**Object-Oriented Programming**: Classes and Objects, Creating Classes in Python	1	07-10-2026		
23.	Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, sample programs.	3	12-10-2026		

24.	Encapsulation, Inheritance, Polymorphism.	1	14-10-2026		
25.	Sample Python programs on object-oriented programming.	3	26-10-2026		
26.	**Unit 5: Introduction to Data Science**: Functional Programming	1	28-10-2026		
27.	JSON and XML in Python, NumPy with Python, Pandas.	3	02-11-2026		
28.	JSON and XML in Python, NumPy with Python, Pandas. Example Programs on Numpy and pandas.	1	04-11-2026		
29.	**Internal Exam**	3	09-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**D. Jyothi**	**Dr. G. Minni**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mrs. B.Swathi
Course Name & Code **:** Discrete Mathematics & Graph Theory & 23FE11
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/III/B **A.Y.:** 2026-27
Regulations : R23

PREREQUISITE: Mathematics courses of first year of study.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- 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 (COs): At the end of the course, student will be able to

CO1	Construct mathematical arguments using logical connectives and quantifiers and verify them. **(Apply- L3)**
CO2	Demonstrate the basic terminology of functions, relations, lattices and their operations. **(Understand -L2)**
CO3	Illustrate the basic principles/techniques to solve different combinatorial problems and linear recurrence relations**.(Apply- L3)**
CO4	Demonstrate the different types of graphs.**(Understand -L2)**
CO5	Apply the properties of graphs to solve the graph theory problems in computer science**.(Apply- L3)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1													
CO2	3	2	1												
CO3	3	3	1	1											
CO4	3	3	1												
CO5	3	3	1	1											1
1 - Low			**2 –**Medium							**3 -** High					

TEXTBOOKS:

T1 Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.

T2 Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.

T3 Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill

REFERENCE BOOKS:

R1	Discrete Mathematics for Computer Scientists and Mathematicians, J. L.Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
R2	Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
R3	Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.
R4	Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: MATHEMATICAL LOGIC

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Propositional Calculus: Statements and Notations, Connectives	1	13-07-2026		TLM1	
2.	Well Formed Formulas, Truth Tables	1	14-07-2026		TLM1	
3.	Tutorial on : Statements and Notations, Connectives,TruthTables	1	15-07-2026		TLM3	
4.	Tautologies, Equivalence of Formulas, Duality Law	1	18-07-2026		TLM1	
5.	Tautological Implications, Normal Forms,	1	20-07-2026		TLM1	
6.	Theory of Inference for Statement Calculus, Consistency of Premises,	1	21-07-2026		TLM2	
7.	Tutorial on : Theory of Inference for Statement Calculus, Consistency of Premises	1	22-07-2024		TLM3	
8.	Indirect Method of Proof, Predicate Calculus: Predicates	1	25-07-2026		TLM1	
9.	Predicative Logic, Statement Functions	1	27-07-2026		TLM1	
10.	Variables and Quantifiers	1	28-07-2026		TLM1	
11.	Tutorial on : Predicates, Predicative Logic, Statement Functions,	1	29-07-2026		TLM3	
12.	Free and Bound Variables	1	01-08-2026		TLM1	
13.	Inference Theory for Predicate Calculus	2	03-08-2026 04-08-2026		TLM1	
14.	Tutorial on Unit 1	1	05-08-2026		TLM3	
15.	Activity Based Learning	1	08-08-2026		TLM7	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: SET THEORY

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
16.	Sets: Operations on Sets	1	10-08-2026		TLM1	
17.	Principle of Inclusion-Exclusion	1	11-08-2026		TLM2	
18.	Relations: Properties, Operations	1	12-08-2026		TLM1	
19.	Tutorial on Practice the sets and Relations Problems	1	17-08-2024		TLM3	

20.	Partition and Covering,	2	18-08-2026 19-08-2026		TLM1	
21.	Transitive Closure, Equivalence,	1	22-08-2026		TLM1	
22.	Compatibility and Partial Ordering, Hasse Diagrams	2	24-08-2026 25-08-2026		TLM1	
23.	Tutorial on Transitive Closure, Equivalence,Hasse Diagrams	1	29-08-2026		TLM3	
24.	Functions: Bijective, Composition, Inverse,	1	31-08-2026		TLM1	
25.	Permutation, and Recursive Functions,	1	01-09-2026		TLM1	
26.	Lattice and its Properties	1	02-09-2026		TLM1	
27.	Activity Based Learning	1	05-09-2026		TLM7	
No. of classes required to complete UNIT-II: 14				**No. of classes taken:**		

UNIT-III: COMBINATORICS AND RECURRENCE RELATIONS:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
28.	Basis of Counting, Permutations, Permutations with Repetitions	1	12-09-2026		TLM1	
29.	Circular and Restricted Permutations, Combinations,	1	15-09-2026		TLM1	
30.	Tutorial on Permutations, Combinations,	1	16-09-2026		TLM3	
31.	Restricted Combinations	1	19-09-2026		TLM1	
32.	Binomial and Multinomial Coefficients and Theorems.	1	21-09-2026		TLM2	
33.	Tutorial on Binomial and Multinomial Coefficients and Theorems.	1	22-09-2026		TLM3	
34.	Recurrence Relations: Generating Functions, Function of Sequences,	1	23-09-2026		TLM1	
35.	Partial Fractions, Calculating Coefficient of Generating Functions	1	26-09-2026		TLM1	
36.	Recurrence Relations, Formulation as Recurrence Relations	1	28-09-2026		TLM1	
37.	Tutorial on Partial Fractions, Recurrence Relations	1	29-09-2026		TLM3	
38.	Solving Recurrence Relations by Substitution and Generating Functions	1	30-09-2026		TLM1	
39.	Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations	2	03-10-2026 05-10-2026		TLM1	
40.	Tutorial on UNIT III	1	06-10-2026		TLM3	
41.	Activity Based Learning	1	07-10-2026		TLM7	
No. of classes required to complete UNIT-III: 15				**No. of classes taken:**		

UNIT-IV: Graph Theory:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
42.	Basic Concepts, Graph Theory and its Applications	1	10-10-2026		TLM1	
43.	Subgraphs, Graph Representations: Adjacency and Incidence Matrices	2	12-10-2026 13-10-2026		TLM1	
44.	Isomorphic Graphs,	1	14-10-2026		TLM2	
45.	Paths and Circuits	1	17-10-2026		TLM1	
46.	Tutorial on Graphs	1	26-10-2026		TLM3	
47.	Eulerian and Hamiltonian Graphs,	1	27-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 9				**No. of classes taken:**		

UNIT-V: Multi Graphs

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
48.	Multigraphs,	1	28-10-2026		TLM1	
49.	Bipartite and Planar Graphs	1	31-10-2026		TLM1	
50.	Euler's Theorem	1	02-11-2026		TLM3	
51.	Graph Colouring	1	03-11-2026		TLM1	
52.	Covering	1	04-11-2026		TLM1	
53.	Chromatic Number	1	07-11-2026		TLM1	
54.	Spanning Trees, Prim's and Kruskal's Algorithms	1	09-11-2026		TLM1	
55.	BFS Spanning Trees.	1	10-11-2026		TLM2	
56.	DFS Spanning Trees	1	11-11-2026		TLM1	
No. of classes required to complete UNIT-V: 09				**No. of classes taken:**		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Pigeon Hole Principle	1	29-08-2026		**TLM1**	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project
TLM7	Activity Based learning		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I,II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mrs B.Swathi**	**Mrs B.Swathi**	**Dr. D. Venkata Subbaiah**	**Dr. S. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.D.Venkata Subbaiah

Course Name & Code : UHV 2 – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT -20HS01
L-T-P Structure : **2-1-0** **Credits: 3**
Program/Sem/Sec : II B.Tech., III-Sem, B-Sec **A.Y.: 2026-27**

PRE-REQUISITE: Nil

AIM of Course UHV2: The course "Universal Human Values" aims to help individuals understand and internalize fundamental human values to live a more fulfilling and ethical life. It focuses on developing a holistic perspective, promoting self-awareness, and fostering harmony within oneself and with others. The course content typically includes exploring concepts like happiness, prosperity, and ethical conduct, and their implications for personal and professional life.

COURSE EDUCATIONAL OBJECTIVES(CEO):

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

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Describe the terms like Natural Acceptance, Happiness and Prosperity (L2)
CO2	Identify one's self, and one's surroundings (family, society nature) (L2)
CO3	Relate human values with human relationship and human society. (L2)
CO4	Illustrate the need for universal human values and harmonious existence (L2)
CO5	Develop as socially and ecologically responsible engineers (L3)

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

CO	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	3	-	-	-	-	-	-	-
CO3	-	-	-	-	-	2	-	3	2	-	-	-	-	-	-
CO4	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	2	3	-	-	-	1	-	-	-

TEXTBOOKS:

T1 Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

REFERENCE BOOKS:

R1 Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

R2 Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

R3 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi**.**

R4 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

R5 Small is Beautiful - E. F Schumacher.

R6 Slow is Beautiful - Cecile Andrews.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and need of Value Education.	2	13-07-26 14-07-26		TLM1	
2.	Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)	2	15-07-26 18-07-26		TLM1	
3.	Understanding Value Education	1	20--07-26		TLM2	
4.	Practice Session PS1 Sharing about Oneself	1	21-07-26		TLM6	
5.	self-exploration as the Process for Value Education	1	22-07-26		TLM2	
6.	Continuous Happiness and Prosperity – the Basic Human Aspirations	2	25-07-26 27-07-26		TLM1	
7.	Practice Session PS2 Exploring Human Consciousness	1	28-07-26		TLM1	
8.	Happiness and Prosperity – Current Scenario	1	29-07-26		TLM1	

9.	Method to Fulfill the Basic Human Aspirations	1	01-08-26		TLM1	
10.	Practice Session PS3 Exploring Natural Acceptance	1	03-08-26		TLM6	
11.	Activity/tutorial	1	04-08-26			
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
12.	Understanding Human being as the Co-existence of the self and the body.	2	05-08-26 10-08-26		TLM2	
13.	Distinguishing between the Needs of the self and the body	1	11-08-26		TLM2	
14.	Practice Session PS4 Exploring the difference of Needs of self and body.	1	12-08-26		TLM2	
15.	The body as an Instrument of the self	2	17-08-26 18-08-26		TLM1	
16.	Understanding Harmony in the self	2	19-08-26 22-08-26		TLM2	
17.	Practice Session PS5 Exploring Sources of Imagination in the self	1	24-08-26		TLM6	
18.	Harmony of the self with the body	1	25-08-26		TLM2	
19.	Program to ensure self-regulation and Health	1	29-08-26		TLM1	
20.	Practice Session PS6 Exploring Harmony of self with the body	1	31-08-26		TLM2	
21.	Activity/tutorial	1	01-09-26			
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-202026 TO 09-09-202026)						

UNIT-III

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Harmony in the Family – the Basic Unit of Human Interaction	1	02-09-26		TLM2	
23.	'Trust' – the Foundational Value in Relationship	2	05-09-26 15-09-26		TLM1	
24.	Practice Session PS7 Exploring the	1	16-09-26		TLM6	

	Feeling of Trust					
25.	'Respect' – as the Right Evaluation	1	19-09-26		TLM1	
26.	Other Feelings, Justice in Human-to-Human Relationship	1	21-09-26		TLM1	
27.	Practice Session PS8 Exploring the Feeling of Respect	1	22-09-26		TLM6	
28.	Understanding Harmony in the Society	1	23-09-26		TLM1	
29.	Vision for the Universal Human Order	1	26-09-26		TLM1	
30.	Practice Session PS9 Exploring Systems to fulfil Human Goal	1	28-09-26		TLM6	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT-IV

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31.	Understanding Harmony in the Nature	1	29-09-26		TLM2	
32.	Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature	2	30-09-26 03-10-26		TLM2	
33.	Practice Session PS10 Exploring the Four Orders of Nature	1	05-10-26		TLM6	
34.	Realizing Existence as Co-existence at All Levels	2	06-10-26 07-10-26		TLM2	
35.	The Holistic Perception of Harmony in Existence	2	12-10-26 13-10-26		TLM2	
36.	Practice Session PS11 Exploring Co-existence in Existence.	1	14-10-26 17-10-26		TLM6	
No. of classes required to complete UNIT-IV: 09				**No. of classes taken:**		

UNIT-V

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Natural Acceptance of Human Values	1	26-10-26		TLM2	
38.	Definitiveness of (Ethical) Human Conduct	1	27-10-26		TLM2	
39.	Practice Session PS12 Exploring Ethical Human Conduct	1	28-10-26		TLM2	
40.	A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order	1	31-10-26		TLM2	
41.	Competence in Professional Ethics	1	02-11-26		TLM2	
42.	Practice Session PS13 Exploring Humanistic Models in Education	1	03-11-26		TLM6	
43.	Holistic Technologies, Production Systems and Management Models-Typical Case Studies	1	04-11-26 07-11-26		TLM2	
44.	Strategies for Transition towards Value-based Life and Profession	1	09-11-26		TLM2	
45.	Practice Session PS14 Exploring Steps of Transition towards Universal Human Order	1	10-11-26		TLM6	
No. of classes required to complete UNIT-V: 09				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Pollution-Human Role	1	11/11/2026		TLM2			
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (12-11-202026 TO 14-11-202026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr.D.Venkata Subbaiah**			**Dr. Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Ms. Md. Sajeena
Course Name & Code **:** DL&CO 23IT01
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : II B.Tech., III-Sem, B-Sec **A.Y.: 2026-27**

Prerequisites:
Course Objectives: The main objectives of the course is to

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

COURSE OUTCOMES (COs): At the end of the course, students will be able to

CO1	Evaluate digital number systems and use Boolean algebra theorems, Properties and Canonical forms for digital logic circuit design. **(Understand- L2)**
CO2	Design Sequential logic circuits and understand basic functional blocks a computer system . **(Apply- L3)**
CO3	Understand computer architecture and Data representation to perform computer arithmetic operations and processor organization. **(Understand- L2)**
CO4	Analyze the memory hierarchy in a computer system. **(Understand- L2)**
CO5	Understand the I/O operations and the interfaces **(Understand-L2)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

CO	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	1	-	-	-	-	-	-	-	-	-	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-

Textbooks:

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

Reference Books:

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Number systems, Logic gates and Boolean algebra, Combinational circuits

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to DLD	1	13-07-2026		TLM1	
2.	Number systems	1	14-07-2026		TLM1	
3.	Different Number systems	1	16-07-2026		TLM1	
4.	Conversions of one number to another number	2	17-07-2026 20-07-2026		TLM1	
5.	Data Representations	1	21-07-2026		TLM1	
6.	Binary codes	2	23-07-2026 24-07-2026		TLM1	
7.	Basic Logic gates and Universal gates	2	27-07-2026 28-07-2026		TLM1	
8.	Boolean Logic functions	2	30-07-2026 31-07-2026		TLM1	
9.	K-Maps Simplications	2	03-08-2026 04-08-2026		TLM1	
10.	Combinational circuits, Desing Decoder and Multiplexers	1	06-08-2026		TLM1	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: Sequential Logic Circuits, Basic structure of computer, Computer generations

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Introduction to sequential circuits,	1	07-08-2026		TLM1	
12.	Flip-flops(RS,J,T,D),	2	10-08-2026 11-08-2026		TLM1	
13.	Master slave flip-flop	1	13-08-2026		TLM1	
14.	Conversion of flip-flops, Truth & excitation tables	2	14-08-2026 17-08-2026		TLM1	
15.	Registers	1	18-08-2026		TLM1	
16.	counters	1	20-08-2026		TLM1	
17.	Basic structure of computer	1	21-08-2026		TLM1	
18.	Bus structure	1	24-08-2026		TLM1	
19.	Multi processors and multi computers	1	25-08-2026		TLM1	
20.	Computer generations	1	27-08-2026		TLM1	
21.	Von- Neumann Architecture	1	28-08-2026		TLM1	
22.	Activity Based Learning	1	31-08-2026		TLM1	
No. of classes required to complete UNIT-II: 14				**No. of classes taken:**		
MID-1 Examinations From 07-09-2026 to 09-09-2026						

UNIT-III: Data Representation, Processor Organization

S. No.	Topics to be covered	No. of Classes	Tentative Date of	Actual Date of	Teaching Learning	HOD Sign

		Required	Completion	Completion	Methods	Weekly
23.	Signed Number representation	1	01-09-2026		TLM2	
24.	Addition and Subtraction of Signed Numbers	1	03-09-2026 10-09-2026		TLM2	
25.	Design of Fast Adders	1	11-09-2026		TLM2	
26.	Multiplication of Positive Numbers	1	15-09-2026		TLM2	
27.	Signed-operand Multiplication	1	17-09-2026		TLM2	
28.	Fast Multiplication	1	18-09-2026		TLM2	
29.	Integer Division,	1	21-09-2026		TLM2	
30.	Floating-Point Numbers and Operations	1	22-09-2026		TLM2	
31.	Processor Organization of Fundamental Concepts	1	24-09-2026		TLM2	
32.	Execution of a Complete Instruction	1	25-09-2026		TLM2	
33.	Multiple-Bus Organization	1	28-09-2026		TLM2	
34.	Hardwired Control	1	29-09-2026		TLM2	
35.	Micro programmed Control	1	01-10-2026		TLM2	
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: Memory organization, Virtual Memories

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Memory organization	1	05-10-2026		TLM2	
37.	Semiconductor RAM Memories	1	06-10-2026		TLM2	
38.	Concept of memory hierarchical organization	1	08-10-2026		TLM2	
39.	Read-Only Memories, Speed, Size and Cost	1	09-10-2026		TLM2	
40.	Cache memory	1	12-10-2026		TLM2	
41.	Virtual Memories	1	13-10-2026		TLM2	
42.	Memory Management Requirements, Secondary Storage	2	15-10-2026 16-10-2026		TLM2	
No. of classes required to complete UNIT-IV: 8				**No. of classes taken:**		

UNIT-V: Input/output Organization: & Peripheral devices, DMA

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
43.	Input/Output Organization: Accessing I/O Devices	1	26-10-2026		TLM2	
44.	Interrupts	1	27-10-2026		TLM2	
45.	Processor Examples	1	29-10-2026		TLM2	
46.	Interface Circuits	1	30-10-2026		TLM2	
47.	Peripheral devices –I/O sub-systems	1	02-11-2026		TLM2	
48.	I/O device interface	1	03-11-2026		TLM2	
49.	I/O transfers-program controlled	1	05-11-2026		TLM2	
50.	Interrupt driven	1	06-11-2026		TLM2	
51.	DMA	1	09-11-2026		TLM2	
52.	Activity Based Learning	1	09-11-2026		TLM2	
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		
MID-1 Examinations From 12-11-2026 to 14-11-2026						

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actually Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	Error Correction Code Addressing Modes	1	10-11-2026		TLM2	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineer**ing 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Ms. Md. Sajeena**	**Dr. Ch.Venkata Narayana**	**Dr .D.Venkata Subbaiah**	**Dr. S. Nagarjuna Reddy**
Signature				

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Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.N V NAIK
Course Name & Code : ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS & 23CS04
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE/III /B **A.Y.:** 2026-27

PREREQUISITE: Data Structures

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course is to

1. Provide knowledge on advance data structures frequently used in Computer Science domain
2. Develop skills in algorithm design techniques popularly used
3. Understand the use of various data structures in the algorithm design

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Identify the characteristics of an algorithm, analyze its time and space complexity and construct balanced binary trees. **(Apply-L3)**
CO2	Understand Heap structures and graph terminology to perform various operations on non-linear data structures. **(Understand-L2)**
CO3	Apply Divide and Conquer, Greedy algorithm and dynamic programming for solving problems**. (Apply - L3)**
CO4	Analyze the backtracking and branch-and-bound search methods on optimization problems **(Apply - L3)**
CO5	Summarize the importance of NP-Hard and its applications. **(Understand-L2)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	-	-	-		3	3	3
CO2	2	2	-	-	-	-	-	-	-	-	-	-	3	3	3
CO3	2	2	3	-	-	-	-	-	-	-	-	-	3	3	1
CO4	2	2	3	-	-	-	-	-	-	-	-	-	3	2	3
CO5	2	2	-	1	-	-	-	-	-	-	-	-		-	-
1 - Low			**2 –**Medium							**3 -** High					

TEXTBOOKS:

T1 Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2ndEdition Universities Press

T2 Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition University Press

REFERENCE BOOKS:

R1 Data Structures and program design in C, Robert Kruse, Pearson Education Asia

R2 An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

R3 The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth,

Addison-Wesley, 1997.

R4 Data Structures using C & C++: Langsam, Augenstein &Tanenbaum, Pearson, 1995 Algorithms + Data Structures & Programs: N.Wirth, PHI

R5 Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.

R6 Data structures in Java: Thomas Standish, Pearson Education Asia

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction, AVL Tree, B-Tree

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and CO discussion	1	13-07-2026		TLM1	
2.	Introduction to Algorithm-Characteristics	1	14-07-2026		TLM1	
3.	Pseudo code specifications-Sample Algorithms	1	16-07-2026		TLM1	
4.	Tutorial on writing algorithms using Pseudo Code	1	17-07-2026		TLM3	
5.	Algorithm Analysis- Time and Space Complexity	2	18-07-2026 20-07-2026		TLM1	
6.	Tutorial on finding space & time complexity of algorithms	1	21-07-2026		TLM3	
7.	Asymptotic Notations	2	23-07-2026 24-07-2026		TLM1	
8.	AVL Tree Operations	3	25-07-2026 27-07-2026 28-07-2026		TLM1	
9.	B-Tree operations	3	30-07-2026 31-07-2026 01-08-2026		TLM1	
10.	Tutorial on AVL Tree and Trees	1	03-08-2026		TLM3	
No. of classes required to complete UNIT-I: 16				**No. of classes taken:**		

UNIT-II: Heap Tress, Graphs, Divide and Conquer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Heap Trees (Priority Queue) - Introduction	1	04-08-2026		TLM1	
12.	Max Heap, Min Heap Construction-operations	1	06-08-2026		TLM1	
13.	Implementation of Heap Tree	1	07-08-2026		TLM1	
14.	Tutorial on Heap Tree Construction	1	08-08-2026		TLM3	
15.	Graph Terminology	1	10-08-2026		TLM1	
16.	Representations of Graphs	1	11-08-2026		TLM1	
17.	Basic Search and Traversal Techniques – DFS	1	13-08-2026		TLM1	
18.	BFS – Example, Implementation	1	14-08-2026		TLM1	
19.	Connected Components, Biconnected Components	3	17-08-2026 18-08-2026 20-08-2026		TLM1	
20.	Divide and Conquer General Method	2	21-08-2026 22-08-2026		TLM1	
21.	Finding Max and Min	2	22-08-2026 24-08-2026		TLM1	
22.	Merge Sort	2	25-08-2026 27-08-2026		TLM1	
23.	Quick sort	2	31-08-2026 01-09-2026		TLM1	

24.	Strassen' Matrix Multiplication	1	03-09-2026		TLM1	
25.	Tutorial on Divide and Conquer Problems	1	05-09-2026		TLM3	
No. of classes required to complete UNIT-II: 21				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)						

UNIT-III: Greedy Method:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Introduction to Greedy Method	1	10-09-2026		TLM1	
27.	Job Sequencing with dead Lines	1	11-09-2026		TLM1	
28.	Knapsack Problem	1	12-09-2026		TLM1	
29.	Minimum Cost Spanning Tree- Kruskal Algorithm	2	15-09-2026 17-09-2026		TLM1	
30.	Tutorial on different knapsack problem instances	1	18-09-2026		TLM3	
31.	Prims Algorithm	1	19-09-2026		TLM1	
32.	Single Source Shortest Path	2	21-09-2026 22-09-2026		TLM1	
33.	Tutorial on analysis of prims & kruskal's algorithm	1	24-09-2026			
34.	Optimal Storage on tapes	1	25-09-2026		TLM1	
35.	Huffman Coding	1	26-09-2026		TLM1	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Dynamic Programming

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Introduction to Dynamic Programming	1	28-09-2026		TLM1	
37.	All pairs shortest path	1	29-09-2026		TLM1	
38.	Tutorial on Tabular & Memorization methods in Dynamic Programing	1	01-10-2026		TLM3	
39.	Bellman Ford Algorithm	1	03-10-2026		TLM1	
40.	0/1 knapsack problem	2	05-10-2026 06-10-2026		TLM1	
41.	Tutorial on Analysis of Bellman Ford & Floyd Warshall Algorithms	1	08-10-2026		TLM3	
42.	Optimal binary search tree	2	09-10-2026 10-10-2026		TLM1	
43.	String editing	2	12-10-2026 13-10-2026		TLM1	
44.	Travelling salesperson problem	1	15-10-2026		TLM1	
45.	Tutorial on Analysis of OBST	1	16-10-2026		TLM3	
No. of classes required to complete UNIT-IV: 13				**No. of classes taken:**		

UNIT-V: Back tracking & Branch and bound

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Backtracking Introduction	1	17-10-2026		TLM1	
47.	N-queens Problem	1	26-10-2026		TLM1	
48.	Graph Coloring	1	27-10-2026		TLM1	
49.	Tutorial on Analysis of N-Queens	1	29-10-2026		TLM3	
50.	Sum of subsets problem	1	30-10-2026		TLM1	
51.	Introduction to Branch and Bound	1	31-10-2026		TLM1	
52.	0/1 Knapsack-LCBB, FIFOBB	2	02-11-2026 03-11-2026		TLM1	
53.	Tutorial on 0/1 Knapsack	1	05-11-2026			
54.	Travelling Salesperson Problem -LC Search	1	06-11-2026		TLM1	
55.	Introduction to P and NP	1	07-11-2026		TLM1	
56.	NP-Complete Problems	1	09-11-2026		TLM1	
57.	Revision	1	10-11-2026		TLM1	
No. of classes required to complete UNIT-V: 13				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Np-Hard Problems	1	01-11-2025					
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5

II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. N V NAIK**	**Dr. D.Srinivasa rao**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. Y. VIJAY BHASKAR REDDY
Course Name & Code : OBJECT ORIENTED PROGRAMMING THROUGH JAVA & 23CS05
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE/III/B **A.Y.:** 2026-27

PREREQUISITE: Introduction to Programming

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course are to:

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

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Identify the syntax and semantics of java programming language and basic concepts of Java. **(Understand-L2)**
CO2	Understand the basic concepts of object-oriented programming **(Understand-L2)**
CO3	Develop reusable programs using the concepts of inheritance, polymorphism, and interfaces. **(Apply-L3)**
CO4	Apply the concepts of packages, exception handling & I/O streams to develop secure, error free, and efficient applications **(Apply-L3)**
CO5	Design multithreaded and GUI based applications which mimic the real word scenarios. **(Apply-L3)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	2	2	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	2	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	2	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	2	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	2	-	-
1 - Low					**2 –**Medium						**3 -** High				

TEXTBOOKS:

T1 JAVA one step ahead, Anitha Seth, B. L. Juneja, Oxford.
T2 Joy with JAVA, Fundamentals of Object-Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
T3 JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

REFERENCE BOOKS:

R1 The complete Reference Java, 11thedition, Herbert Schildt, TMH
R2 Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Object Oriented Programming, Data Types, Variables, Introduction to Operators and Control Statements

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and CO discussion	1	13-07-2026		TLM1	
2.	Basic concepts, Principles	1	14-07-2026		TLM1	
3.	Program Structure in Java	2	16-07-2026 17-07-2026		TLM1	
4.	Command Line Arguments, User Input to Programs.	2	18-07-2026 20-07-2026		TLM1	
5.	Data Types, Variables	2	21-07-2026 23-07-2026		TLM1	
6.	Static Variables and Methods, Attribute Final	2	24-07-2026 25-07-2026		TLM1	
7.	Introduction to Operators	2	27-07-2026 28-07-2026		TLM1	
8.	Control Statements	2	30-07-2026 31-07-2026		TLM1	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Classes and Objects, Constructors and Methods and String Handling in Java

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
9.	Classes and Objects	1	01-08-2026		TLM1	
10.	Class Declaration and Modifiers, Class Members	1	03-08-2026		TLM1	
11.	Declaration of Class Objects, Assigning One Object to Another	1	04-08-2026		TLM1	
12.	Access Control for Class Members, Accessing Private Members of Class.	1	06-08-2026		TLM1	
13.	Constructors and Methods Introduction	1	07-08-2026		TLM1	
14.	Defining Methods, Constructor Methods for Class	2	10-08-2026 11-08-2026		TLM1	
15.	Overloaded Constructor Methods	1	13-08-2026		TLM1	
16.	Overloaded Methods, Nested Classes	2	14-08-2026 17-08-2026		TLM1	
17.	Passing Arguments by Value and by Reference, Keyword this	1	18-08-2026		TLM1	
18.	Class Objects as Parameters in Methods, Access Control	1	20-08-2026		TLM1	
19.	Recursive Methods, Nesting of Methods, Attributes Final and Static	2	21-08-2026 22-08-2026		TLM1	
20.	String Handling in Java, String class	2	24-08-2026 27-08-2026		TLM1	
21.	StringTokenizer, StringBuffer classes	2	28-08-2026 29-08-2026		TLM1	
No. of classes required to complete UNIT-II: 18				**No. of classes taken:**		
I MID EXAMINATIONS (02-09-2024 TO 07-09-2024)						

UNIT-III: Arrays, Inheritance and Interfaces

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Introduction to Arrays	1	31-08-2026		TLM1	
23.	Operations on Array Elements	1	01-09-2026		TLM1	
24.	Sorting & Searching values in Arrays	1	03-09-2026		TLM1	
25.	Two & Three-Dimensional Arrays and Vectors	2	05-09-2026 10-09-2026		TLM1	
26.	Inheritance and Polymorphism	2	11-09-2026 15-09-2026		TLM1	
27.	Method overloading & overriding, abstract classes	2	17-09-2026 18-09-2026		TLM1	
28.	Interface concepts	1	19-09-2026		TLM1	
29.	Functional Interfaces, Annotations	1	21-09-2026		TLM1	
No. of classes required to complete UNIT-III: 11				**No. of classes taken:**		

UNIT-IV: Packages and Java Library, Exception Handling and Java I/O, File

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
30.	Packages and Java Library Introduction	1	22-09-2026		TLM1	
31.	Packages related concepts	2	24-09-2026 25-09-2026		TLM1	
32.	Wrapper Classes, Auto-boxing and Auto-unboxing	1	26-09-2026		TLM1	
33.	Java util Classes and Interfaces	1	28-09-2026		TLM1	
34.	Exception Handling Hierarchy & keywords	2	29-09-2026 01-10-2026		TLM1	
35.	Generating user defined exception	2	01-10-2026 03-10-2026		TLM1	
36.	Java I/O streams and Files	2	05-10-2026 06-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Multithreaded Programming, Java Collections and Java FX GUI

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Multithreaded Programming	1	08-10-2026		TLM1	
38.	Thread life cycle, naming, priories of the threads, states	2	09-10-2026 12-10-2026		TLM1	
39.	Synchronization & Inter-thread communication	2	13-10-2026 15-10-2026		TLM1	
40.	Java Collections & Hierarchy	2	16-10-2026 17-10-2026		TLM1	
41.	List, Set Interfaces	1	26-10-2026		TLM1	
42.	Map Interface with examples	2	27-10-2026 29-10-2026		TLM1	
43.	Java FX, Overview of AWT & Swings API	1	30-10-2026		TLM1	
44.	Event handling	1	31-10-2026		TLM1	
45.	Layouts, mouse events	1	02-11-2026		TLM1	
46.	Revision	1	03-11-2026		TLM1	
No. of classes required to complete UNIT-V: 14				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text book followed	HOD Sign Weekly
1.	Java new features	2	05-11-2026 06-11-2026		TLM1			
2.	Realtime applications examples	3	07-11-2026 09-11-2026 10-11-2026		TLM1			
No. of classes required to complete - 5					No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
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PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Dr. Y. V. B. Reddy**	**Dr. Y. V. B. Reddy**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.N V NAIK
Course Name & Code **:** ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB & 23CS53
L-T-P Structure **: 0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE/III/B **A.Y.:** 2026-27

PREREQUISITE: DATA STRUCTURES LAB

COURSE EDUCATIONAL OBJECTIVE:
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 (CO):
CO1: Implement balanced binary trees, heaps and graph traversals using arrays and linked list. **(Apply-L3)**
CO2: Implement Various Sorting Techniques. **(Apply - L3)**
CO3: : Implement optimization problems using greedy, dynamic programming, backtracking and branch-and-bound techniques. **(Apply - L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	1	-		-	-	-	-	-	-		3	3	3
CO2	-	2	1	-		-	-	-	-	-	-	-	3	3	3
CO3	-	2	1	-		-	-	-	-	-	-	-	3	3	3
CO4	-	-	-	-	-	-	-	2	2	2	-	-		-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	BST	03	15-07-2026		
2.	AVL tree	03	22-07-2026		
3.	B-Tree	03	29-07-2026		
4.	Heap Construction	03	05-08-2026		
5.	BFT & DFT	03	12-08-2026		
6.	Finding Biconnected Components	03	19-08-2026		
7.	Finding Max and Min	03	02-09-2026		
8.	Merge sort, Quick sort	03	16-09-2026		
9.	Single source shortest path	03	23-09-2026		
10.	Job sequencing with dead lines	03	30-09-2026		
11.	0/1 knapsack -Dynamic Programming	03	07-10-2026		
12.	N-queens Problem	03	14-10-2026		
13.	Travelling Sales person Problem-Branch and bound	03	28-10-2026		
14.	Practice lab	03	04-11-2026		
15.	Internal Exam	03	11-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
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Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. N V NAIK**	**Dr. D.Srinivasa Rao**	**Dr. Y.V.B Reddy**	**Dr. S.Nagarjuna Reddy**
Signature				

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hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.Y. VIJAY BHASKAR REDDY
Course Name & Code **:** OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB & 23CS54
L-T-P Structure **: 0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE/III/B **A.Y.:** 2026-27

PREREQUISITE: Computer Programming Lab

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the course are 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.
- Construct Threads, Event Handling, implement packages, Java FX GUI.

COURSE OUTCOMES (CO):

CO1: Implement basic concepts of the java programming language. **(Apply-L3)**
CO2: Implement object-oriented programming concepts and exception handling **(Apply- L3)**
CO3: Design multithreaded and GUI based applications. **(Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	2	-	-	-	-	-	-	2	2	-	-
CO2	3	2	2	-	2	-	-	-	-	-	-	2	2	-	-
CO3	3	2	2	-	2	-	-	-	-	-	-	2	2	-	-
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	Exercise – 1	03	16-07-2026		
2.	Exercise – 2	03	23-07-2026		
3.	Exercise – 3	06	30-07-2026 06-08-2026		
4.	Exercise – 4	06	13-08-2026 20-08-2026		
5.	Exercise – 5	03	27-08-2026		
6.	Exercise – 6	06	03-09-2026 10-09-2026		
7.	Exercise – 7	06	17-09-2026 24-09-2026		
8.	Exercise – 8	03	08-10-2026		
9.	Exercise – 9	03	29-10-2026		
10.	Internal Exam	03	05-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Dr. Y. V. B. Reddy**	**Dr. Y. V. B. Reddy**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: K.Naga Rajeswari

Course Name & Code : PYTHON PROGRAMMING **(SOC)** & 23CSS1
L-T-P Structure : **0-1-2** **Credits:** 2
Program/Sem/Sec : B.Tech/CSE/III/B **A.Y.:** 2026-27

PREREQUISITE: INTRODUCTION TO PROGRAMMING

COURSE EDUCATIONAL OBJECTIVE:

The main objectives of the course are to

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

COURSE OUTCOMES (CO):

CO1: Implement the core programming concepts of Python programming language**. (Apply-L3)**
CO2: Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries **(Apply-L3)**
CO3: Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications**. (Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO2	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO3	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S.NO	Topic to be covered	Number of Hours	Tentative Date of Completion	Actual Date of Completion	HOD Signature
1.	**UNIT-1:** Introduction, Course Outcomes, Introduction to Python,	1	14-07-2026		
2.	Installation, Variables, Data types.Reading Input, Print output, Comments	3	17-07-2026		
3.	Types of operators, Working on operators, Sample Programs, Type Conversion	1	21-07-2026		
4.	Control statements – if, else, nestedif, elif	3	24-07-2026		
5.	Loop statements, Programs on Loop statements	1	28-07-2026		
6.	pass, continue and break	3	31-07-2026		
7.	Exception Handling	1	4-08-2026		
8.	Programs on exception handling.	3	7-08-2026		
9.	**UNIT-2:** Function Definition and Calling the function, return Statement and void Function	1	11-08-2026		
10.	Scope and Lifetime of Variables,	3	14-08-2026		
11.	Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments, sample programs.Strings Introduction, Basic String Operations	1	18-08-2026		
12.	Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings., Sample Programs on strings	3	21-08-2026		
13.	Creating Lists, Basic List Operations,	1	25-08-2026		
14.	Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement., Programs on Lists **Unit-3:** Introduction to Dictionaries, Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries,	3	28-08-2026		
15.	Built-In Functions Used on Dictionaries, Dictionary	1	01-09-2026		

	Methods, del Statement. Sample programs on dictionaries.				
16.	Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Sample Programs on tuples.	3	04-09-2026		
17.	Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function	1	11-09-2026		
18.	Sets, Set Methods, Frozenset., Sample Programs on sets, tuples.	3	04-09-2026		
19.	**Unit-4**: Introduction to files	1	11-09-2026		
20.	Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files	3	15-09-2026		
21.	Pickle Module	3	18-09-2026		
22.	Reading and Writing CSV Files, Python os and os.path Modules. Sample programs.	1	22-09-2026		
23.	**Object-Oriented Programming**: Classes and Objects, Creating Classes in Python	3	25-09-2026		
24.	Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, sample programs.	1	29-09-2026		
25.	Encapsulation, Inheritance, Polymorphism,	1	06-10-2026		
26.	Sample Python programs on object-oriented programming.	3	09-10-2026		
27.	**Unit 5: Introduction to Data Science**: Functional Programming	1	13-10-2026		
28.	JSON and XML in Python, NumPy with Python, Pandas.	3	16-10-2026		
29.	JSON and XML in Python, NumPy with Python, Pandas. Example Programs on Numpy and pandas.	1	27-10-2026		
30.	Revision	3	30-10-2026		
31.	Revision	1	03-11-2026		
32.	**Internal Exam**	3	06-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
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Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

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Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**K.Naga Rajeswari**	**Dr.G.Minni**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: G.V. RAJYA LAKSHMI
Course Name & Code : ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS & 23CS04
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE/III /C **A.Y.:** 2026-27

PREREQUISITE: Data Structures

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course is to

1. Provide knowledge on advance data structures frequently used in Computer Science domain
2. Develop skills in algorithm design techniques popularly used
3. Understand the use of various data structures in the algorithm design

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Identify the characteristics of an algorithm, analyze its time and space complexity and construct balanced binary trees. **(Apply-L3)**
CO2	Understand Heap structures and graph terminology to perform various operations on non-linear data structures. **(Understand-L2)**
CO3	Apply Divide and Conquer, Greedy algorithm and dynamic programming for solving problems**. (Apply - L3)**
CO4	Analyze the backtracking and branch-and-bound search methods on optimization problems **(Apply - L3)**
CO5	Summarize the importance of NP-Hard and its applications. **(Understand-L2)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	-	-	-	-	3	3	3
CO2	2	2	-	-	-	-	-	-	-	-	-	-	3	3	3
CO3	2	2	3	-	-	-	-	-	-	-	-	-	3	3	1
CO4	2	2	3	-	-	-	-	-	-	-	-	-	3	2	3
CO5	2	2	-	1	-	-	-	-	-	-	-	-	-	-	-
1 - Low **2 –**Medium **3 -** High															

TEXTBOOKS:

T1 Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2ndEdition Universities Press

T2 Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition University Press

REFERENCE BOOKS:

R1 Data Structures and program design in C, Robert Kruse, Pearson Education Asia

R2 An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

R3 The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.

R4 Data Structures using C & C++: Langsam, Augenstein &Tanenbaum, Pearson, 1995 Algorithms + Data Structures & Programs: N.Wirth, PHI

R5 Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.

R6 Data structures in Java: Thomas Standish, Pearson Education Asia

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction, AVL Tree, B-Tree

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and CO discussion	1	13-07-2026		TLM1	
2.	Introduction to Algorithm-Characteristics	1	14-07-2026		TLM1	
3.	Algorithm/Pseudo code specifications- Sample Algorithms	1	15-07-2026		TLM1	
4.	Example Algorithms using Pseudo Code	1	16-07-2026		TLM3	
5.	Time and Space Complexity - Examples	2	20-07-2026		TLM1	
6.	Asymptotic Notations	2	22-07-2026		TLM1	
7.	Examples on finding space & time complexity of algorithms	1	23-07-2026		TLM3	
8.	AVL Tree Operations - Analysis	2	27-07-2026		TLM1	
9.	B-Tree operations, Activity - Quiz	2	29-07-2026		TLM1	
10.	Examples on AVL & B Tree operations	2	31-07-2026		TLM3	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: Heap Tress, Graphs, Divide and Conquer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Heap Trees (Priority Queue) – Introduction	1	03-08-2026		TLM1	
12.	Max Heap, Min Heap Construction-operations	1	04-08-2026		TLM1	
13.	Implementation of Heap Tree	1	05-08-2026		TLM1	
14.	Graph Terminology, Representations of Graphs	1	06-08-2026		TLM1	
15.	Tutorial on Heap Tree Construction	1	07-08-2026		TLM3	
16.	Basic Search and Traversal Techniques – DFS	2	11-08-2026		TLM1	
17.	BFS – Example, Implementation	1	12-08-2026		TLM1	
18.	Examples on BFS & DFS traversals	1	13-08-2026		TLM3	

19.	Connected Components, Biconnected Components	2	17-08-2026		TLM1	
20.	Divide and Conquer General Method, Finding Max and Min	1	18-08-2026		TLM1	
21.	Merge Sort	1	19-08-2026		TLM1	
22.	Tutorial on Merge Sort Analysis	1	20-08-2026		TLM3	
23.	Quick sort, Merge sort Activity – Role Play	1	21-08-2026		TLM1	
24.	Strassen' Matrix Multiplication	1	24-08-2026		TLM1	
25.	Practice on Divide & Conquer Technique problems	1	25-08-2026		TLM3	
No. of classes required to complete UNIT-II: 17				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)						

UNIT-III: Greedy Method:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Introduction to Greedy Method	1	27-08-2026		TLM1	
27.	Job Sequencing with dead Lines	1	28-08-2026		TLM1	
28.	Knapsack Problem	1	31-08-2026		TLM1	
29.	Minimum Cost Spanning Tree- Kruskal Algorithm	1	01-09-2026		TLM1	
30.	Tutorial on different knapsack problem instances	1	02-09-2026		TLM3	
31.	Prims Algorithm	2	03-09-2026		TLM1	
32.	Single Source Shortest Path	1	10-09-2026		TLM1	
33.	Tutorial on analysis of prims & kruskal's algorithm	1	11-09-2026		TLM3	
34.	Optimal Storage on tapes	1	15-09-2026		TLM1	
35.	Huffman Coding, Group Activity	1	16-09-2026		TLM1	
No. of classes required to complete UNIT-III: 11				**No. of classes taken:**		

UNIT-IV: Dynamic Programming

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Introduction to Dynamic Programming	1	17-09-2026		TLM1	
37.	All pairs shortest path	1	18-09-2026		TLM1	
38.	Tutorial on Tabular & Memorization methods in Dynamic Proraming	1	21-09-2026		TLM3	
39.	Bellman Ford Algorithm	1	22-09-2026		TLM1	
40.	0/1 knapsack problem	2	24-09-2026		TLM1	
41.	Tutorial on Analysis of Bellman Ford & Floyd Warshall Algorithms	2	28-09-2026		TLM3	
42.	Optimal binary search tree	2	30-09-2026		TLM1	
43.	String editing algorithm	2	05-10-2026		TLM1	
44.	Travelling salesperson problem	2	07-10-2026		TLM1	
45.	Tutorial on Greedy algorithms, Activity seminar	2	09-10-2026		TLM3	
No. of classes required to complete UNIT-IV: 16				**No. of classes taken:**		

UNIT-V: Back tracking & Branch and bound

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Backtracking Introduction	2	13-10-2026		TLM1	
47.	N-queens Problem	2	15-10-2026		TLM1	
48.	Graph Coloring	1	16-10-2026		TLM1	
49.	Sum of subsets problem	2	27-10-2026			
50.	Examples on sum of subsets	1	28-10-2026		TLM1	
51.	Introduction to Branch and Bound	1	29-10-2026		TLM1	
52.	0/1 Knapsack-LCBB, FIFOBB	2	02-11-2026		TLM1	
53.	Tutorial on 0/1 Knapsack	1	03-11-2026			
54.	Travelling Salesperson Problem -LC Search	2	05-11-2026		TLM1	
55.	Introduction to P and NP	1	06-11-2026		TLM1	
56.	NP-Complete Problems	1	09-11-2026		TLM1	
57.	Revision	1	10-11-2026		TLM1	
No. of classes required to complete UNIT-V: 17				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Np-Hard Problems	1	11-11-2026		TLM2			
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**G.V.Rajya Lakshmi**	**Dr.D.Srinivasa Rao**	**Dr. Y.V.B Reddy**	**Dr.S.Nagarjuna Reddy**
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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. CH V NARAYANA
Course Name & Code : DL&CO 20IT01
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : II B.Tech., III-Sem, C-Sec R23 **A.Y.: 2026-27**

Prerequisites:

Course Objectives: The main objectives of the course is to

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

COURSE OUTCOMES (COs): At the end of the course, students will be able to

CO1	Evaluate digital number systems and use Boolean algebra theorems, Properties and Canonical forms for digital logic circuit design. **(Understand- L2)**
CO2	Design Sequential logic circuits and understand basic functional blocks a computer system . **(Apply- L3)**
CO3	Understand computer architecture and Data representation to perform computer arithmetic operations and processor organization. **(Understand- L2)**
CO4	Analyze the memory hierarchy in a computer system. **(Understand- L2)**
CO5	Understand the I/O operations and the interfaces **(Understand-L2)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

CO	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	1	-	-	-	-	-	-	-	-	-	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-

Textbooks:

1. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 6th edition, McGraw Hill

2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education.
3. Computer Organization and Architecture, William Stallings, 11thEdition, Pearson.

Reference Books:

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Number systems, Logic gates and Boolean algebra, Combinational circuits

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to DLD	1	14-07-2026		TLM1	
2.	Number systems	1	15-07-2026		TLM1	
3.	Different Number systems	1	16-07-2026		TLM1	
4.	Conversions of one number to another number	2	18-07-2026 21-07-2026		TLM1	
5.	Binary codes	2	22-07-2026 23-07-2026		TLM1	
6.	Basic Logic gates and Universal gates	2	25-07-2026 28-07-2026		TLM1	
7.	Boolean Logic functions	2	29-07-2026 30-07-2026		TLM1	
8.	K-Maps Simplications	3	01-08-2026 04-08-2026 05-08-2026		TLM1	
9.	Combinational circuits, Desing Decoder and Multiplexers	1	06-08-2026		TLM1	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: Sequential Logic Circuits, Basic structure of computer, Computer generations

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
10.	Introduction to sequential circuits,	1	11-08-2026		TLM1	
11.	Flip-flops(RS,J,T,D),	2	12-08-2026 13-08-2026		TLM1	
12.	Master slave flip-flop	1	18-08-2026		TLM1	
13.	Conversion of flip-flops, Truth & excitation tables	2	19-08-2026 20-08-2026		TLM1	
14.	Registers	1	22-08-2026		TLM1	
15.	counters	1	25-08-2026		TLM1	
16.	Basic structure of computer	2	27-08-2026 29-08-2026		TLM1	
17.	Bus structure	1	01-09-2026		TLM1	
18.	Multi processors and multi computers	1	02-09-2026		TLM1	
19.	Computer generations	1	03-09-2026		TLM1	
20.	Von- Neumann Architecture	2	05-09-2026 10-09-2026			
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: Data Representation, Processor Organization

S.	Topics to be covered	No. of	Tentative	Actual	Teaching	HOD

No.		Classes Required	Date of Completion	Date of Completion	Learning Methods	Sign Weekly
21.	Signed Number representation	1	12-09-2026		TLM2	
22.	Addition and Subtraction of Signed Numbers	1	15-09-2026		TLM2	
23.	Design of Fast Adders	1	16-09-2026		TLM2	
24.	Multiplication of Positive Numbers	1	17-09-2026		TLM2	
25.	Signed-operand Multiplication	1	19-09-2026		TLM2	
26.	Fast Multiplication	1	22-09-2026		TLM2	
27.	Integer Division,	1	23-09-2026		TLM2	
28.	Floating-Point Numbers and Operations	1	24-09-2026		TLM2	
29.	Processor Organization of Fundamental Concepts	1	26-09-2026		TLM2	
30.	Execution of a Complete Instruction	1	29-09-2026		TLM2	
31.	Multiple-Bus Organization	1	30-09-2026		TLM2	
32.	Hardwired Control	1	01-10-2026		TLM2	
33.	Micro programmed Control	1	03-10-2026		TLM2	
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: Memory organization, Virtual Memories

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34.	Memory organization	1	06-10-2026		TLM2	
35.	Semiconductor RAM Memories	1	07-10-2026		TLM2	
36.	Concept of memory hierarchical organization	1	08-10-2026		TLM2	
37.	Read-Only Memories, Speed, Size and Cost	1	10-10-2026		TLM2	
38.	Cache memory	1	13-10-2026		TLM2	
39.	Virtual Memories	1	14-10-2026		TLM2	
40.	Memory Management Requirements, Secondary Storage	3	15-10-2026 17-10-2026 27-10-2026		TLM2	
No. of classes required to complete UNIT-IV: 9				**No. of classes taken:**		

UNIT-V: Input/output Organization: & Peripheral devices, DMA

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
41.	Input/Output Organization: Accessing I/O Devices	1	28-10-2026		TLM2	
42.	Interrupts	1	29-10-2026		TLM2	
43.	Processor Examples	1	31-10-2026		TLM2	
44.	Interface Circuits	1	03-11-2026		TLM2	
45.	Peripheral devices –I/O sub-systems	1	04-11-2026		TLM2	
46.	I/O device interface	1	05-11-2026		TLM2	
47.	I/O transfers-program controlled	1	07-11-2026		TLM2	
48.	Interrupt driven	1	10-11-2026		TLM2	
49.	DMA	1	11-11-2026		TLM2	
No. of classes required to complete UNIT-V: 15				**No. of classes taken:**		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineer**ing 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. CH V NARAYANA**	**Dr.J.Nageswara Rao**	**Dr .D.Venkata Subbaiah**	**Dr. S. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. Anand Thota
Course Name & Code : Discrete Mathematics & Graph Theory & 23FE11
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/III/C **A.Y.:** 2026-27
Regulations : R23

PREREQUISITE: Mathematics courses of first year of study.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- 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 (COs): At the end of the course, student will be able to

CO1	Construct mathematical arguments using logical connectives and quantifiers and verify them. **(Apply- L3)**
CO2	Demonstrate the basic terminology of functions, relations, lattices and their operations. **(Understand -L2)**
CO3	Illustrate the basic principles/techniques to solve different combinatorial problems and linear recurrence relations**.(Apply- L3)**
CO4	Demonstrate the different types of graphs.**(Understand -L2)**
CO5	Apply the properties of graphs to solve the graph theory problems in computer science**.(Apply- L3)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1													
CO2	3	2	1												
CO3	3	3	1	1											
CO4	3	3	1												
CO5	3	3	1	1											1
1 - Low			**2 –**Medium						**3 -** High						

TEXTBOOKS:

T1 Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.

T2 Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.

T3 Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill

REFERENCE BOOKS:

R1	Discrete Mathematics for Computer Scientists and Mathematicians, J. L.Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
R2	Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
R3	Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.
R4	Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: MATHEMATICAL LOGIC

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Propositional Calculus: Statements and Notations, Connectives	1	13-07-2026		TLM1	
2.	Well Formed Formulas, Truth Tables	1	16-07-2026		TLM1	
3.	Tutorial on : Statements and Notations, Connectives,TruthTables	1	17-07-2026		TLM3	
4.	Tautologies, Equivalence of Formulas, Duality Law	1	18-07-2026		TLM1	
5.	Tautological Implications, Normal Forms,	1	20-07-2026		TLM1	
6.	Theory of Inference for Statement Calculus, Consistency of Premises,	1	23-07-2026		TLM1	
7.	Tutorial on : Theory of Inference for Statement Calculus, Consistency of Premises	1	24-07-2026	6	TLM3	
8.	Indirect Method of Proof, Predicate Calculus: Predicates	1	25-07-2026		TLM1	
9.	Predicative Logic, Statement Functions	1	27-07-2026		TLM1	
10.	Variables and Quantifiers	1	30-07-2026		TLM1	
11.	Tutorial on : Predicates, Predicative Logic, Statement Functions,	1	31-07-2026		TLM3	
12.	Free and Bound Variables	1	01-08-2026		TLM1	
13.	Inference Theory for Predicate Calculus	2	03-08-2026 06-08-2026		TLM1	
14.	Tutorial on Unit 1	1	07-08-2026		TLM3	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: SET THEORY

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Sets: Operations on Sets	1	08-08-2026		TLM1	
16.	Principle of Inclusion-Exclusion	1	10-08-2026		TLM1	
17.	Relations: Properties, Operations	1	13-08-2026		TLM1	
18.	Tutorial on Practice the sets and Relations Problems	1	14-08-2026		TLM3	
19.	Partition and Covering,	1	17-08-2026		TLM1	
20.	Transitive Closure, Equivalence,	1	20-08-2026		TLM1	

21.	Compatibility and Partial Ordering, Hasse Diagrams	1	21-08-2026		TLM1	
22.	Tutorial on Transitive Closure, Equivalence,Hasse Diagrams	1	22-08-2026		TLM3	
23.	Functions: Bijective, Composition, Inverse,	1	24-08-2026		TLM1	
24.	Permutation, and Recursive Functions,	1	27-08-2026		TLM1	
25.	Tutorial on Functions& Recursive Functions	1	28-08-2026		TLM3	
26.	Lattice and its Properties	1	29-08-2026		TLM1	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: COMBINATORICS AND RECURRENCE RELATIONS:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
27.	Basis of Counting, Permutations, Permutations with Repetitions	1	31-08-2026		TLM1	
28.	Circular and Restricted Permutations, Combinations,	1	03-09-2026		TLM1	
29.	Tutorial on Permutations, Combinations,	1	05-09-2026		TLM3	
30.	Restricted Combinations	1	10-09-2026		TLM1	
31.	Binomial and Multinomial Coefficients and Theorems.	1	11-09-2026		TLM1	
32.	Tutorial on Binomial and Multinomial Coefficients and Theorems.	1	12-09-2026		TLM3	
33.	Recurrence Relations: Generating Functions, Function of Sequences,	1	17-09-2026		TLM1	
34.	Partial Fractions, Calculating Coefficient of Generating Functions	1	18-09-2026		TLM1	
35.	Recurrence Relations, Formulation as Recurrence Relations	1	19-09-2026		TLM1	
36.	Tutorial on Partial Fractions, Recurrence Relations	1	21-09-2026		TLM3	
37.	Solving Recurrence Relations by Substitution and Generating Functions	1	24-09-2026		TLM1	
38.	Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations	2	25-09-2026 26-09-2026		TLM1	
39.	Tutorial on UNIT III	1	28-09-2026		TLM3	
No. of classes required to complete UNIT-III: 14				**No. of classes taken:**		

UNIT-IV: Graph Theory:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
40.	Basic Concepts, Graph Theory and its Applications	1	01-10-2026		TLM1	
41.	Subgraphs, Graph Representations: Adjacency and Incidence Matrices	1	03-10-2026		TLM1	
42.	Isomorphic Graphs,	1	05-10-2026		TLM1	
43.	Paths and Circuits	1	08-10-2026		TLM1	
44.	Tutorial on Graphs	1	09-10-2026		TLM3	
45.	Eulerian and Hamiltonian Graphs,	1	10-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 6				**No. of classes taken:**		

UNIT-V: Multi Graphs

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Multigraphs	1	12-10-2026		TLM1	
47.	Bipartite and Planar Graphs	1	15-10-2026		TLM1	
48.	Tutorial on Bipartite and Planar Graphs	1	16-10-2026		TLM3	
49.	Euler's Theorem	1	17-10-2027		TLM1	
50.	Graph Colouring	1	26-10-2026		TLM1	
51.	Covering	1	29-10-2026		TLM1	
52.	Tutorial on Graph Colouring, Euler Theorem	1	30-10-2026		TLM3	
53.	Chromatic Number	1	31-10-2026		TLM1	
54.	Spanning Trees, Prim's and Kruskal's Algorithms	1	02-11-2026		TLM1	
55.	BFS Spanning Trees.	1	05-11-2026		TLM1	
56.	Tutorial on UNIT V	1	06-11-2026		TLM3	
57.	DFS Spanning Trees	1	07-11-2026		TLM1	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Pigeon Hole Principle	1	9-11-2026		**TLM1**	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I,II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To inculcate algorithmic thinking, formulation techniques and visualization, leading to problem solving skills using different programming paradigms.
PSO 2	To inculcate an ability to analyze, design and implement data driven applications into the students
PSO 3	Develop an ability to implement various processes/methodologies/practices employed in design, validation, testing and maintenance of software products.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. Anand Thota**	**Mrs. B. Swathi**	**Dr. D. Venkata Subbaiah**	**Dr. S. Nagarjuna Reddy**
Signature				

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hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Ch. Srinivasa Rao
Course Name & Code : UHV 2 – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT -23HS01
L-T-P Structure : **2-1-0** **Credits:** 3
Program/Sem/Sec : II B.Tech., III-Sem, C-Sec **A.Y.: 2026-27**

PRE-REQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES(CEO):

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

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Describe the terms like Natural Acceptance, Happiness and Prosperity (Understand-L2)
CO2	Identify one's self, and one's surroundings (family, society nature) (Understand - L2)
CO3	Relate human values with human relationship and human society. (Understand-L2)
CO4	Illustrate the need for universal human values and harmonious existence (Understand-L2)
CO5	Develop as socially and ecologically responsible engineers (Apply-L3)

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

CO	**Program Outcomes (POs)**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	3	-	-	-	-	-	-	-
CO3	-	-	-	-	-	2	-	3	2	-	-	-	-	-	-
CO4	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-
CO5	-						2	3				1	-	-	-

TEXTBOOKS:

T1 Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

REFERENCE BOOKS:

R1 Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

R2 Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

R3 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi**.**

R4 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

R5 Small is Beautiful - E. F Schumacher.

R6 Slow is Beautiful - Cecile Andrews.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):UNIT-I

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and need of Value Education.	1	13/07/26		TLM1	
2.	Right Understanding, Relationship and Physical Facility (Holistic) Development and the Role of Education	2	15/07/26 16/07/26		TLM1	
3.	Understanding Value Education	2	18/07/26 20/07/26		TLM2	
4.	Practice Session PS1 Sharing about Oneself	1	12/07/26		TLM6	
5.	self-exploration as the Process for Value Education	2	22/07/26 23/07/26		TLM2	
6.	Continuous Happiness and Prosperity – the Basic Human Aspirations	1	25/07/26		TLM1	
7.	Practice Session PS2 Exploring Human Consciousness	1	27/07/26		TLM1	
8.	Happiness and Prosperity – Current Scenario	1	29/07/26		TLM1	
9.	Method to Fulfill the Basic Human Aspirations	2	30/07/26 03/08/26		TLM1	
10.	Practice Session PS3 Exploring Natural Acceptance	1	05/08/26		TLM6	
No. of classes required to complete UNIT-I: 13				**No. of classes taken:**		

UNIT-II

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Understanding Human being as the Co-existence of the self and the body.	2	06/08/26 08/08/26		TLM2	
12.	Distinguishing between the Needs of the self and the body	2	10/08/26 12/08/26		TLM2	

13.	Practice Session PS4 Exploring the difference of Needs of self and body.	1	13/08/26		TLM2
14.	The body as an Instrument of the self	2	17/08/26 19/08/26		TLM1
15.	Understanding Harmony in the self	2	20/08/26 22/08/26		TLM2
16.	Practice Session PS5 Exploring Sources of Imagination in the self	1	24/08/26		TLM6
17.	Harmony of the self with the body	2	27/08/26 29/08/26		TLM2
18.	Programme to ensure self-regulation and Health	2	31/08/26 02/09/26		TLM1
19.	Practice Session PS6 Exploring Harmony of self with the body	1	03/09/26		TLM2
No. of classes required to complete UNIT-II: 15				**No. of classes taken:**	
I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)					

UNIT-III

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
20.	Harmony in the Family – the Basic Unit of Human Interaction	1	05/09/26 10/09/26		TLM2	
21.	'Trust' – the Foundational Value in Relationship	2	12/09/26 16/09/26		TLM1	
22.	Practice Session PS7 Exploring the Feeling of Trust	1	17/09/26		TLM6	
23.	'Respect' – as the Right Evaluation	2	19/09/26 21/09/26		TLM1	
24.	Other Feelings, Justice in Human-to-Human Relationship	1	23/09/26		TLM1	
25.	Practice Session PS8 Exploring the Feeling of Respect	1	24/09/26		TLM6	
26.	Understanding Harmony in the Society	1	26/09/26		TLM1	
27.	Vision for the Universal Human Order	2	28/09/26 30/09/26		TLM1	
28.	Practice Session PS9 Exploring Systems to fulfil Human Goal	1	01/10/26		TLM6	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign
29.	Understanding Harmony in the Nature	1	01/10/26 03/10/26		TLM2	
30.	Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature	2	05/10/26 01/10/26		TLM2	
31.	Practice Session PS10 Exploring the Four Orders of Nature	1	07/10/26		TLM6	
32.	Realizing Existence as Co-existence at All Levels	2	08/10/26 10/10/26		TLM2	
33.	The Holistic Perception of Harmony in Existence	1	12/10/26		TLM2	
34.	Practice Session PS11 Exploring Co-existence in Existence.	1	14/10/26		TLM6	
No. of classes required to complete UNIT-IV: 08				**No. of classes taken:**		

UNIT-V

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
35.	Natural Acceptance of Human Values	1	15/10/26		TLM2	
36.	Definitiveness of (Ethical) Human Conduct	1	17/10/26		TLM2	
37.	Practice Session PS12 Exploring Ethical Human Conduct	1	26/10/26		TLM2	
38.	A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order	1	28/10/26		TLM2	
39.	Competence in Professional Ethics	1	29/10/26		TLM2	
40.	Practice Session PS13 Exploring Humanistic Models in Education	1	31/10/26		TLM6	
41.	Holistic Technologies, Production Systems and Management Models-Typical Case Studies	`1	02/11/26		TLM2	
42.	Strategies for Transition towards Value-based Life and Profession	1	04/11/26		TLM2	

43.	Practice Session PS14 Exploring Steps of Transition towards Universal Human Order	1	05/11/26		TLM6	
No. of classes required to complete UNIT-V: 09				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Pollution-Human Role	1	07/11/26		TLM2			
No. of classes required :1					**No. of classes taken:**			
II MID EXAMINATIONS (26-10-2026 TO 11-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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 public health and safety, and the cultural, societal, and environmental considerations.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and moder Engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr.Ch. Srinivasa Rao**	**Dr. B. Srinivasa Rao**	**Dr. B. Srinivasa Rao**	**Dr. S. Nagarjuna Reddy**
Signature				

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hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: G.V.RAJYA LAKSHMI
Course Name & Code **:** ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB & 23CS53
L-T-P Structure **: 0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE/III/C **A.Y.:** 2026-27

PREREQUISITE: DATA STRUCTURES LAB

COURSE EDUCATIONAL OBJECTIVE:
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 (CO):
CO1: Implement balanced binary trees, heaps and graph traversals using arrays and linked list. **(Apply-L3)**
CO2: Implement Various Sorting Techniques. **(Apply - L3)**
CO3: : Implement optimization problems using greedy, dynamic programming, backtracking and branch-and-bound techniques. **(Apply - L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	1	-		-	-	-	-	-	-	-	3	3	3
CO2	-	2	1	-		-	-	-	-	-	-	-	3	3	3
CO3	-	2	1	-		-	-	-	-	-	-	-	3	3	3
CO4	-	-	-	-	-	-	-	2	2	2	-	-		-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:
COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	Introduction problems	03	17-07-2026		
2.	AVL tree	03	24-07-2026		
3.	B-Tree	03	31-07-2026		
4.	Heap Construction, MAX & MIN heaps	03	07-08-2026		
5.	BFT, DFT techniques	03	14-08-2026		
6.	Finding Biconnected Components, Articulation point	03	21-08-2026		
7.	Finding Maximum and Minimum in an Array	03	28-08-2026		
8.	Merge sort, Quick sort	03	11-09-2026		
9.	Single source shortest path	03	18-09-2026		
10.	Job sequencing with dead lines	03	25-09-2026		
11.	0/1 knapsack - Dynamic Programming	03	09-10-2026		
12.	N-queens Problem	03	16-10-2026		
13.	Travelling Sales person Problem-Branch and bound	03	30-10-2026		
14.	Internal Exam	03	06-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**G.V.Rajya Lakshmi**	**Dr.D.Srinivasa Rao**	**Dr. Y.V.B Reddy**	**Dr.S.Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mrs. B. Usha Rani
Course Name & Code : PYTHON PROGRAMMING & 23CSS1
L-T-P Structure : **0-1-2** **Credits:** 2
Program/Sem/Sec : B.Tech/CSE/III/C **A.Y.:** 2026-27

PREREQUISITE: INTRODUCTION TO PROGRAMMING

COURSE EDUCATIONAL OBJECTIVE:
The main objectives of the course are to

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

COURSE OUTCOMES (CO):
CO1: Implement the core programming concepts of Python programming language**. (Apply-L3)**
CO2: Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries **(Apply-L3)**
CO3: Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications**. (Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO2	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO3	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S.NO	Topic to be covered	Number of Hours	Tentative Date of Completion	Actual Date of Completion	HOD Signature
1.	**UNIT-1:** Introduction, Course Outcomes, Introduction to Python.	1	13-07-2026		
2.	Installation, Variables, Data types. Reading Input, Print output, Comments	3	15-07-2026		
3.	Types of operators, Working on operators, Sample Programs, Type Conversion	1	20-07-2026		
4.	Control statements – if, else, nestedif, elif, Loop statements	3	22-07-2026		
5.	Programs on Loop statements pass, continue and break	1	27-07-2026		
6.	Exception Handling, Programs on exception handling.	3	29-07-2026		
7.	**UNIT-2:** Function Definition and Calling the function, return Statement and void Function	1	03-08-2026		
8.	Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments	3	05-08-2026		
9.	sample programs.Strings Introduction, Basic String Operations	1	10-08-2026		
10.	Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings., Sample Programs on strings	3	12-08-2026		
11.	Creating Lists, Basic List Operations	1	17-08-2026		
12.	Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement., Programs on Lists **Unit-3:** Introduction to Dictionaries, Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries	3	19-08-2026		
13.	Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement. Sample programs on dictionaries.	1	24-08-2026		
14.	Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples,	1	31-08-2026		

	Built-In Functions Used on Tuples, Sample Programs on tuples.				
15.	Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function	3	02-09-2026		
16.	Sets, Set Methods, Frozenset., Sample Programs on sets, tuples.	3	16-09-2026		
17.	**Unit-4**: Introduction to files	1	21-09-2026		
18.	Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, sample programs on files.	3	23-09-2026		
19.	Pickle Module	1	28-09-2026		
20.	Reading and Writing CSV Files, Python os and os.path Modules. Sample programs.	3	30-09-2026		
21.	**Object-Oriented Programming**: Classes and Objects, Creating Classes in Python	1	05-10-2026		
22.	Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, sample programs.	3	07-10-2026		
23.	Encapsulation, Inheritance, Polymorphism	1	12-10-2026		
24.	Sample Python programs on object-oriented programming.	3	14-10-2026		
25.	**Unit 5: Introduction to Data Science**: Functional Programming	1	26-10-2026		
26.	JSON and XML in Python, NumPy with Python, Pandas. Example Programs on Numpy and pandas.	3	28-10-2026		
27.	**Sample project**	1	02-11-2026		
28.	**Internal Exam**	3	04-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30

Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
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PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
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PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
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PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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PO 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.
PO 12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mrs. B. Usha Rani**	**Dr. G. Minni**	**Dr.Y.Vijaya Baskara Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. A. Koteswara Rao
Course Name & Code : Object Oriented Programming Through JAVA &23CS05
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE/III /C **A.Y.:** 2026-27

PREREQUISITE: Introduction to Programming

COURSE EDUCATIONAL OBJECTIVES(CEO):

The learning objectives of this course are to:
1. Identify Java language components and how they work together in applications
2. Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
3. Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
4. Understand how to design applications with threads in Java
5. Understand how to use Java APIs for program development

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Identify the syntax and semantics of java programming language and basic concepts of Java. **(Understand-L2)**
CO2	Understand the basic concepts of object-oriented programming **(Understand-L2)**
CO3	Develop reusable programs using the concepts of inheritance, polymorphism, and interfaces. **(Apply-L3)**
CO4	Apply the concepts of packages, exception handling & I/O streams to develop secure, error free, and efficient applications **(Apply-L3)**
CO5	Design multithreaded and GUI based applications which mimic the real word scenarios. **(Apply-L3)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	2	2	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	2	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	2	3	3
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	3	3
CO5	3	2	-	-	-	-	-	-	-	-	-	2	2	2	2
1 - Low							2 –Medium						3 - High		

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. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

REFERENCE BOOKS:

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Object Oriented Programming, Data Types, Operators, Control Statements

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Basic concepts, Principles, Program Structure in Java	1	13-07-2026		TLM1	
2.	Writing Simple Java Programs, Elements or Tokens in Java Programs	1	14-07-2026		TLM1	
3.	Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.	2	16-07-2026 17-07-2026		TLM1	
4.	Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final	2	18-07-2026 20-07-2026		TLM1	
5.	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.	2	21-07-2026 23-07-2026		TLM1	
6.	Introduction, if Expression, Nested if Expressions,if–else Expressions , TernaryOperator?:	3	24-07-2026 25-07-2026 27-07-2026		TLM1	
7.	Switch Statement, Iteration Statements , while Expression, do–while Loop ,for Loop, Nested for Loop,For–Each for Loop ,Break Statement, Continue Statement.	3	28-07-2026 30-07-2026 31-07-2026		TLM1	
No. of classes required to complete UNIT-I: 13				**No. of classes taken:**		

UNIT-II: Classes and Objects, Constructors and Methods, String Handling in Java

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
8.	Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another	1	31-07-2026		TLM1	
9.	Access Control for Class Members, Accessing Private Members of Class.	1	01-08-2026		TLM1	
10.	Introduction, Defining Methods, Constructor Methods for Class	1	03-08-2026		TLM1	
11.	Constructors and Methods: Introduction, Defining Methods	1	04-08-2026		TLM1	
12.	Constructor Methods for Class, Overloaded Constructor Methods, Overloaded Methods	1	06-08-2026		TLM1	

13.	Nested Classes, Passing Arguments by Value and by Reference Keyword this.	2	07-08-2026 10-08-2026		TLM1	
14.	Class Objects as Parameters in Methods	1	11-08-2026		TLM1	
15.	Access Control, Recursive Methods	2	13-08-2026 14-08-2026		TLM1	
16.	Nesting of Methods	1	17-08-2026		TLM1	
17.	Attributes Final and Static.	1	18-08-2026		TLM1	
18.	Introduction, Interface Char Sequence	2	20-08-2026 21-08-2026		TLM1	
19.	Class String, Methods for Extracting Characters from Strings	2	22-08-2026 24-08-2026		TLM1	
20.	Comparison, Modifying, Searching; Class String Buffer	2	25-08-2026 27-08-2026		TLM1	
No. of classes required to complete UNIT-II: 18				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)						

UNIT-III: Arrays, Inheritance, Interfaces

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
21.	Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays	1	28-08-2026		TLM1	
22.	Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays	2	29-08-2026 31-08-2026		TLM1	
23.	Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.	2	01-09-2026 03-09-2026		TLM1	
24.	Introduction, Relationship between classes- Has-a, Is-a, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final	2	05-09-2026 15-09-2026		TLM1	
25.	Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes.	2	17-09-2026 18-09-2026		TLM1	
26.	Introduction, Declaration of Interface, Implementation of Interface	2	19-09-2026 21-09-2026		TLM1	
27.	Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces	1	22-09-2026		TLM1	
28.	Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.	1	24-09-2026		TLM1	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Packages and Java Library, Exception Handling, Java I/O and File

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	Introduction, Defining Package, Importing Packages and Classes into	1	25-09-2026		TLM1	

	Programs, Path and Class Path, Access Control, Packages in Java SE- Java. Lang Package and its Classes					
30.	Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing. Java util Classes and Interfaces	2	26-09-2026 28-09-2026		TLM1	
31.	Formatter Class, Random Class, Time Package, Formatting for Date/Time in Java , Temporal Adjusters Class	2	29-09-2026		TLM1	
32.	Introduction, Hierarchy of Standard Exception Classes, Keywords try, catch, throw, throws, and finally Blocks, Multiple Catch Clauses	2	01-10-2026 03-10-2026		TLM1	
33.	Class Throwable, Unchecked Exceptions, Checked Exceptions, Generating user defined exception.	2	05-10-2026 06-10-2026		TLM1	
34.	Java I/O API, standard I/O streams, types, Byte streams	2	08-10-2026 09-10-2026		TLM1	
35.	Character streams, Scanner class, Files in Java	2	12-10-2026 13-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: Multithreaded Programming, Java Collections, Java FX GUI

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Introduction, Need for Multiple Threads ., Multithreaded Programming for Multi-core Processor	1	15-10-2026		TLM1	
37.	Thread Class, Main Thread - Creation of New Threads, Thread States	2	16-10-2026 17-10-2026		TLM1	
38.	Thread Priorities, Synchronization, Inter-thread Communication-producer consumer problem.	2	26-10-2026		TLM1	
39.	Introduction, Purpose of Collection Framework, Hierarchy of collection Interfaces / classes, Methods defined in Collection Interface	2	27-10-2026 29-10-2026		TLM1	
40.	Interface Iterator, Collection classes/Interfaces –List, Set, Map	1	30-10-2026		TLM1	
41.	Overview of AWT & Swings API, limitations	2	31-10-2026 02-11-2026		TLM1	
42.	Java FX Scene Builder, Java FX App Window Structure	2	03-11-2026 05-11-2026		TLM1	
43.	Displaying text and image	1	06-11-2026		TLM1	
44.	Event handling, laying out nodes in scene graph, mouse events	2	07-11-2026 09-11-2026		TLM1	
45.	Revision	1	10-11-2026		TLM1	
No. of classes required to complete UNIT-V: 16				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	JDBC	1	11-11-2026					
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success oforganization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr.A.Koteswara Rao**	**Dr. Y.V.B Reddy**	**Dr. Y.V.B Reddy**	**Dr. S.Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),
An ISO 21001:2018,14001:2015,50001:2018 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. A. Koteswara Rao
Course Name & Code : Object Oriented Programming Through JAVA Lab & 23CS54
L-T-P Structure : **0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE/III/C **A.Y.:** 2026-27

PREREQUISITE: Computer Programming Lab

COURSE EDUCATIONAL OBJECTIVE:
The objectives of the course is to
1. Practice object-oriented programming in the Java programming language .
2. Implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
3. Illustrate inheritance, Exception handling mechanism, JDBC connectivity .
4. Construct Threads, Event Handling, implement packages, Java FX GUI.

COURSE OUTCOMES (CO):
CO1 : Implement basic concepts of the java programming language. **(Apply-L3)**
CO2 : Implement object-oriented programming concepts and exception handling**(Apply-L3)**
CO3 : Design multithreaded, database and GUI based applications. **(Apply-L3)**
CO4 : Improve individual / teamwork skills, communication & report writing skills with ethical values. **(Apply-L3)**

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	2	-	-	-	-	-	-	2	2	2	
CO2	3	2	2	-	2	-	-	-	-	-	-	2	2	2	2
CO3	3	2	2	-	2	-	-	-	-	-	-	2	2	2	2
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	Basic Java Programs	03	14-07-2026		
2.	a. Write a JAVA program to display default value of all primitive data type of JAVA b. Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.	03	21-07-2026		
3.	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.	03	28-07-2026		
4.	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 Overloading. c. Write a JAVA program to implement constructor. d. Write a JAVA program to implement constructor overloading.	03	04-08-2026		
5.	a. Write a JAVA program to implement Single Inheritance b. Write a JAVA program to implement multilevel Inheritance c. Write a JAVA program for abstract class to find areas of different shape	03	11-08-2026		
6.	Practice Lab	03	18-08-2026		
7.	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	03	25-08-2026		
8.	a. Write a JAVA program that describes exception handling mechanism b. Write a JAVA program Illustrating Multiple catch clauses c. Write a JAVA program for creation of Java Built-in Exceptions d. Write a JAVA program for creation of User Defined Exception	03	01-09-2026		
9.	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	06	15-09-2026 22-09-2026		

10.	a. Write a JAVA program that import and use the user defined packages b. Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX) c. Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI	06	29-09-2026 06-10-2026		
11.	a. Implement the programs using List Interface and its implemented classes. b. Implement the programs using Set Interface and its implemented classes. c. Implement the programs using Map Interface and its implemented classes.	06	13-10-2026		
12.	Internal Exam	03	03-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success oforganization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr.A.Koteswara Rao**	**Dr. Y.V.B Reddy**	**Dr. Y.V.B Reddy**	**Dr. S.Nagarjuna Reddy**
Signature				

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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. Anand Thota
Course Name & Code : Discrete Mathematics & Graph Theory & 23FE11
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/III/D **A.Y.:** 2026-27
Regulations : R23

PREREQUISITE: Mathematics courses of first year of study.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- 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 (COs): At the end of the course, student will be able to

CO1	Construct mathematical arguments using logical connectives and quantifiers and verify them. **(Apply- L3)**
CO2	Demonstrate the basic terminology of functions, relations, lattices and their operations. **(Understand -L2)**
CO3	Illustrate the basic principles/techniques to solve different combinatorial problems and linear recurrence relations**.(Apply- L3)**
CO4	Demonstrate the different types of graphs.**(Understand -L2)**
CO5	Apply the properties of graphs to solve the graph theory problems in computer science**.(Apply- L3)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1													
CO2	3	2	1												
CO3	3	3	1	1											
CO4	3	3	1												
CO5	3	3	1	1											1
1 - Low			**2 –**Medium						**3 -** High						

TEXTBOOKS:

T1 Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.

T2 Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.

T3 Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill

REFERENCE BOOKS:

R1	Discrete Mathematics for Computer Scientists and Mathematicians, J. L.Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
R2	Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
R3	Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.
R4	Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: MATHEMATICAL LOGIC

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Propositional Calculus: Statements and Notations, Connectives	1	14-07-2026		TLM1	
2.	Well Formed Formulas, Truth Tables	1	15-07-2026		TLM1	
3.	Tutorial on : Statements and Notations, Connectives,TruthTables	1	16-07-2026		TLM3	
4.	Tautologies, Equivalence of Formulas, Duality Law	1	17-07-2026		TLM1	
5.	Tautological Implications, Normal Forms,	1	21-07-2026		TLM1	
6.	Theory of Inference for Statement Calculus, Consistency of Premises,	1	22-07-2026		TLM1	
7.	Tutorial on : Theory of Inference for Statement Calculus, Consistency of Premises	1	23-07-2026	6	TLM3	
8.	Indirect Method of Proof, Predicate Calculus: Predicates	1	24-07-2026		TLM1	
9.	Predicative Logic, Statement Functions	1	28-07-2026		TLM1	
10.	Variables and Quantifiers	1	29-07-2026		TLM1	
11.	Tutorial on : Predicates, Predicative Logic, Statement Functions,	1	30-07-2026		TLM3	
12.	Free and Bound Variables	1	31-07-2026		TLM1	
13.	Inference Theory for Predicate Calculus	2	04-08-2026 05-08-2026		TLM1	
14.	Tutorial on Unit 1	1	06-08-2026		TLM3	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: SET THEORY

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Sets: Operations on Sets	1	07-08-2026		TLM1	
16.	Principle of Inclusion-Exclusion	1	11-08-2026		TLM1	
17.	Relations: Properties, Operations	1	12-08-2026		TLM1	
18.	Tutorial on Practice the sets and Relations Problems	1	13-08-2026		TLM3	
19.	Partition and Covering,	1	14-08-2026		TLM1	
20.	Transitive Closure, Equivalence,	1	18-08-2026		TLM1	

21.	Compatibility and Partial Ordering, Hasse Diagrams	1	19-08-2026		TLM1	
22.	Tutorial on Transitive Closure, Equivalence,Hasse Diagrams	1	20-08-2026		TLM3	
23.	Functions: Bijective, Composition, Inverse,	1	21-08-2026		TLM1	
24.	Permutation, and Recursive Functions,	1	25-08-2026		TLM1	
25.	Tutorial on Functions& Recursive Functions	1	27-08-2026		TLM3	
26.	Lattice and its Properties	1	28-08-2026		TLM1	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: COMBINATORICS AND RECURRENCE RELATIONS:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
27.	Basis of Counting, Permutations, Permutations with Repetitions	1	01-09-2026		TLM1	
28.	Circular and Restricted Permutations, Combinations,	1	02-09-2026		TLM1	
29.	Tutorial on Permutations, Combinations,	1	03-09-2026		TLM3	
30.	Restricted Combinations	1	10-09-2026		TLM1	
31.	Binomial and Multinomial Coefficients and Theorems.	1	15-09-2026		TLM1	
32.	Tutorial on Binomial and Multinomial Coefficients and Theorems.	1	16-09-2026		TLM3	
33.	Recurrence Relations: Generating Functions, Function of Sequences,	1	17-09-2026		TLM1	
34.	Partial Fractions, Calculating Coefficient of Generating Functions	1	18-09-2026		TLM1	
35.	Recurrence Relations, Formulation as Recurrence Relations	1	22-09-2026		TLM1	
36.	Tutorial on Partial Fractions, Recurrence Relations	1	23-09-2026		TLM3	
37.	Solving Recurrence Relations by Substitution and Generating Functions	1	24-09-2026		TLM1	
38.	Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations	2	25-09-2026 29-09-2026		TLM1	
39.	Tutorial on UNIT III	1	30-09-2026		TLM3	
No. of classes required to complete UNIT-III: 14				**No. of classes taken:**		

UNIT-IV: Graph Theory:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
40.	Basic Concepts, Graph Theory and its Applications	1	01-10-2026		TLM1	
41.	Subgraphs, Graph Representations: Adjacency and Incidence Matrices	1	06-10-2026		TLM1	
42.	Isomorphic Graphs,	1	07-10-2026		TLM1	
43.	Paths and Circuits	1	08-10-2026		TLM1	
44.	Tutorial on Graphs	1	09-10-2026		TLM3	
45.	Eulerian and Hamiltonian Graphs,	1	13-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 6				**No. of classes taken:**		

UNIT-V: Multi Graphs

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Multigraphs	1	14-10-2026		TLM1	
47.	Bipartite and Planar Graphs	1	15-10-2026		TLM1	
48.	Tutorial on Bipartite and Planar Graphs	1	16-10-2026		TLM3	
49.	Euler's Theorem	1	27-10-2027		TLM1	
50.	Graph Colouring	1	28-10-2026		TLM1	
51.	Covering	1	29-10-2026		TLM1	
52.	Tutorial on Graph Colouring, Euler Theorem	1	30-10-2026		TLM3	
53.	Chromatic Number	1	03-10-2026		TLM1	
54.	Spanning Trees, Prim's and Kruskal's Algorithms	1	04-11-2026		TLM1	
55.	BFS Spanning Trees.	1	05-11-2026		TLM1	
56.	Tutorial on UNIT V	1	06-11-2026		TLM3	
57.	DFS Spanning Trees	1	10-11-2026		TLM1	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Pigeon Hole Principle	1	9-11-2026		**TLM1**	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I,II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To inculcate algorithmic thinking, formulation techniques and visualization, leading to problem solving skills using different programming paradigms.
PSO 2	To inculcate an ability to analyze, design and implement data driven applications into the students
PSO 3	Develop an ability to implement various processes/methodologies/practices employed in design, validation, testing and maintenance of software products.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. Anand Thota**	**Mrs. B. Swathi**	**Dr. D. Venkata Subbaiah**	**Dr. S. Nagarjuna Reddy**
Signature				

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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: B.LAVANYA

Course Name & Code : UHV 2 – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT -20HS01
L-T-P Structure : **2-1-0** **Credits: 3**
Program/Sem/Sec : II B.Tech., III-Sem, D-Sec **A.Y.: 2026-27**

PRE-REQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES(CEO):

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

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Describe the terms like Natural Acceptance, Happiness and Prosperity (L2)
CO2	Identify one's self, and one's surroundings (family, society nature) (L2)
CO3	Relate human values with human relationship and human society. (L2)
CO4	Illustrate the need for universal human values and harmonious existence (L2)
CO5	Develop as socially and ecologically responsible engineers (L3)

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

CO	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	3	-	-	-	-	-	-	-
CO3	-	-	-	-	-	2	-	3	2	-	-	-	-	-	-
CO4	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	2	3	-	-	-	1	-	-	-

TEXTBOOKS:

T1 Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

REFERENCE BOOKS:

R1 Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

R2 Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

R3 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi**.**

R4 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

R5 Small is Beautiful - E. F Schumacher.

R6 Slow is Beautiful - Cecile Andrews.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and need of Value Education.	1	13/07/26		TLM1	
2.	Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)	1	14/07/26		TLM1	
3.	Understanding Value Education	1	15/07/26		TLM2	
4.	Practice Session PS1 Sharing about Oneself	1	16/07/26		TLM6	
5.	self-exploration as the Process for Value Education	1	20/07/26		TLM2	
6.	Continuous Happiness and Prosperity – the Basic Human Aspirations	1	21/07/26		TLM1	
7.	Practice Session PS2 Exploring Human Consciousness	1	22/07/26		TLM1	
8.	Happiness and Prosperity – Current Scenario	1	23/07/26		TLM1	
9.	Method to Fulfill the Basic Human Aspirations	1	27/07/26		TLM1	
10.	Practice Session PS3 Exploring Natural Acceptance	1	28/07/26		TLM6	
11.	Activity Based Learning	1	29/07/26			
No. of classes required to complete UNIT-I: 11				**No. of classes taken:**		

UNIT-II

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
12.	Understanding Human being as the Co-existence of the self and the body.	2	30/07/26 & 03/08/26		TLM2	
13.	Distinguishing between the Needs of the self and the body	1	04/08/26		TLM2	
14.	Practice Session PS4 Exploring the difference of Needs of self and body.	1	05/08/26		TLM2	
15.	The body as an Instrument of the self	2	06/08/26 & 10/08/26		TLM1	
16.	Understanding Harmony in the self	1	11/08/26		TLM2	
17.	Practice Session PS5 Exploring Sources of Imagination in the self	1	12/08/26		TLM6	
18.	Harmony of the self with the body	2	13/08/26 & 17/08/26		TLM2	
19.	Programme to ensure self-regulation and Health	1	18/08/26		TLM1	
20.	Practice Session PS6 Exploring Harmony of self with the body	1	19/08/26		TLM2	
21.	Activity Based Learning	1	20/08/26			
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)						

UNIT-III

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Harmony in the Family – the Basic Unit of Human Interaction	1	24/08/26		TLM2	
23.	'Trust' – the Foundational Value in Relationship	2	25/08/26 & 27/08/26		TLM1	
24.	Practice Session PS7 Exploring the Feeling of Trust	1	31/08/26		TLM6	
25.	'Respect' – as the Right Evaluation	1	01/09/26		TLM1	
26.	Other Feelings, Justice in Human-to-Human Relationship	1	02/09/26		TLM1	

27.	Practice Session PS8 Exploring the Feeling of Respect	1	03/09/26		TLM6	
28.	Understanding Harmony in the Society	1	10/09/26		TLM1	
29.	Vision for the Universal Human Order	1	15/09/26		TLM1	
30.	Practice Session PS9 Exploring Systems to fulfil Human Goal	1	16/09/26		TLM6	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT-IV

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31.	Understanding Harmony in the Nature	2	17/09/26 & 21/09/26		TLM2	
32.	Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature	2	22/09/26 & 23/09/26		TLM2	
33.	Practice Session PS10 Exploring the Four Orders of Nature	1	24/09/26		TLM6	
34.	Realizing Existence as Co-existence at All Levels	2	28/09/26 & 29/09/26		TLM2	
35.	The Holistic Perception of Harmony in Existence	1	30/09/26		TLM2	
36.	Practice Session PS11 Exploring Co-existence in Existence.	1	01/10/26		TLM6	
37.	Activity Based Learning	1	05/10/26			
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
38.	Natural Acceptance of Human Values	2	06/10/26 & 07/10/26		TLM2	
39.	Definitiveness of (Ethical) Human Conduct	2	08/10/26 & 12/10/26		TLM2	
40.	Practice Session PS12 Exploring Ethical Human Conduct	1	13/10/26		TLM2	
41.	A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order	2	14/10/26 & 15/10/26		TLM2	
42.	Competence in Professional Ethics	2	26/10/26 & 27/10/26		TLM2	
43.	Practice Session PS13 Exploring Humanistic Models in Education	1	28/10/26		TLM6	
44.	Holistic Technologies, Production Systems and Management Models-Typical Case Studies	2	29/10/26 & 02/11/26		TLM2	
45.	Strategies for Transition towards Value-based Life and Profession	2	03/11/26 & 04/11/26		TLM2	
46.	Practice Session PS14 Exploring Steps of Transition towards Universal Human Order	2	05/11/26 & 09/11/26		TLM6	
No. of classes required to complete UNIT-V: 16				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Pollution-Human Role	1	29/10/26		TLM2			
2.	Mutual-Enrichment	1	02/11/26		TLM2			
No. of classes		2			No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.

PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**B.LAVANYA**	**Dr.B.Srinivasa Rao**	**Dr.B.Srinivasa Rao**	**Dr. Nagarjuna Reddy**
Signature				

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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. CH V NARAYANA
Course Name & Code : DL&CO 20IT01
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : II B.Tech., III-Sem, D-Sec R23 **A.Y.: 2026-27**

Prerequisites:

Course Objectives: The main objectives of the course is to

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

COURSE OUTCOMES (COs): At the end of the course, students will be able to

CO1	Evaluate digital number systems and use Boolean algebra theorems, Properties and Canonical forms for digital logic circuit design. **(Understand- L2)**
CO2	Design Sequential logic circuits and understand basic functional blocks a computer system . **(Apply- L3)**
CO3	Understand computer architecture and Data representation to perform computer arithmetic operations and processor organization. **(Understand- L2)**
CO4	Analyze the memory hierarchy in a computer system. **(Understand- L2)**
CO5	Understand the I/O operations and the interfaces **(Understand-L2)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

CO	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	1	-	-	-	-	-	-	-	-	-	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-

Textbooks:

1. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 6th edition, McGraw Hill

2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education.
3. Computer Organization and Architecture, William Stallings, 11thEdition, Pearson.

Reference Books:

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Number systems, Logic gates and Boolean algebra, Combinational circuits

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to DLD	1	14-07-2026		TLM1	
2.	Number systems	1	15-07-2026		TLM1	
3.	Different Number systems	1	16-07-2026		TLM1	
4.	Conversions of one number to another number	2	17-07-2026 21-07-2026		TLM1	
5.	Binary codes	2	22-07-2026 23-07-2026		TLM1	
6.	Basic Logic gates and Universal gates	2	24-07-2026 28-07-2026		TLM1	
7.	Boolean Logic functions	2	29-07-2026 30-07-2026		TLM1	
8.	K-Maps Simplications	3	31-07-2026 04-08-2026 05-08-2026		TLM1	
9.	Combinational circuits, Desing Decoder and Multiplexers	1	06-08-2026		TLM1	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: Sequential Logic Circuits, Basic structure of computer, Computer generations

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
10.	Introduction to sequential circuits,	1	07-08-2026		TLM1	
11.	Flip-flops(RS,J,T,D),	2	11-08-2026 12-08-2026		TLM1	
12.	Master slave flip-flop	1	13-08-2026		TLM1	
13.	Conversion of flip-flops, Truth & excitation tables	2	14-08-2026 18-08-2026		TLM1	
14.	Registers	1	19-08-2026		TLM1	
15.	counters	1	20-08-2026		TLM1	
16.	Basic structure of computer	2	21-08-2026 25-08-2026		TLM1	
17.	Bus structure	1	27-08-2026		TLM1	
18.	Multi processors and multi computers	1	28-08-2026		TLM1	
19.	Computer generations	1	01-09-2026		TLM1	
20.	Von- Neumann Architecture	2	02-09-2026 03-09-2026			
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: Data Representation, Processor Organization

S.	Topics to be covered	No. of	Tentative	Actual	Teaching	HOD

No.		Classes Required	Date of Completion	Date of Completion	Learning Methods	Sign Weekly
21.	Signed Number representation	1	10-09-2026		TLM2	
22.	Addition and Subtraction of Signed Numbers	1	11-09-2026		TLM2	
23.	Design of Fast Adders	1	15-09-2026		TLM2	
24.	Multiplication of Positive Numbers	1	16-09-2026		TLM2	
25.	Signed-operand Multiplication	1	17-09-2026		TLM2	
26.	Fast Multiplication	1	18-09-2026		TLM2	
27.	Integer Division,	1	22-09-2026		TLM2	
28.	Floating-Point Numbers and Operations	1	23-09-2026		TLM2	
29.	Processor Organization of Fundamental Concepts	1	24-09-2026		TLM2	
30.	Execution of a Complete Instruction	1	25-09-2026		TLM2	
31.	Multiple-Bus Organization	1	29-09-2026		TLM2	
32.	Hardwired Control	1	30-09-2026		TLM2	
33.	Micro programmed Control	1	01-10-2026		TLM2	
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: Memory organization, Virtual Memories

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34.	Memory organization	1	06-10-2026		TLM2	
35.	Semiconductor RAM Memories	1	07-10-2026		TLM2	
36.	Concept of memory hierarchical organization	1	08-10-2026		TLM2	
37.	Read-Only Memories, Speed, Size and Cost	1	09-10-2026		TLM2	
38.	Cache memory	1	13-10-2026		TLM2	
39.	Virtual Memories	1	14-10-2026		TLM2	
40.	Memory Management Requirements, Secondary Storage	3	15-10-2026 16-10-2026 27-10-2026		TLM2	
No. of classes required to complete UNIT-IV: 9				**No. of classes taken:**		

UNIT-V: Input/output Organization: & Peripheral devices, DMA

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
41.	Input/Output Organization: Accessing I/O Devices	1	28-10-2026		TLM2	
42.	Interrupts	1	29-10-2026		TLM2	
43.	Processor Examples	1	30-10-2026		TLM2	
44.	Interface Circuits	1	03-11-2026		TLM2	
45.	Peripheral devices –I/O sub-systems	1	04-11-2026		TLM2	
46.	I/O device interface	1	05-11-2026		TLM2	
47.	I/O transfers-program controlled	1	06-11-2026		TLM2	
48.	Interrupt driven	1	10-11-2026		TLM2	
49.	DMA	1	11-11-2026		TLM2	
No. of classes required to complete UNIT-V: 15				**No. of classes taken:**		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineer**ing 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. CH V NARAYANA**	**Dr.J.Nageswara Rao**	**Dr .D.Venkata Subbaiah**	**Dr. S. Nagarjuna Reddy**
Signature				

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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: G.V. RAJYA LAKSHMI
Course Name & Code : ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS & 23CS04
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE/III /D **A.Y.:** 2026-27

PREREQUISITE: Data Structures

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course is to

1. Provide knowledge on advance data structures frequently used in Computer Science domain
2. Develop skills in algorithm design techniques popularly used
3. Understand the use of various data structures in the algorithm design

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Identify the characteristics of an algorithm, analyze its time and space complexity and construct balanced binary trees. **(Apply-L3)**
CO2	Understand Heap structures and graph terminology to perform various operations on non-linear data structures. **(Understand-L2)**
CO3	Apply Divide and Conquer, Greedy algorithm and dynamic programming for solving problems**. (Apply - L3)**
CO4	Analyze the backtracking and branch-and-bound search methods on optimization problems **(Apply - L3)**
CO5	Summarize the importance of NP-Hard and its applications. **(Understand-L2)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	-	-	-	-	3	3	3
CO2	2	2	-	-	-	-	-	-	-	-	-	-	3	3	3
CO3	2	2	3	-	-	-	-	-	-	-	-	-	3	3	1
CO4	2	2	3	-	-	-	-	-	-	-	-	-	3	2	3
CO5	2	2	-	1	-	-	-	-	-	-	-	-	-	-	-
1 - Low **2 –**Medium **3 -** High															

TEXTBOOKS:

T1 Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2ndEdition Universities Press

T2 Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition University Press

REFERENCE BOOKS:

R1 Data Structures and program design in C, Robert Kruse, Pearson Education Asia

R2 An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

R3 The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.

R4 Data Structures using C & C++: Langsam, Augenstein &Tanenbaum, Pearson, 1995 Algorithms + Data Structures & Programs: N.Wirth, PHI

R5 Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.

R6 Data structures in Java: Thomas Standish, Pearson Education Asia

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction, AVL Tree, B-Tree

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and CO discussion	1	13-07-2026		TLM1	
2.	Introduction to Algorithm-Characteristics	1	14-07-2026		TLM1	
3.	Algorithm/Pseudo code specifications- Sample Algorithms	1	15-07-2026		TLM1	
4.	Example Algorithms using Pseudo Code	1	16-07-2026		TLM3	
5.	Time and Space Complexity - Examples	2	20-07-2026		TLM1	
6.	Asymptotic Notations	2	22-07-2026		TLM1	
7.	Examples on finding space & time complexity of algorithms	1	23-07-2026		TLM3	
8.	AVL Tree Operations - Analysis	2	27-07-2026		TLM1	
9.	B-Tree operations, Activity - Quiz	2	29-07-2026		TLM1	
10.	Examples on AVL & B Tree operations	2	01-08-2026		TLM3	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: Heap Tress, Graphs, Divide and Conquer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Heap Trees (Priority Queue) – Introduction	1	03-08-2026		TLM1	
12.	Max Heap, Min Heap Construction-operations	1	04-08-2026		TLM1	
13.	Implementation of Heap Tree	1	05-08-2026		TLM1	
14.	Graph Terminology, Representations of Graphs	1	06-08-2026		TLM1	
15.	Tutorial on Heap Tree Construction	1	08-08-2026		TLM3	
16.	Basic Search and Traversal Techniques – DFS	2	11-08-2026		TLM1	
17.	BFS – Example, Implementation	1	12-08-2026		TLM1	
18.	Examples on BFS & DFS traversals	1	13-08-2026		TLM3	

19.	Connected Components, Biconnected Components	2	18-08-2026		TLM1	
20.	Divide and Conquer General Method, Finding Max and Min	1	19-08-2026		TLM1	
21.	Merge Sort	1	20-08-2026		TLM1	
22.	Tutorial on Merge Sort Analysis	1	22-08-2026		TLM3	
23.	Quick sort, Merge sort Activity – Role Play	1	24-08-2026		TLM1	
24.	Strassen' Matrix Multiplication	1	25-08-2026		TLM1	
25.	Practice on Divide & Conquer Technique problems	1	27-08-2026		TLM3	
No. of classes required to complete UNIT-II: 17				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)						

UNIT-III: Greedy Method:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Introduction to Greedy Method	1	29-08-2026		TLM1	
27.	Job Sequencing with dead Lines	1	31-08-2026		TLM1	
28.	Knapsack Problem	1	01-09-2026		TLM1	
29.	Minimum Cost Spanning Tree- Kruskal Algorithm	1	02-09-2026		TLM1	
30.	Tutorial on different knapsack problem instances	1	03-09-2026		TLM3	
31.	Prims Algorithm	2	05-09-2026		TLM1	
32.	Single Source Shortest Path	1	10-09-2026		TLM1	
33.	Tutorial on analysis of prims & kruskal's algorithm	1	12-09-2026		TLM3	
34.	Optimal Storage on tapes	1	15-09-2026		TLM1	
35.	Huffman Coding, Group Activity	1	16-09-2026		TLM1	
No. of classes required to complete UNIT-III: 11				**No. of classes taken:**		

UNIT-IV: Dynamic Programming

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Introduction to Dynamic Programming	1	17-09-2026		TLM1	
37.	All pairs shortest path	1	19-09-2026		TLM1	
38.	Tutorial on Tabular & Memorization methods in Dynamic Proraming	1	21-09-2026		TLM3	
39.	Bellman Ford Algorithm	1	22-09-2026		TLM1	
40.	0/1 knapsack problem	2	24-09-2026		TLM1	
41.	Tutorial on Analysis of Bellman Ford & Floyd Warshall Algorithms	2	28-09-2026		TLM3	
42.	Optimal binary search tree	2	30-09-2026		TLM1	
43.	String editing algorithm	2	03-10-2026		TLM1	
44.	Travelling salesperson problem	2	06-10-2026		TLM1	
45.	Tutorial on Greedy algorithms, Activity seminar	2	08-10-2026		TLM3	
No. of classes required to complete UNIT-IV: 16				**No. of classes taken:**		

UNIT-V: Back tracking & Branch and bound

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Backtracking Introduction	2	12-10-2026		TLM1	
47.	N-queens Problem	2	14-10-2026		TLM1	
48.	Graph Coloring	2	17-10-2026		TLM1	
49.	Sum of subsets problem	2	27-10-2026			
50.	Examples on sum of subsets	1	28-10-2026		TLM1	
51.	Introduction to Branch and Bound	1	29-10-2026		TLM1	
52.	0/1 Knapsack-LCBB, FIFOBB	2	02-11-2026		TLM1	
53.	Tutorial on 0/1 Knapsack	1	03-11-2026			
54.	Travelling Salesperson Problem -LC Search	2	05-11-2026		TLM1	
55.	Introduction to P and NP	1	07-11-2026		TLM1	
56.	NP-Complete Problems	1	09-11-2026		TLM1	
57.	Revision	1	10-11-2026		TLM1	
No. of classes required to complete UNIT-V: 18				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Np-Hard Problems	1	11-11-2026		TLM2			
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**G.V.Rajya Lakshmi**	**Dr.D.Srinivasa Rao**	**Dr. Y.V.B Reddy**	**Dr.S.Nagarjuna Reddy**
Signature				

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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.M.Kiran Kumar
Course Name & Code **:** Object Oriented Programming Through JAVA &23CS05
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE/III /D **A.Y.:** 2026-27

PREREQUISITE: Introduction to Programming

COURSE EDUCATIONAL OBJECTIVES(CEO):

The learning objectives of this course are to:
1. Identify Java language components and how they work together in applications
2. Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
3. Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
4. Understand how to design applications with threads in Java
5. Understand how to use Java APIs for program development

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Identify the syntax and semantics of java programming language and basic concepts of Java. **(Understand-L2)**
CO2	Understand the basic concepts of object-oriented programming **(Understand-L2)**
CO3	Develop reusable programs using the concepts of inheritance, polymorphism, and interfaces. **(Apply-L3)**
CO4	Apply the concepts of packages, exception handling & I/O streams to develop secure, error free, and efficient applications **(Apply-L3)**
CO5	Design multithreaded and GUI based applications which mimic the real word scenarios. **(Apply-L3)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	2	2	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	2	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	2	3	3
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	3	3
CO5	3	2	-	-	-	-	-	-	-	-	-	2	2	2	2
1 - Low						2 –Medium						3 - High			

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. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

REFERENCE BOOKS:

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Object Oriented Programming, Data Types,Operators, Control Statements

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Basic concepts, Principles, Program Structure in Java	1	13-07-2026		TLM1	
2.	Writing Simple Java Programs, Elements or Tokens in Java Programs	1	14-07-2026		TLM1	
3.	Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.	2	15-07-2026 16-07-2026		TLM1	
4.	Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final	2	17-07-2026 20-07-2026		TLM1	
5.	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.	2	21-07-2026 22-07-2026		TLM1	
6.	Introduction, if Expression, Nested if Expressions,if–else Expressions , TernaryOperator?:	3	23-07-2026 24-07-2026 27-07-2026		TLM1	
7.	Switch Statement, Iteration Statements , while Expression, do–while Loop ,for Loop, Nested for Loop,For–Each for Loop ,Break Statement, Continue Statement.	3	28-07-2026 29-07-2026 30-07-2026		TLM1	
No. of classes required to complete UNIT-I: 13				**No. of classes taken:**		

UNIT-II: Classes and Objects, Constructors and Methods, String Handling in Java

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
8.	Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another	1	31-07-2026		TLM1	
9.	Access Control for Class Members, Accessing Private Members of Class.	1	03-08-2026		TLM1	
10.	Introduction, Defining Methods, Constructor Methods for Class	1	04-08-2026		TLM1	
11.	Constructors and Methods: Introduction, Defining Methods	1	05-08-2026		TLM1	
12.	Constructor Methods for Class, Overloaded Constructor Methods, Overloaded Methods	1	06-08-2026		TLM1	

13.	Nested Classes, Passing Arguments by Value and by Reference Keyword this.	2	07-08-2026 10-08-2026		TLM1	
14.	Class Objects as Parameters in Methods	1	11-08-2026		TLM1	
15.	Access Control, Recursive Methods	2	12-08-2026 13-08-2026		TLM1	
16.	Nesting of Methods	1	14-08-2026		TLM1	
17.	Attributes Final and Static.	1	17-08-2026		TLM1	
18.	Introduction, Interface Char Sequence	2	18-08-2026 19-08-2026		TLM1	
19.	Class String, Methods for Extracting Characters from Strings	2	20-08-2026 21-08-2026		TLM1	
20.	Comparison, Modifying, Searching; Class String Buffer	2	34-08-2026 25-08-2026		TLM1	
No. of classes required to complete UNIT-II: 18				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)						

UNIT-III: Arrays, Inheritance, Interfaces

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
21.	Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays	1	27-08-2026		TLM1	
22.	Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays	2	28-08-2026 31-08-2026		TLM1	
23.	Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.	2	01-09-2026 02-09-2026		TLM1	
24.	Introduction, Relationship between classes- Has-a, Is-a, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final	2	03-09-2026 15-09-2026		TLM1	
25.	Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes.	2	16-09-2026 17-09-2026		TLM1	
26.	Introduction, Declaration of Interface, Implementation of Interface	2	18-09-2026 21-09-2026		TLM1	
27.	Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces	1	22-09-2026		TLM1	
28.	Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.	1	23-09-2026		TLM1	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Packages and Java Library, Exception Handling, Java I/O and File

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	Introduction, Defining Package, Importing Packages and Classes into	1	24-09-2026		TLM1	

	Programs, Path and Class Path, Access Control, Packages in Java SE- Java. Lang Package and its Classes					
30.	Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing. Java util Classes and Interfaces	2	25-09-2026 28-09-2026		TLM1	
31.	Formatter Class, Random Class, Time Package, Formatting for Date/Time in Java , Temporal Adjusters Class	2	29-09-2026		TLM1	
32.	Introduction, Hierarchy of Standard Exception Classes, Keywords try, catch, throw, throws, and finally Blocks, Multiple Catch Clauses	2	30-09-2026 01-10-2026		TLM1	
33.	Class Throwable, Unchecked Exceptions, Checked Exceptions, Generating user defined exception.	2	05-10-2026 06-10-2026		TLM1	
34.	Java I/O API, standard I/O streams, types, Byte streams	2	07-10-2026 08-10-2026		TLM1	
35.	Character streams, Scanner class, Files in Java	2	09-10-2026 12-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: Multithreaded Programming, Java Collections, Java FX GUI

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Introduction, Need for Multiple Threads ., Multithreaded Programming for Multi-core Processor	1	13-10-2026		TLM1	
37.	Thread Class, Main Thread - Creation of New Threads, Thread States	2	14-10-2026 15-10-2026		TLM1	
38.	Thread Priorities, Synchronization, Inter-thread Communication-producer consumer problem.	2	16-10-2026		TLM1	
39.	Introduction, Purpose of Collection Framework, Hierarchy of collection Interfaces / classes, Methods defined in Collection Interface	2	26-10-2026 27-10-2026		TLM1	
40.	Interface Iterator, Collection classes/Interfaces –List, Set, Map	1	28-10-2026		TLM1	
41.	Overview of AWT & Swings API, limitations	2	29-10-2026 30-10-2026		TLM1	
42.	Java FX Scene Builder, Java FX App Window Structure	2	02-11-2026 03-11-2026		TLM1	
43.	Displaying text and image	1	04-11-2026		TLM1	
44.	Event handling, laying out nodes in scene graph, mouse events	2	05-11-2026 05-11-2026		TLM1	
45.	Revision	2	09-11-2026 10-11-2026		TLM1	
No. of classes required to complete UNIT-V: 17				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	JDBC	1	11-11-2026					
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success oforganization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr.M.Kiran Kumar**	**Dr. Y.V.B Reddy**	**Dr. Y.V.B Reddy**	**Dr. S.Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: G.V.RAJYA LAKSHMI
Course Name & Code **:** ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB & 23CS53
L-T-P Structure **: 0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE/III/D **A.Y.:** 2026-27

PREREQUISITE: DATA STRUCTURES LAB

COURSE EDUCATIONAL OBJECTIVE:
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 (CO):
CO1: Implement balanced binary trees, heaps and graph traversals using arrays and linked list. **(Apply-L3)**
CO2: Implement Various Sorting Techniques. **(Apply - L3)**
CO3: : Implement optimization problems using greedy, dynamic programming, backtracking and branch-and-bound techniques. **(Apply - L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	1	-		-	-	-	-	-	-	-	3	3	3
CO2	-	2	1	-		-	-	-	-	-	-	-	3	3	3
CO3	-	2	1	-		-	-	-	-	-	-	-	3	3	3
CO4	-	-	-	-	-	-	-	2	2	2	-	-		-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:
COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	Introduction problems	03	13-07-2026		
2.	AVL tree	03	20-07-2026		
3.	B-Tree	03	27-07-2026		
4.	Heap Construction, MAX & MIN heaps	03	03-08-2026		
5.	BFT, DFT techniques	03	10-08-2026		
6.	Finding Biconnected Components, Articulation point	06	17-08-2026 24-08-2026		
7.	Finding Maximum and Minimum in an Array	03	31-08-2026		
8.	Merge sort, Quick sort	03	21-09-2026		
9.	Single source shortest path	03	28-09-2026		
10.	Job sequencing with dead lines	03	05-10-2026		
11.	0/1 knapsack - Dynamic Programming	03	12-10-2026		
12.	N-queens Problem	03	26-10-2026		
13.	Travelling Sales person Problem-Branch and bound	03	02-11-2026		
14.	Internal Exam	03	09-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
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PO 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.
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PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**G.V.Rajya Lakshmi**	**Dr.D.Srinivasa Rao**	**Dr. Y.V.B Reddy**	**Dr.S.Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.M.Kiran Kumar
Course Name & Code : Object Oriented Programming Through JAVA Lab&23CS54
L-T-P Structure : **0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE/III/D **A.Y.:** 2026-27

PREREQUISITE: Computer Programming Lab

COURSE EDUCATIONAL OBJECTIVE:
The objectives of the course is to
1. Practice object-oriented programming in the Java programming language .
2.Implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
3.Illustrate inheritance, Exception handling mechanism, JDBC connectivity .
4.Construct Threads, Event Handling, implement packages, Java FX GUI.

COURSE OUTCOMES (CO):
CO1 : Implement basic concepts of the java programming language. **(Apply-L3)**
CO2 : Implement object-oriented programming concepts and exception handling**(Apply-L3)**
CO3 : Design multithreaded, database and GUI based applications. **(Apply-L3)**
CO4 : Improve individual / teamwork skills, communication & report writing skills with ethical values. **(Apply-L3)**

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	2	-	-	-	-	-	-	2	2	2	
CO2	3	2	2	-	2	-	-	-	-	-	-	2	2	2	2
CO3	3	2	2	-	2	-	-	-	-	-	-	2	2	2	2
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	Basic Java Programs	03	17-07-2026		
2.	a.Write a JAVA program to display default value of all primitive data type of JAVA b.Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.	03	24-07-2026		
3.	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.	03	31-07-2026		
4.	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 Overloading. c.Write a JAVA program to implement constructor. d.Write a JAVA program to implement constructor overloading.	03	07-08-2026		
5.	a.Write a JAVA program to implement Single Inheritance b.Write a JAVA program to implement multilevel Inheritance c.Write a JAVA program for abstract class to find areas of different shape	03	14-08-2026		
6.	Practice Lab	03	21-08-2026		
7.	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	03	22-08-2026		
8.	a.Write a JAVA program that describes exception handling mechanism b.Write a JAVA program Illustrating Multiple catch clauses c.Write a JAVA program for creation of Java Built-in Exceptions d.Write a JAVA program for creation of User Defined Exception	03	28-08-2026		
9.	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	06	18-09-2026 25-09-2026		

10.	a.Write a JAVA program that import and use the user defined packages b.Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX) c.Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI	03	09-10-2026		
11.	a.Implement the programs using List Interface and its implemented classes. b.Implement the programs using Set Interface and its implemented classes. c.Implement the programs using Map Interface and its implemented classes.	06	09-10-2026 16-10-2026		
12.	Internal Exam	03	30-10-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success oforganization.
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Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr.M.Kiran Kumar**	**Dr. Y.V.B Reddy**	**Dr. Y.V.B Reddy**	**Dr. S.Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor	: Dr. G.Minni	
Course Name & Code	: PYTHON PROGRAMMING (SOC) & 23CSS1	
L-T-P Structure	: 0-1-2	Credits: 2
Program/Sem/Sec	: B.Tech./III Sem./D Section.	A.Y.: 2026-27
PRE-REQUISITE:	: Mathematics, Basic Computer concepts	

COURSE EDUCATIONAL OBJECTIVE (CEO):

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects

COURSE OUTCOMES (COs): At the end of the course, the student will be able to:

CO1:	Implement the core programming concepts of Python programming language..	Apply – L3
CO2:	Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries	Apply – L3
CO3:	Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications	Apply – L3
CO4:	Improve individual / teamwork skills, communication & report writing skills with ethical values	Apply – L3

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	-	-	-	-	-	-	-	2	2	2	-	-		-	-
1 – Low								**2** – Medium					**3** – High		

REFERENCE BOOKS:

R1: Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2ndEdition, Pearson, 2024

R2: Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT – I: Introduction to Python Programming and Control Statement & Loops

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Discussion of Syllabus ,CEO's and CO's Introduction to Python, Installation, Variables, Data types.	1	14-07-2026		TLM1	
2.	Reading Input, Print output, Comments	3	18-07-2026		TLM1	
3.	Types of operators, Working on operators, Sample Programs, Type Conversion	1	21-07-2026		TLM1 TLM1	
4.	Control statements – if, else, nestedif, elif	3	25-07-2026		TLM1	
5.	Loop statements, Programs on Loop statements	1	28-07-2026		TLM1	
6.	pass, continue and break	3	01-08-2026		TLM1	
7.	Catching Exceptions Using try and except Statement	1	04-08-2026		TLM1	
8.	Programs on exception handling.	3	08-08-2026		TLM1	
No. of classes required to complete UNIT – I: 16				**No. of classes taken:**		

UNIT – II: Functions and Strings

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
9.	Function Definition and Calling the function, return Statement and void Function	1	11-08-2026		TLM1	
10.	Scope and Lifetime of Variables	1	18-08-2026		TLM1	
11.	Default Parameters, Keyword Arguments,*args and **kwargs, Command Line Arguments, sample programs	3	22-08-2026		TLM1	
12.	Strings Introduction, Basic String Operations , Accessing Characters in String by Index Number	1	25-08-2026		TLM1	
13.	String Slicing and Joining, String Methods, Formatting Strings.	3	29-08-2026		TLM1 TLM1	
14.	Sample Programs on strings Creating Lists, Basic List Operations,	1	01-09-2026		TLM1	
15.	Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement., Programs on Lists	3	05-09-2026		TLM1	
No. of classes required to complete UNIT – II: 13				**No. of classes taken:**		

UNIT – III: Dictionaries , Tuples and Sets

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
16.	Introduction to Dictionaries, Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries,	3	12-09-2026		TLM1	

17.	Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement. Sample programs on dictionaries. Creating	1	15-09-2026		TLM1	
18.	Tuples, Basic Tuple Operations, tuple() Function	3	19-09-2026		TLM1	
19.	Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Sample Programs on tuples., Relation between Tuples and Lists	1	22-09-2026		TLM1	
20	,Relation between Tuples and Dictionaries, Using zip() Function	3	26-09-2026		TLM1	
21	Sets, Set Methods, Frozen set., Sample Programs on sets, tuples.	1	29-03-2026		TLM1	
No. of classes required to complete UNIT – III: 12				**No. of classes taken:**		

UNIT – IV: Files & Object-Oriented Programming

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Introduction to files, Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files	1	03-10-2026		TLM1	
23.	Pickle Module	3	06-10-2026		TLM1	
24.	Reading and Writing CSV Files, Python os and os. path Modules. Sample programs	1	10-10-2026		TLM1	
25.	**Object-Oriented programming** Classes and Objects, Creating Classes in Python	3	13-10-2026		TLM1	
26.	Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, sample programs	1	17-10-2026		TLM1 TLM1	
27.	Encapsulation, Inheritance, Polymorphism. Sample Python programs on object-oriented programming.	3	27-10-2026		TLM1	
No. of classes required to complete UNIT – IV: 12				**No. of classes taken:**		

UNIT – V: Introduction to Data Science

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
28	**Introduction to Data Science**: Functional Programming	3	31-11-2026		TLM1	
29	JSON and XML in Python, NumPy with Python, Pandas.	1	03-11-2026		TLM1	
30	Internal Test	3	07-11-2026		TLM1	
31	Example Programs on Numpy and pandas	1	10-11-2026			
No. of classes required to complete UNIT – V: 8				**No. of classes taken:**		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**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.
PO3	**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.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data andsynthesis of the information to provide valid conclusions.
PO5	**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
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge toassess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**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.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a memberand leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for and have the preparation and ability to engaging independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr. G. Minni	Dr. G. Minni	Dr. Y. V. B. Reddy	Dr. S. Nagarjuna Reddy
Signature				

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Institution Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mrs. N. V.Padmavathi
Course Name & Code : Discrete Mathematics & Graph Theory & 23FE11
L-T-P Structure : **3-1-0** **Credits:** 3
Program/Sem/Sec : B.Tech/III/E **A.Y.:** 2024-25
Regulations : R23

PREREQUISITE: Mathematics courses of first year of study.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- 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 (COs): At the end of the course, student will be able to

CO1	Construct mathematical arguments using logical connectives and quantifiers and verify them. **(Apply- L3)**
CO2	Demonstrate the basic terminology of functions, relations, lattices and their operations. **(Understand -L2)**
CO3	Illustrate the basic principles/techniques to solve different combinatorial problems and linear recurrence relations**.(Apply- L3)**
CO4	Demonstrate the different types of graphs.**(Understand -L2)**
CO5	Apply the properties of graphs to solve the graph theory problems in computer science**.(Apply- L3)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1													
CO2	3	2	1												
CO3	3	3	1	1											
CO4	3	3	1												
CO5	3	3	1	1											1
1 - Low						**2 –**Medium						**3 -** High			

TEXTBOOKS:

T1 Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.

T2 Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.

T3 Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill

REFERENCE BOOKS:

R1	Discrete Mathematics for Computer Scientists and Mathematicians, J. L.Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
R2	Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
R3	Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.
R4	Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: MATHEMATICAL LOGIC

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Propositional Calculus: Statements and Notations, Connectives	1	13-07-2026		TLM1	
2.	Well Formed Formulas, Truth Tables	1	14-07-2026		TLM1	
3.	Tutorial on : Statements and Notations, Connectives,TruthTables	1	15-07-2026		TLM3	
4.	Tautologies, Equivalence of Formulas, Duality Law	1	16-07-2026		TLM1	
5.	Tautological Implications, Normal Forms,	1	20-07-2026		TLM1	
6.	Theory of Inference for Statement Calculus, Consistency of Premises,	1	21-07-2026		TLM1	
7.	Tutorial on : Theory of Inference for Statement Calculus, Consistency of Premises	1	22-07-2026		TLM3	
8.	Indirect Method of Proof, Predicate Calculus: Predicates	1	23-07-2026		TLM1	
9.	Predicative Logic, Statement Functions	1	27-07-2026		TLM1	
10.	Variables and Quantifiers	1	28-07-2026		TLM1	
11.	Tutorial on : Predicates, Predicative Logic, Statement Functions,	1	29-07-2026		TLM3	
12.	Free and Bound Variables	1	30-07-2026		TLM1	
13.	Inference Theory for Predicate Calculus	2	03-08-2026		TLM1	
14.	Tutorial on Unit 1	1	04-08-2026		TLM3	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: SET THEORY

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Sets: Operations on Sets	1	05-08-2026		TLM1	
16.	Principle of Inclusion-Exclusion	1	06-08-2026		TLM1	
17.	Relations: Properties, Operations	1	10-08-2026		TLM1	
18.	Tutorial on Practice the sets and Relations Problems	1	11-08-2026		TLM3	
19.	Partition and Covering,	1	12-08-2026		TLM1	
20.	Transitive Closure, Equivalence,	1	13-08-2026		TLM1	
21.	Compatibility and Partial Ordering, Hasse	1	17-08-2026		TLM1	

	Diagrams					
22.	Tutorial on Transitive Closure, Equivalence,Hasse Diagrams	1	18-08-2026		TLM3	
23.	Functions: Bijective, Composition, Inverse,	1	19-08-2026		TLM1	
24.	Permutation, and Recursive Functions,	1	20-08-2026		TLM1	
25.	Tutorial on Functions& Recursive Functions	1	24-08-2026		TLM3	
26.	Lattice and its Properties	1	25-08-2026		TLM1	
27.	Activity	1	25-08-2026			
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: COMBINATORICS AND RECURRENCE RELATIONS:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
28.	Basis of Counting, Permutations, Permutations with Repetitions	1	27-08-2026		TLM1	
29.	Circular and Restricted Permutations, Combinations,	1	31-08-2026		TLM1	
30.	Tutorial on Permutations, Combinations,	1	01-09-2026		TLM3	
31.	Restricted Combinations	1	02-09-2026		TLM1	
32.	Binomial and Multinomial Coefficients and Theorems.	1	03-09-2026		TLM1	
33.	Tutorial on Binomial and Multinomial Coefficients and Theorems.	1	15-09-2026		TLM3	
34.	Recurrence Relations: Generating Functions, Function of Sequences,	1	16-09-2026		TLM1	
35.	Partial Fractions, Calculating Coefficient of Generating Functions	1	17-09-2026		TLM1	
36.	Recurrence Relations, Formulation as Recurrence Relations	1	21-09-2026		TLM1	
37.	Tutorial on Partial Fractions, Recurrence Relations	1	22-09-2026		TLM3	
38.	Solving Recurrence Relations by Substitution and Generating Functions	1	23-09-2026		TLM1	
39.	Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations	2	24-09-2026		TLM1	
40.	Tutorial on UNIT III	1	28-09-2026		TLM3	
No. of classes required to complete UNIT-III: 14				**No. of classes taken:**		

UNIT-IV: Graph Theory:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
41.	Basic Concepts, Graph Theory and its Applications	1	29-09-2026		TLM1	
42.	Subgraphs, Graph Representations: Adjacency and Incidence Matrices	2	30-09-2026		TLM1	
43.	Isomorphic Graphs,	1	01-10-2026		TLM1	
44.	Paths and Circuits	1	05-10-2026		TLM1	
45.	Tutorial on Graphs	1	06-10-2026		TLM3	
46.	Eulerian and Hamiltonian Graphs,	1	07-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 7				**No. of classes taken:**		

UNIT-V: Multi Graphs

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
47.	Multigraphs,	1	08-10-2026		TLM1	

48.	Bipartite and Planar Graphs	1	12-10-2026		TLM1	
49.	Tutorial on Bipartite and Planar Graphs	1	13-10-2026		TLM3	
50.	Euler's Theorem	1	14-10-2026		TLM1	
51.	Graph Colouring	1	15-10-2026		TLM1	
52.	Covering	1	26-10-2026		TLM1	
53.	Tutorial on Graph Colouring, Euler Theorem	1	27-10-2026		TLM3	
54.	Chromatic Number	1	28-10-2026		TLM1	
55.	Spanning Trees, Prim's and Kruskal's Algorithms	1	29-10-2026		TLM1	
56.	BFS Spanning Trees.	1	02-11-2026		TLM1	
57.	Tutorial on UNIT V	1	03-11-2026		TLM3	
58.	DFS Spanning Trees	1	04-11-2026		TLM1	
59.	Activity	1	05-11-2026			
60.	pratice	1	09-11-2026			
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Pigeon Hole Principle	1	05	10-11-2026 11-11-2026	**TLM1**	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I,II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To inculcate algorithmic thinking, formulation techniques and visualization, leading to problem solving skills using different programming paradigms.
PSO 2	To inculcate an ability to analyze, design and implement data driven applications into the students
PSO 3	Develop an ability to implement various processes/methodologies/practices employed in design, validation, testing and maintenance of software products.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mrs N.V.Padmavathi**	**Mrs B. Swathi**	**Dr. D. Venkata Subbaiah**	**Dr. S. Nagarjuna Reddy**
Signature				

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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: B.LAVANYA
Course Name & Code : UHV 2 – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT -20HS01
L-T-P Structure : **2-1-0** **Credits: 3**
Program/Sem/Sec : II B.Tech., III-Sem, E-Sec **A.Y.: 2026-27**

PRE-REQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES(CEO):

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

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Describe the terms like Natural Acceptance, Happiness and Prosperity (L2)
CO2	Identify one's self, and one's surroundings (family, society nature) (L2)
CO3	Relate human values with human relationship and human society. (L2)
CO4	Illustrate the need for universal human values and harmonious existence (L2)
CO5	Develop as socially and ecologically responsible engineers (L3)

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

CO	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	3	-	-	-	-	-	-	-
CO3	-	-	-	-	-	2	-	3	2	-	-	-	-	-	-
CO4	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	2	3	-	-	-	1	-	-	-

TEXTBOOKS:

T1 Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

REFERENCE BOOKS:

R1 Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

R2 Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

R3 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi**.**

R4 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

R5 Small is Beautiful - E. F Schumacher.

R6 Slow is Beautiful - Cecile Andrews.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and need of Value Education.	1	15/07/26		TLM1	
2.	Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)	1	16/07/26		TLM1	
3.	Understanding Value Education	1	17/07/26		TLM2	
4.	Practice Session PS1 Sharing about Oneself	1	18/07/26		TLM6	
5.	self-exploration as the Process for Value Education	1	22/07/26		TLM2	
6.	Continuous Happiness and Prosperity – the Basic Human Aspirations	1	23/07/26		TLM1	
7.	Practice Session PS2 Exploring Human Consciousness	1	24/07/26		TLM1	
8.	Happiness and Prosperity – Current Scenario	1	25/07/26		TLM1	
9.	Method to Fulfill the Basic Human Aspirations	1	29/07/26		TLM1	
10.	Practice Session PS3 Exploring Natural Acceptance	1	30/07/26		TLM6	
11.	Activity Based Learning	1	31/07/26			
No. of classes required to complete UNIT-I: 11				**No. of classes taken:**		

UNIT-II

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
12.	Understanding Human being as the Co-existence of the self and the body.	2	01/08/26 & 05/08/26		TLM2	
13.	Distinguishing between the Needs of the self and the body	1	06/08/26		TLM2	
14.	Practice Session PS4 Exploring the difference of Needs of self and body.	1	07/08/26		TLM2	
15.	The body as an Instrument of the self	2	08/08/26 & 12/08/26		TLM1	
16.	Understanding Harmony in the self	1	13/08/26		TLM2	
17.	Practice Session PS5 Exploring Sources of Imagination in the self	1	14/08/26		TLM6	
18.	Harmony of the self with the body	2	19/08/26 & 20/08/26		TLM2	
19.	Programme to ensure self-regulation and Health	1	21/08/26		TLM1	
20.	Practice Session PS6 Exploring Harmony of self with the body	1	22/08/26		TLM2	
21.	Activity Based Learning	1	27/08/26			
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)						

UNIT-III

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Harmony in the Family – the Basic Unit of Human Interaction	1	28/08/26		TLM2	
23.	'Trust' – the Foundational Value in Relationship	2	29/08/26 & 02/09/26		TLM1	
24.	Practice Session PS7 Exploring the Feeling of Trust	1	03/09/26		TLM6	
25.	'Respect' – as the Right Evaluation	1	05/09/26		TLM1	
26.	Other Feelings, Justice in Human-to-Human Relationship	1	10/09/26		TLM1	

27.	Practice Session PS8 Exploring the Feeling of Respect	1	11/09/26		TLM6	
28.	Understanding Harmony in the Society	1	12/09/26		TLM1	
29.	Vision for the Universal Human Order	1	16/09/26		TLM1	
30.	Practice Session PS9 Exploring Systems to fulfil Human Goal	1	17/09/26		TLM6	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT-IV

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31.	Understanding Harmony in the Nature	2	18/09/26 & 19/09/26		TLM2	
32.	Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature	2	23/09/26 & 24/09/26		TLM2	
33.	Practice Session PS10 Exploring the Four Orders of Nature	1	25/09/26		TLM6	
34.	Realizing Existence as Co-existence at All Levels	2	26/09/26 & 30/09/26		TLM2	
35.	The Holistic Perception of Harmony in Existence	1	01/10/26		TLM2	
36.	Practice Session PS11 Exploring Co-existence in Existence.	1	03/10/26		TLM6	
37.	Activity Based Learning	1	07/10/26			
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
38.	Natural Acceptance of Human Values	2	08/10/26 & 09/10/26		TLM2	
39.	Definitiveness of (Ethical) Human Conduct	2	10/10/26 & 14/10/26		TLM2	
40.	Practice Session PS12 Exploring Ethical Human Conduct	1	15/10/26		TLM2	
41.	A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order	2	16/10/26 & 17/10/26		TLM2	
42.	Competence in Professional Ethics	2	28/10/26 & 29/10/26		TLM2	
43.	Practice Session PS13 Exploring Humanistic Models in Education	1	30/10/26		TLM6	
44.	Holistic Technologies, Production Systems and Management Models-Typical Case Studies	2	31/10/26 & 04/11/26		TLM2	
45.	Strategies for Transition towards Value-based Life and Profession	2	05/11/26 & 06/11/26		TLM2	
46.	Practice Session PS14 Exploring Steps of Transition towards Universal Human Order	2	07/11/26 & 11/11/26		TLM6	
No. of classes required to complete UNIT-V: 16				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Pollution-Human Role	1	29/10/26		TLM2			

2.	Mutual-Enrichment	1	04/11/26		TLM2			
No. of classes		2			No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.

PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**B.LAVANYA**	**Dr.B.Srinivasa Rao**	**Dr.B.Srinivasa Rao**	**Dr. Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. J. Nageswara Rao
Course Name & Code : DL&CO 20IT01
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : II B.Tech., III-Sem, E-Sec **A.Y.: 2026-27**

Prerequisites:

Course Objectives: The main objectives of the course is to

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

COURSE OUTCOMES (COs): At the end of the course, students will be able to

CO1	Evaluate digital number systems and use Boolean algebra theorems, Properties and Canonical forms for digital logic circuit design. **(Understand- L2)**
CO2	Design Sequential logic circuits and understand basic functional blocks a computer system . **(Apply- L3)**
CO3	Understand computer architecture and Data representation to perform computer arithmetic operations and processor organization. **(Understand- L2)**
CO4	Analyze the memory hierarchy in a computer system. **(Understand- L2)**
CO5	Understand the I/O operations and the interfaces **(Understand-L2)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

CO	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	1	-	-	-	-	-	-	-	-	-	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-

Textbooks:

1. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 6th edition, McGraw Hill

2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education.
3. Computer Organization and Architecture, William Stallings, 11thEdition, Pearson.

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Number systems, Logic gates and Boolean algebra, Combinational circuits

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to DLD	1	13-07-2026		TLM1	
2.	Number systems	1	14-07-2026		TLM1	
3.	Different Number systems	1	15-07-2026		TLM1	
4.	Conversions of one number to another number	2	16-07-2026 20-07-2026		TLM1	
5.	Data Representations	1	21-07-2026		TLM1	
6.	Binary codes	2	22-07-2026 23-07-2026		TLM1	
7.	Basic Logic gates and Universal gates	2	27-07-2026 28-07-2026		TLM1	
8.	Boolean Logic functions	2	29-07-2026 30-07-2026		TLM1	
9.	K-Maps Simplications	3	03-08-2026 04-08-2026 05-08-2026		TLM1	
10.	Combinational circuits, Desing Decoder and Multiplexers	1	06-08-2026		TLM1	
No. of classes required to complete UNIT-I: 16				**No. of classes taken:**		

UNIT-II: Sequential Logic Circuits, Basic structure of computer, Computer generations

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Introduction to sequential circuits,	1	10-07-2026		TLM1	
12.	Flip-flops(RS,J,T,D),	2	11-07-2026 12-07-2026		TLM1	
13.	Master slave flip-flop	1	13-08-2026		TLM1	
14.	Conversion of flip-flops, Truth & excitation tables	2	17-08-2026 18-08-2026		TLM1	
15.	Registers	1	19-08-2026		TLM1	
16.	counters	1	20-08-2026		TLM1	
17.	Basic structure of computer	2	24-08-2026 25-08-2026		TLM1	
18.	Bus structure	1	27-08-2026		TLM1	
19.	Multi processors and multi computers	1	31-08-2026		TLM1	
20.	Computer generations	1	01-09-2026		TLM1	
21.	Von- Neumann Architecture	2	02-09-2026 03-09-2026			
No. of classes required to complete UNIT-II: 15				**No. of classes taken:**		

UNIT-III: Data Representation, Processor Organization

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Signed Number representation	1	04-09-2026		TLM2	
23.	Addition and Subtraction of Signed Numbers	1	05-09-2026		TLM2	
24.	Design of Fast Adders	1	10-09-2026		TLM2	
25.	Multiplication of Positive Numbers	1	15-09-2026		TLM2	
26.	Signed-operand Multiplication	1	16-09-2026		TLM2	
27.	Fast Multiplication	1	17-09-2026		TLM2	
28.	Integer Division,	1	21-09-2026		TLM2	
29.	Floating-Point Numbers and Operations	1	22-09-2026		TLM2	
30.	Processor Organization of Fundamental Concepts	1	23-09-2026		TLM2	
31.	Execution of a Complete Instruction	1	24-09-2026		TLM2	
32.	Multiple-Bus Organization	1	28-09-2026		TLM2	
33.	Hardwired Control	1	29-09-2026		TLM2	
34.	Micro programmed Control	1	30-09-2026		TLM2	
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: Memory organization, Virtual Memories

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
35.	Memory organization	1	01-10-2026		TLM2	
36.	Semiconductor RAM Memories	1	5-10-2026		TLM2	
37.	Concept of memory hierarchical organization	1	6-10-2026		TLM2	
38.	Read-Only Memories, Speed, Size and Cost	1	07-10-2026		TLM2	
39.	Cache memory	1	08-10-2026		TLM2	
40.	Virtual Memories	1	12-10-2026		TLM2	
41.	Memory Management Requirements, Secondary Storage	3	13-10-2026 14-10-2026 15-10-2026		TLM2	
No. of classes required to complete UNIT-IV: 9				**No. of classes taken:**		

UNIT-V: Input/output Organization: & Peripheral devices, DMA

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
42.	Input/Output Organization: Accessing I/O Devices	1	26-10-2026		TLM2	
43.	Interrupts	1	27-10-2026		TLM2	
44.	Processor Examples	1	28-10-2026		TLM2	
45.	Interface Circuits	1	29-10-2026		TLM2	
46.	Peripheral devices –I/O sub-systems	2	2-10-2026 3-10-2026		TLM2	
47.	I/O device interface	1	4-10-2026		TLM2	
48.	I/O transfers-program controlled	1	5-10-2026		TLM2	
49.	Interrupt driven	1	10-10-2026		TLM2	
50.	DMA	1	11-10-2026		TLM2	
No. of classes required to complete UNIT-V: 110				**No. of classes taken:**		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineer**ing 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr.J.Nageswara Rao**	**Dr.CH.V.N.REDDY**	**Dr .D.Venkata Subbaiah**	**Dr. S. Nagarjuna Reddy**
Signature				

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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. R. Ashok
Course Name & Code : ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS & 23CS04
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE/III /E **A.Y.:** 2026-27

PREREQUISITE: Data Structures

COURSE EDUCATIONAL OBJECTIVES (CEO):

The main objectives of the course is to

1. Provide knowledge on advance data structures frequently used in Computer Science domain
2. Develop skills in algorithm design techniques popularly used
3. Understand the use of various data structures in the algorithm design

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Identify the characteristics of an algorithm, analyze its time and space complexity and construct balanced binary trees. **(Apply-L3)**
CO2	Understand Heap structures and graph terminology to perform various operations on non-linear data structures. **(Understand-L2)**
CO3	Apply Divide and Conquer, Greedy algorithm and dynamic programming for solving problems**. (Apply - L3)**
CO4	Analyze the backtracking and branch-and-bound search methods on optimization problems **(Apply - L3)**
CO5	Summarize the importance of NP-Hard and its applications. **(Understand-L2)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	-	-	-		3	3	3
CO2	2	2	-	-	-	-	-	-	-	-	-	-	3	3	3
CO3	2	2	3	-	-	-	-	-	-	-	-	-	3	3	1
CO4	2	2	3	-	-	-	-	-	-	-	-	-	3	2	3
CO5	2	2	-	1	-	-	-	-	-	-	-	-		-	-
1 - Low			**2 –**Medium							**3 -** High					

TEXTBOOKS:

T1 Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2ndEdition Universities Press

T2 Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition University Press

REFERENCE BOOKS:

R1 Data Structures and program design in C, Robert Kruse, Pearson Education Asia

R2 An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

R3 The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth,

Addison-Wesley, 1997.

R4 Data Structures using C & C++: Langsam, Augenstein &Tanenbaum, Pearson, 1995 Algorithms + Data Structures & Programs: N.Wirth, PHI

R5 Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.

R6 Data structures in Java: Thomas Standish, Pearson Education Asia

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction, AVL Tree, B-Tree

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and CO discussion	1	13-07-2026		TLM1	
2.	Introduction to Algorithm-Characteristics	1	15-07-2026		TLM1	
3.	Pseudo code specifications-Sample Algorithms	1	16-07-2026		TLM1	
4.	Tutorial on writing algorithms using Pseudo Code	1	17-07-2026		TLM3	
5.	Algorithm Analysis- Time and Space Complexity	2	18-07-2026 20-07-2026		TLM1	
6.	Tutorial on finding space & time complexity of algorithms	1	22-07-2026		TLM3	
7.	Asymptotic Notations	2	23-07-2026 24-07-2026		TLM1	
8.	AVL Tree Operations	3	25-07-2026 27-07-2026 29-07-2026		TLM1	
9.	B-Tree operations	3	30-07-2026 31-07-2026 01-08-2026		TLM1	
10.	Tutorial on AVL Tree and Trees	1	03-08-2026		TLM3	
No. of classes required to complete UNIT-I: 16				**No. of classes taken:**		

UNIT-II: Heap Tress, Graphs, Divide and Conquer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Heap Trees (Priority Queue) - Introduction	1	05-08-2026		TLM1	
12.	Max Heap, Min Heap Construction-operations	1	06-08-2026		TLM1	
13.	Implementation of Heap Tree	1	07-08-2026		TLM1	
14.	Tutorial on Heap Tree Construction	1	08-08-2026		TLM3	
15.	Graph Terminology	1	10-08-2026		TLM1	
16.	Representations of Graphs	1	12-08-2026		TLM1	
17.	Basic Search and Traversal Techniques – DFS	1	13-08-2026		TLM1	
18.	BFS – Example, Implementation	1	14-08-2026		TLM1	
19.	Connected Components, Biconnected Components	3	17-08-2026 19-08-2026 20-08-2026		TLM1	
20.	Divide and Conquer General Method	2	21-08-2026 22-08-2026		TLM1	
21.	Finding Max and Min	2	22-08-2026 24-08-2026		TLM1	
22.	Merge Sort	2	27-08-2026 28-08-2026		TLM1	
23.	Quick sort	2	29-08-2026 31-08-2026		TLM1	

24.	Strassen' Matrix Multiplication	1	02-09-2026		TLM1	
25.	Tutorial on Divide and Conquer Problems	2	03-09-2026 05-09-2026		TLM3	
No. of classes required to complete UNIT-II: 22				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)						

UNIT-III: Greedy Method:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Introduction to Greedy Method	1	10-09-2026		TLM1	
27.	Job Sequencing with dead Lines	1	11-09-2026		TLM1	
28.	Knapsack Problem	1	12-09-2026		TLM1	
29.	Minimum Cost Spanning Tree- Kruskal Algorithm	2	16-09-2026 17-09-2026		TLM1	
30.	Tutorial on different knapsack problem instances	1	18-09-2026		TLM3	
31.	Prims Algorithm	1	19-09-2026		TLM1	
32.	Single Source Shortest Path	2	21-09-2026 23-09-2026		TLM1	
33.	Tutorial on analysis of prims & kruskal's algorithm	1	24-09-2026			
34.	Optimal Storage on tapes	1	25-09-2026		TLM1	
35.	Huffman Coding	1	26-09-2026		TLM1	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Dynamic Programming

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Introduction to Dynamic Programming	1	28-09-2026		TLM1	
37.	All pairs shortest path	1	30-09-2026		TLM1	
38.	Tutorial on Tabular & Memorization methods in Dynamic Programing	1	01-10-2026		TLM3	
39.	Bellman Ford Algorithm	1	03-10-2026		TLM1	
40.	0/1 knapsack problem	2	05-10-2026 07-10-2026		TLM1	
41.	Tutorial on Analysis of Bellman Ford & Floyd Warshall Algorithms	1	08-10-2026		TLM3	
42.	Optimal binary search tree	2	09-10-2026 10-10-2026		TLM1	
43.	String editing	2	12-10-2026 14-10-2026		TLM1	
44.	Travelling salesperson problem	1	15-10-2026		TLM1	
45.	Tutorial on Analysis of OBST	1	16-10-2026		TLM3	
No. of classes required to complete UNIT-IV: 13				**No. of classes taken:**		

UNIT-V: Back tracking & Branch and bound

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Backtracking Introduction	1	17-10-2026		TLM1	
47.	N-queens Problem	1	21-10-2026		TLM1	
48.	Graph Coloring	1	22-10-2026		TLM1	
49.	Tutorial on Analysis of N-Queens	1	23-10-2026		TLM3	
50.	Sum of subsets problem	1	24-10-2026		TLM1	
51.	Introduction to Branch and Bound	1	26-10-2026		TLM1	
52.	0/1 Knapsack-LCBB, FIFOBB	2	28-10-2026 29-10-2026		TLM1	
53.	Tutorial on 0/1 Knapsack	1	30-10-2026			
54.	Travelling Salesperson Problem -LC Search	2	31-10-2026 02-11-2026		TLM1	
55.	Introduction to P and NP	2	04-11-2026 05-11-2026		TLM1	
56.	NP-Complete Problems	2	06-11-2026 07-11-2026		TLM1	
57.	Revision	1	09-11-2026		TLM1	
No. of classes required to complete UNIT-V: 13				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Np-Hard Problems	1	11-11-2025					
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5

II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
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PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Dr. R.Ashok**	**Dr. D.Srinivasa rao**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mrs. B. Usha Rani
Course Name & Code : Object Oriented Programming Through JAVA &23CS05
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE/III /E **A.Y.:** 2026-27

PREREQUISITE: Introduction to Programming

COURSE EDUCATIONAL OBJECTIVES(CEO):

The learning objectives of this course are to:
1. Identify Java language components and how they work together in applications
2. Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
3. Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
4. Understand how to design applications with threads in Java
5. Understand how to use Java APIs for program development

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Identify the syntax and semantics of java programming language and basic concepts of Java. **(Understand-L2)**
CO2	Understand the basic concepts of object-oriented programming **(Understand-L2)**
CO3	Develop reusable programs using the concepts of inheritance, polymorphism, and interfaces. **(Apply-L3)**
CO4	Apply the concepts of packages, exception handling & I/O streams to develop secure, error free, and efficient applications **(Apply-L3)**
CO5	Design multithreaded and GUI based applications which mimic the real word scenarios. **(Apply-L3)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	2	2	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	2	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	2	3	3
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	3	3
CO5	3	2	-	-	-	-	-	-	-	-	-	2	2	2	2
1 - Low							2 –Medium						3 - High		

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. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

REFERENCE BOOKS:

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Object Oriented Programming, Data Types,Operators, Control Statements

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	CO'S & PO's, Introduction and Basic concepts	1	14-07-2026		TLM1	
2.	Principles, Program Structure in Java	1	15-07-2026		TLM1	
3.	Writing Simple Java Programs, Elements or Tokens in Java Programs	1	16-07-2026			
4.	Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.	2	17-07-2026 18-07-2026		TLM1	
5.	Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final	2	21-07-2026 22-07-2026		TLM1	
6.	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.	2	23-07-2026 24-07-2026		TLM1	
7.	Introduction, if Expression, Nested if Expressions,if–else Expressions , TernaryOperator?:	3	25-07-2026 28-07-2026 29-07-2026		TLM1	
8.	Switch Statement, Iteration Statements , while Expression, do–while Loop ,for Loop, Nested for Loop,For–Each for Loop ,Break Statement, Continue Statement.	3	30-07-2026 31-07-2026 01-08-2026		TLM1	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: Classes and Objects, Constructors and Methods, String Handling in Java

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
9.	Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another	2	04-08-2026 05-08-2026		TLM1	
10.	Access Control for Class Members, Accessing Private Members of Class.	1	06-08-2026		TLM1	
11.	Introduction, Defining Methods, Constructor Methods for Class	1	07-08-2026		TLM1	
12.	Constructors and Methods: Introduction, Defining Methods	1	08-08-2026		TLM1	

13.	Constructor Methods for Class, Overloaded Constructor Methods, Overloaded Methods	1	11-08-2026		TLM1	
14.	Nested Classes, Passing Arguments by Value and by Reference Keyword this.	2	12-08-2026 13-08-2026		TLM1	
15.	Class Objects as Parameters in Methods	1	14-08-2026		TLM1	
16.	Access Control, Recursive Methods	2	18-08-2026 19-08-2026		TLM1	
17.	Nesting of Methods	1	20-08-2026		TLM1	
18.	Attributes Final and Static.	1	21-08-2026		TLM1	
19.	Introduction, Interface Char Sequence	2	22-08-2026 27-08-2026		TLM1	
20.	Class String, Methods for Extracting Characters from Strings	2	28-08-2026 29-08-2026		TLM1	
21.	Comparison, Modifying, Searching; Class String Buffer	2	01-09-2026 02-09-2026		TLM1	
No. of classes required to complete UNIT-II: 18				**No. of classes taken:**		
I MID EXAMINATIONS (07-11-2026 TO 08-11-2026)						

UNIT-III: Arrays, Inheritance, Interfaces

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays	1	03-09-2026		TLM1	
23.	Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays	2	05-09-2026 10-09-2026		TLM1	
24.	Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.	2	11-09-2026 12-09-2026		TLM1	
25.	Introduction, Relationship between classes- Has-a, Is-a, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final	2	15-09-2026 16-09-2026		TLM1	
26.	Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes.	2	17-09-2026 18-09-2026		TLM1	
27.	Introduction, Declaration of Interface, Implementation of Interface	2	19-09-2026 22-09-2026		TLM1	
28.	Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces	1	23-09-2026		TLM1	
29.	Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.	1	24-09-2026		TLM1	
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: Packages and Java Library, Exception Handling, Java I/O and File

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
30.	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	1	25-09-2026		TLM1	
31.	Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing. Java util Classes and Interfaces	2	26-09-2026 29-09-2026		TLM1	
32.	Formatter Class, Random Class, Time Package, Formatting for Date/Time in Java , Temporal Adjusters Class	2	30-09-2026 01-10-2026		TLM1	
33.	Introduction, Hierarchy of Standard Exception Classes, Keywords try, catch, throw, throws, and finally Blocks, Multiple Catch Clauses	2	03-10-2026 06-10-2026		TLM1	
34.	Class Throwable, Unchecked Exceptions, Checked Exceptions, Generating user defined exception.	2	07-10-2026 08-10-2026		TLM1	
35.	Java I/O API, standard I/O streams, types, Byte streams	2	09-10-2026 10-10-2026		TLM1	
36.	Character streams, Scanner class, Files in Java	2	13-10-2026 14-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 13				**No. of classes taken:**		

UNIT-V: Multithreaded Programming, Java Collections, Java FX GUI

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Introduction, Need for Multiple Threads ., Multithreaded Programming for Multi-core Processor	1	15-10-2026		TLM1	
38.	Thread Class, Main Thread - Creation of New Threads, Thread States	1	16-10-2026		TLM1	
39.	Thread Priorities, Synchronization, Inter-thread Communication-producer consumer problem.	2	17-10-2026 27-10-2026		TLM1	
40.	Introduction, Purpose of Collection Framework, Hierarchy of collection Interfaces / classes, Methods defined in Collection Interface	2	28-10-2026 29-10-2026		TLM1	
41.	Interface Iterator, Collection classes/Interfaces –List, Set, Map	1	30-10-2026		TLM1	
42.	Overview of AWT & Swings API, limitations	2	31-10-2026 03-11-2026		TLM1	
43.	Java FX Scene Builder, Java FX App Window Structure	2	04-11-2026 05-11-2026		TLM1	
44.	Displaying text and image	1	06-11-2026		TLM1	
45.	Event handling, laying out nodes in scene graph, mouse events	1	07-11-2026		TLM1	
46.	Revision	1	10-11-2026		TLM1	
No. of classes required to complete UNIT-V: 14				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	JDBC	1	11-11-2026					
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
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PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success oforganization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mrs. B Usha Rani**	**Dr. Y.V.B Reddy**	**Dr. Y.V.B Reddy**	**Dr. S.Nagarjuna Reddy**
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. R. Ashok
Course Name & Code **:** ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB & 23CS53
L-T-P Structure **: 0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE/III/E **A.Y.:** 2026-27

PREREQUISITE: DATA STRUCTURES LAB

COURSE EDUCATIONAL OBJECTIVE:
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 (CO):
CO1: Implement balanced binary trees, heaps and graph traversals using arrays and linked list. **(Apply-L3)**
CO2: Implement Various Sorting Techniques. **(Apply - L3)**
CO3: : Implement optimization problems using greedy, dynamic programming, backtracking and branch-and-bound techniques. **(Apply - L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	1	-		-	-	-	-	-	-		3	3	3
CO2	-	2	1	-		-	-	-	-	-	-	-	3	3	3
CO3	-	2	1	-		-	-	-	-	-	-	-	3	3	3
CO4	-	-	-	-	-	-	-	2	2	2	-	-		-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	BST	03	14-07-2026		
2.	AVL tree	03	21-07-2026		
3.	B-Tree	03	28-07-2026		
4.	Heap Construction	03	04-08-2026		
5.	BFT & DFT	03	11-08-2026		
6.	Finding Biconnected Components	03	18-08-2026		
7.	Finding Max and Min	03	25-08-2026		
8.	Merge sort, Quick sort	03	01-09-2026		
9.	Single source shortest path	03	15-09-2026		
10.	Job sequencing with dead lines	03	22-09-2026		
11.	0/1 knapsack -Dynamic Programming	03	29-10-2026		
12.	N-queens Problem	03	06-10-2026		
13.	Travelling Sales person Problem-Branch and bound	03	13-10-2026		
14.	Practice lab	06	27-10-2026& 03-11-2026		
15.	Internal Exam	03	10-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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Name of the Faculty	**Dr. R. Ashok**	**Dr. D.Srinivasa Rao**	**Dr. Y.V.B Reddy**	**Dr. S.Nagarjuna Reddy**
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mrs. B Usha Rani
Course Name & Code : Object Oriented Programming Through JAVA Lab&23CS54
L-T-P Structure : **0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE/III/E **A.Y.:** 2026-27

PREREQUISITE: Computer Programming Lab

COURSE EDUCATIONAL OBJECTIVE:
The objectives of the course is to
1. Practice object-oriented programming in the Java programming language .
2.Implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
3.Illustrate inheritance, Exception handling mechanism, JDBC connectivity .
4.Construct Threads, Event Handling, implement packages, Java FX GUI.

COURSE OUTCOMES (CO):
CO1 : Implement basic concepts of the java programming language. **(Apply-L3)**
CO2 : Implement object-oriented programming concepts and exception handling**(Apply-L3)**
CO3 : Design multithreaded, database and GUI based applications. **(Apply-L3)**
CO4 : Improve individual / teamwork skills, communication & report writing skills with ethical values. **(Apply-L3)**

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	2	-	-	-	-	-	-	2	2	2	
CO2	3	2	2	-	2	-	-	-	-	-	-	2	2	2	2
CO3	3	2	2	-	2	-	-	-	-	-	-	2	2	2	2
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	Basic Java Programs	03	13-07-2026		
2.	a.Write a JAVA program to display default value of all primitive data type of JAVA b.Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.	03	20-07-2026		
3.	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.	03	27-07-2026		
4.	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 Overloading. c.Write a JAVA program to implement constructor. d.Write a JAVA program to implement constructor overloading.	03	03-08-2026		
5.	a.Write a JAVA program to implement Single Inheritance b.Write a JAVA program to implement multilevel Inheritance c.Write a JAVA program for abstract class to find areas of different shape	03	10-08-2026		
6.	Practice Lab	03	17-08-2026		
7.	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	03	24-08-2026		
8.	a.Write a JAVA program that describes exception handling mechanism b.Write a JAVA program Illustrating Multiple catch clauses c.Write a JAVA program for creation of Java Built-in Exceptions d.Write a JAVA program for creation of User Defined Exception	03	31-08-2026		
9.	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	03	21-09-2026		
10.	a.Write a JAVA program that import and use the user defined packages b.Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX) c.Build a Tip Calculator app using several JavaFX	03	28-09-2026		

	components and learn how to respond to user interactions with the GUI				
11.	Practice Lab	03	05-10-2026		
12.	a.Implement the programs using List Interface and its implemented classes. b.Implement the programs using Set Interface and its implemented classes. c.Implement the programs using Map Interface and its implemented classes.	03	12-10-2026		
13.	Internal Exam	03	26-10-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
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PO 12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success oforganization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mrs. B Usha Rani**	**Dr. Y.V.B Reddy**	**Dr. Y.V.B Reddy**	**Dr. S.Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. B. Anil Kumar
Course Name & Code : PYTHON PROGRAMMING & 23CSS1
L-T-P Structure : **0-1-2** **Credits:** 2
Program/Sem/Sec : B.Tech/CSE/III/E **A.Y.:** 2026-27

PREREQUISITE: INTRODUCTION TO PROGRAMMING

COURSE EDUCATIONAL OBJECTIVE:
The main objectives of the course are to

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

COURSE OUTCOMES (CO):
CO1: Implement the core programming concepts of Python programming language**. (Apply-L3)**
CO2: Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries **(Apply-L3)**
CO3: Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications**. (Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO2	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO3	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-

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PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S.NO	Topic to be covered	Number of Hours	Tentative Date of Completion	Actual Date of Completion	HOD Signature
1.	**UNIT-1:** Introduction, Course Outcomes, Introduction to Python.	1	17-07-2026		
2.	Installation, Variables, Data types. Reading Input, Print output, Comments	3	18-07-2026		
3.	Types of operators, Working on operators, Sample Programs, Type Conversion	1	24-07-2026		
4.	Control statements – if, else, nestedif, elif, Loop statements	3	25-07-2026		
5.	Programs on Loop statements pass, continue and break	1	31-07-2026		
6.	Exception Handling, Programs on exception handling.	3	01-08-2026		
7.	**UNIT-2:** Function Definition and Calling the function, return Statement and void Function	1	07-08-2026		
8.	Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments	3	08-08-2026		
9.	sample programs.Strings Introduction, Basic String Operations	1	14-08-2026		
10.	Accessing Characters in String by Index Number, String Slicing and Joining,	1	21-08-2026		
11.	String Methods, Formatting Strings., Sample Programs on strings, Creating Lists, Basic List Operations	3	22-08-2026		
12.	Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement., Programs on Lists **Unit-3:** Introduction to Dictionaries, Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries	3	29-08-2026		
13.	Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement. Sample programs on dictionaries.	3	05-09-2026		
14.	Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples,	1	11-09-2026		

	Built-In Functions Used on Tuples, Sample Programs on tuples.				
15.	Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function	3	12-09-2026		
16.	Sets, Set Methods, Frozenset., Sample Programs on sets, tuples.	1	18-09-2026		
17.	**Unit-4**: Introduction to files, Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data	3	19-09-2026		
18.	Reading and Writing Binary Files, sample programs on files, Pickle Module	1	25-09-2026		
19.	Reading and Writing CSV Files, Python os and os.path Modules. Sample programs.	3	26-09-2026		
20.	**Object-Oriented Programming**: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method	3	03-10-2026		
21.	Classes with Multiple Objects, Class Attributes Vs Data Attributes, sample programs.	1	09-10-2026		
22.	Encapsulation, Inheritance, Polymorphism	3	10-10-2026		
23.	Sample Python programs on object-oriented programming.	1	16-10-2026		
24.	**Unit 5: Introduction to Data Science**: Functional Programming, JSON and XML in Python, NumPy with Python	3	17-10-2026		
25.	Pandas, Example Programs on Numpy and pandas.	1	30-10-2026		
26.	**Sample project**	3	31-10-2026		
27.	**Internal Exam**	3	07-11-2026		

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Name of the Faculty	**Mr. B. Anil Kumar**	**Dr. G. Minni**	**Dr. Y. Vijay Bhaskar Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. J. Nageswara Rao
Course Name & Code : DL&CO 20IT01
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : II B.Tech., III-Sem, F-Sec **A.Y.: 2026-27**

Prerequisites:

Course Objectives: The main objectives of the course is to

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

COURSE OUTCOMES (COs): At the end of the course, students will be able to

CO1	Evaluate digital number systems and use Boolean algebra theorems, Properties and Canonical forms for digital logic circuit design. **(Understand- L2)**
CO2	Design Sequential logic circuits and understand basic functional blocks a computer system . **(Apply- L3)**
CO3	Understand computer architecture and Data representation to perform computer arithmetic operations and processor organization. **(Understand- L2)**
CO4	Analyze the memory hierarchy in a computer system. **(Understand- L2)**
CO5	Understand the I/O operations and the interfaces **(Understand-L2)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

CO	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	1	-	-	-	-	-	-	-	-	-	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-

Textbooks:

1. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 6th edition, McGraw Hill

2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education.
3. Computer Organization and Architecture, William Stallings, 11thEdition, Pearson.

Reference Books:

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Number systems, Logic gates and Boolean algebra, Combinational circuits

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to DLD	1	13-07-2026		TLM1	
2.	Number systems	1	14-07-2026		TLM1	
3.	Different Number systems	1	15-07-2026		TLM1	
4.	Conversions of one number to another number	2	17-07-2026 20-07-2026		TLM1	
5.	Data Representations	1	21-07-2026		TLM1	
6.	Binary codes	2	22-07-2026 24-07-2026		TLM1	
7.	Basic Logic gates and Universal gates	2	27-07-2026 28-07-2026		TLM1	
8.	Boolean Logic functions	2	29-07-2026 31-07-2026		TLM1	
9.	K-Maps Simplications	3	03-08-2026 04-08-2026 05-08-2026		TLM1	
10.	Combinational circuits, Desing Decoder and Multiplexers	1	07-08-2026		TLM1	
No. of classes required to complete UNIT-I: 16				**No. of classes taken:**		

UNIT-II: Sequential Logic Circuits, Basic structure of computer, Computer generations

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Introduction to sequential circuits,	1	10-07-2026		TLM1	
12.	Flip-flops(RS,J,T,D),	2	11-07-2026 12-07-2026		TLM1	
13.	Master slave flip-flop	1	14-08-2026		TLM1	
14.	Conversion of flip-flops, Truth & excitation tables	2	17-08-2026 18-08-2026		TLM1	
15.	Registers	1	19-08-2026		TLM1	
16.	counters	1	21-08-2026		TLM1	
17.	Basic structure of computer	2	24-08-2026 25-08-2026		TLM1	
18.	Bus structure	1	28-08-2026		TLM1	
19.	Multi processors and multi computers	1	31-08-2026		TLM1	
20.	Computer generations	1	01-09-2026		TLM1	
21.	Von- Neumann Architecture	2	02-09-2026 03-09-2026			
No. of classes required to complete UNIT-II: 15				**No. of classes taken:**		

UNIT-III: Data Representation, Processor Organization

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Signed Number representation	1	04-09-2026		TLM2	
23.	Addition and Subtraction of Signed Numbers	1	05-09-2026		TLM2	
24.	Design of Fast Adders	1	11-09-2026		TLM2	
25.	Multiplication of Positive Numbers	1	15-09-2026		TLM2	
26.	Signed-operand Multiplication	1	16-09-2026		TLM2	
27.	Fast Multiplication	1	18-09-2026		TLM2	
28.	Integer Division,	1	21-09-2026		TLM2	
29.	Floating-Point Numbers and Operations	1	22-09-2026		TLM2	
30.	Processor Organization of Fundamental Concepts	1	23-09-2026		TLM2	
31.	Execution of a Complete Instruction	1	25-09-2026		TLM2	
32.	Multiple-Bus Organization	1	28-09-2026		TLM2	
33.	Hardwired Control	1	29-09-2026		TLM2	
34.	Micro programmed Control	1	30-09-2026		TLM2	
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: Memory organization, Virtual Memories

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
35.	Memory organization	1	01-10-2026		TLM2	
36.	Semiconductor RAM Memories	1	5-10-2026		TLM2	
37.	Concept of memory hierarchical organization	1	6-10-2026		TLM2	
38.	Read-Only Memories, Speed, Size and Cost	1	07-10-2026		TLM2	
39.	Cache memory	1	09-10-2026		TLM2	
40.	Virtual Memories	1	12-10-2026		TLM2	
41.	Memory Management Requirements, Secondary Storage	3	13-10-2026 14-10-2026 16-10-2026		TLM2	
No. of classes required to complete UNIT-IV: 9				**No. of classes taken:**		

UNIT-V: Input/output Organization: & Peripheral devices, DMA

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
42.	Input/Output Organization: Accessing I/O Devices	1	26-10-2026		TLM2	
43.	Interrupts	1	27-10-2026		TLM2	
44.	Processor Examples	1	28-10-2026		TLM2	
45.	Interface Circuits	1	30-10-2026		TLM2	
46.	Peripheral devices –I/O sub-systems	2	2-10-2026 3-10-2026		TLM2	
47.	I/O device interface	1	4-10-2026		TLM2	
48.	I/O transfers-program controlled	1	6-10-2026		TLM2	
49.	Interrupt driven	1	09-10-2026		TLM2	
50.	DMA	1	10-10-2026 11-10-2026		TLM2	
No. of classes required to complete UNIT-V: 110				**No. of classes taken:**		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
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PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr.J.Nageswara Rao**	**Dr.CH.V.N.REDDY**	**Dr .D.Venkata Subbaiah**	**Dr. S. Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
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An ISO 21001:2018,14001:2015,50001:2018 Certified Institution
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hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: K.ESWAREE DEVI
Course Name & Code : UHV 2 – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT -20HS01
L-T-P Structure : **2-1-0** **Credits: 3**
Program/Sem/Sec : II B.Tech., III-Sem, F-Sec **A.Y.: 2026-27**

PRE-REQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES(CEO):

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

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Describe the terms like Natural Acceptance, Happiness and Prosperity (L2)
CO2	Identify one's self, and one's surroundings (family, society nature) (L2)
CO3	Relate human values with human relationship and human society. (L2)
CO4	Illustrate the need for universal human values and harmonious existence (L2)
CO5	Develop as socially and ecologically responsible engineers (L3)

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

CO	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	3	-	-	-	-	-	-	-
CO3	-	-	-	-	-	2	-	3	2	-	-	-	-	-	-
CO4	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	2	3	-	-	-	1	-	-	-

TEXTBOOKS:

T1 Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

REFERENCE BOOKS:

R1 Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

R2 Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

R3 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi**.**

R4 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

R5 Small is Beautiful - E. F Schumacher.

R6 Slow is Beautiful - Cecile Andrews.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and need of Value Education.	1	13/07/26		TLM1	
2.	Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)	1	14/07/26		TLM1	
3.	Understanding Value Education	1	15/07/26		TLM2	
4.	Practice Session PS1 Sharing about Oneself	1	18/07/26		TLM6	
5.	self-exploration as the Process for Value Education	1	20/07/26		TLM2	
6.	Continuous Happiness and Prosperity – the Basic Human Aspirations	1	21/07/26		TLM1	
7.	Practice Session PS2 Exploring Human Consciousness	1	22/07/26		TLM1	
8.	Happiness and Prosperity – Current Scenario	1	25/07/26		TLM1	
9.	Method to Fulfill the Basic Human Aspirations	1	27/07/26		TLM1	
10.	Practice Session PS3 Exploring Natural Acceptance	1	28/07/26		TLM6	
11.	Activity Based Learning	1	29/07/26			
No. of classes required to complete UNIT-I: 11				**No. of classes taken:**		

UNIT-II

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
12.	Understanding Human being as the Co-existence of the self and the body.	2	01/08/26 & 03/08/26		TLM2	
13.	Distinguishing between the Needs of the self and the body	1	04/08/26		TLM2	
14.	Practice Session PS4 Exploring the difference of Needs of self and body.	1	05/08/26		TLM2	
15.	The body as an Instrument of the self	2	08/08/26 & 10/08/26		TLM1	
16.	Understanding Harmony in the self	1	11/08/26		TLM2	
17.	Practice Session PS5 Exploring Sources of Imagination in the self	1	12/08/26		TLM6	
18.	Harmony of the self with the body	2	17/08/26 & 18/08/26		TLM2	
19.	Programme to ensure self-regulation and Health	1	19/08/26		TLM1	
20.	Practice Session PS6 Exploring Harmony of self with the body	1	22/08/26		TLM2	
21.	Activity Based Learning	1	24/08/26			
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)						

UNIT-III

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Harmony in the Family – the Basic Unit of Human Interaction	1	25/08/26		TLM2	
23.	'Trust' – the Foundational Value in Relationship	2	29/08/26 & 31/08/26		TLM1	
24.	Practice Session PS7 Exploring the Feeling of Trust	1	01/09/26		TLM6	
25.	'Respect' – as the Right Evaluation	1	02/09/26		TLM1	
26.	Other Feelings, Justice in Human-to-Human Relationship	1	05/09/26		TLM1	

27.	Practice Session PS8 Exploring the Feeling of Respect	1	12/09/26		TLM6	
28.	Understanding Harmony in the Society	1	15/09/26		TLM1	
29.	Vision for the Universal Human Order	1	16/09/26		TLM1	
30.	Practice Session PS9 Exploring Systems to fulfil Human Goal	1	19/09/26		TLM6	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT-IV

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31.	Understanding Harmony in the Nature	2	21/09/26 & 22/09/26		TLM2	
32.	Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature	2	23/09/26 & 26/09/26		TLM2	
33.	Practice Session PS10 Exploring the Four Orders of Nature	1	28/09/26		TLM6	
34.	Realizing Existence as Co-existence at All Levels	2	29/09/26 & 30/09/26		TLM2	
35.	The Holistic Perception of Harmony in Existence	1	03/10/26		TLM2	
36.	Practice Session PS11 Exploring Co-existence in Existence.	1	05/10/26		TLM6	
37.	Activity Based Learning	1	06/10/26			
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
38.	Natural Acceptance of Human Values	2	07/10/26 & 10/10/26		TLM2	
39.	Definitiveness of (Ethical) Human Conduct	2	12/10/26 & 13/10/26		TLM2	
40.	Practice Session PS12 Exploring Ethical Human Conduct	1	14/10/26		TLM2	
41.	A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order	2	17/10/26 & 26/10/26		TLM2	
42.	Competence in Professional Ethics	2	27/10/26 & 28/10/26		TLM2	
43.	Practice Session PS13 Exploring Humanistic Models in Education	1	31/11/26		TLM6	
44.	Holistic Technologies, Production Systems and Management Models-Typical Case Studies	2	02/11/26 & 03/11/26		TLM2	
45.	Strategies for Transition towards Value-based Life and Profession	2	04/11/26 & 07/11/26		TLM2	
46.	Practice Session PS14 Exploring Steps of Transition towards Universal Human Order	2	09/11/26 & 10/11/26		TLM6	
No. of classes required to complete UNIT-V: 16				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Pollution-Human Role	1	31/10/26		TLM2			
2.	Mutual-Enrichment	1	02/11/26		TLM2			
No. of classes		2			No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.

PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**K.Eswaree Devi**	**Dr.B.Srinivasa Rao**	**Dr.B.Srinivasa Rao**	**Dr. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mrs. N. V. Padmavathi
Course Name & Code : PYTHON PROGRAMMING & 23CSS1
L-T-P Structure : **0-1-2** **Credits:** 2
Program/Sem/Sec : B.Tech/CSE/III/F **A.Y.:** 2026-27

PREREQUISITE: INTRODUCTION TO PROGRAMMING

COURSE EDUCATIONAL OBJECTIVE:
The main objectives of the course are to

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

COURSE OUTCOMES (CO):
CO1: Implement the core programming concepts of Python programming language**. (Apply-L3)**
CO2: Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries **(Apply-L3)**
CO3: Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications**. (Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO2	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO3	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S.NO	Topic to be covered	Number of Hours	Tentative Date of Completion	Actual Date of Completion	HOD Signature
1.	**UNIT-1:** Introduction,Course Outcomes, Introduction to Python.	3	15-07-2026		
2.	Installation, Variables, Data types. Reading Input, Print output, Comments	1	18-07-2026		
3.	Types of operators, Working onoperators, Sample Programs, Type Conversion	3	22-07-2026		
4.	Control statements – if, else, nestedif, elif	1	25-07-2026		
5.	Loop statements	3	29-07-2026		
6.	Programs on Loop statements pass, continue and break	1	01-08-2026		
7.	Exception Handling	3	05-08-2026		
8.	Programs on exception handling.	1	08-08-2026		
9.	**UNIT-2:** Function Definition and Calling the function, return Statement and void Function	3	12-08-2026		
10.	Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments	3	19-08-2026		
11.	sample programs.Strings Introduction, Basic String Operations	1	22-08-2026		
12.	Accessing Characters in String by IndexNumber,String Slicing and Joining, String Methods, Formatting Strings., Sample Programs on strings	1	29-08-2026		
13.	Creating Lists, Basic List Operations,	3	02-09-2026		
14.	Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement., Programs on Lists **Unit-3:** Introduction to Dictionaries, Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries,	1	05-09-2026		
15.	Built-In Functions Used on Dictionaries,DictionaryMethods, del Statement. Sample programs	1	12-09-2026		

	on dictionaries.				
16.	Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Sample Programs on tuples.	3	16-09-2026		
17.	Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function	1	19-09-2026		
18.	Sets, Set Methods, Frozenset., Sample Programs on sets, tuples.	3	23-09-2026		
19.	**Unit-4**: Introduction to files	1	26-09-2026		
20.	Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, sample programs on files.	3	30-09-2026		
21.	Pickle Module	1	03-10-2026		
22.	Reading and Writing CSV Files, Python os and os.path Modules. Sample programs.	3	07-10-2026		
23.	**Object-Oriented Programming**: Classes and Objects, Creating Classes in Python	1	10-10-2026		
24.	Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, sample programs.	3	14-10-2026		
25.	Encapsulation, Inheritance, Polymorphism,	1	17-10-2026		
26.	Sample Python programs on object-oriented programming.	3	28-10-2026		
27.	**Unit 5: Introduction to Data Science**: Functional Programming	1	31-10-2026		
28.	JSON and XML in Python, NumPy with Python, Pandas. Example Programs on Numpy and pandas.	3	04-11-2026		
29.	**Sample project**	1	07-11-2026		
30.	**Internal Exam**	3	11-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mrs. N.V.Padmavathi**	**Dr. G. Minni**	**Dr.Y.Vijaya Baskara Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. Y.Babu

Course Name & Code : Discrete Mathematics & Graph Theory & 23FE11

L-T-P Structure : 3-0-0 **Credits:** 3

Program/Sem/Sec : B.Tech/III/F **A.Y.:** 2026-27

Regulations : R23

PREREQUISITE: Mathematics courses of first year of study.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- 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 (COs): At the end of the course, student will be able to

CO1	Construct mathematical arguments using logical connectives and quantifiers and verify them. **(Apply- L3)**
CO2	Demonstrate the basic terminology of functions, relations, lattices and their operations. **(Understand -L2)**
CO3	Illustrate the basic principles/techniques to solve different combinatorial problems and linear recurrence relations**.(Apply- L3)**
CO4	Demonstrate the different types of graphs.**(Understand -L2)**
CO5	Apply the properties of graphs to solve the graph theory problems in computer science**.(Apply- L3)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1													
CO2	3	2	1												
CO3	3	3	1	1											
CO4	3	3	1												
CO5	3	3	1	1											1
1 - Low			**2 –**Medium						**3 -** High						

TEXTBOOKS:

T1 Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.

T2 Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.

T3 Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill

REFERENCE BOOKS:

R1	Discrete Mathematics for Computer Scientists and Mathematicians, J. L.Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
R2	Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
R3	Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.
R4	Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: MATHEMATICAL LOGIC

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Propositional Calculus: Statements and Notations, Connectives	1	13-07-2026		TLM1	
2.	Well Formed Formulas, Truth Tables	1	14-07-2026		TLM1	
3.	Tutorial on : Statements and Notations, Connectives,TruthTables	1	17-07-2026		TLM3	
4.	Tautologies, Equivalence of Formulas, Duality Law	1	18-07-2026		TLM1	
5.	Tautological Implications, Normal Forms,	1	20-07-2026		TLM1	
6.	Theory of Inference for Statement Calculus, Consistency of Premises,	1	21-07-2026		TLM1	
7.	Tutorial on : Theory of Inference for Statement Calculus, Consistency of Premises	1	24-07-2026		TLM3	
8.	Indirect Method of Proof, Predicate Calculus: Predicates	1	25-07-2026		TLM1	
9.	Predicative Logic, Statement Functions	1	27-07-2026		TLM1	
10.	Variables and Quantifiers	1	28-07-2026		TLM1	
11.	Tutorial on : Predicates, Predicative Logic, Statement Functions,	1	31-07-2026		TLM3	
12.	Free and Bound Variables	1	01-08-2026		TLM1	
13.	Inference Theory for Predicate Calculus	2	03-08-2026 04-08-2026		TLM1	
14.	Tutorial on Unit 1	1	07-08-2026		TLM3	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: SET THEORY

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Sets: Operations on Sets	1	08-08-2026		TLM1	
16.	Principle of Inclusion-Exclusion	1	10-08-2026		TLM1	
17.	Relations: Properties, Operations	1	11-08-2026		TLM1	
18.	Tutorial on Practice the sets and Relations Problems	1	14-08-2026		TLM3	
19.	Partition and Covering,	1	17-08-2026		TLM1	
20.	Transitive Closure, Equivalence,	1	18-08-2026		TLM1	

21.	Compatibility and Partial Ordering, Hasse Diagrams	1	21-08-2026		TLM1	
22.	Tutorial on Transitive Closure, Equivalence,Hasse Diagrams	1	22-08-2026		TLM3	
23.	Functions: Bijective, Composition, Inverse,	1	24-08-2026		TLM1	
24.	Permutation, and Recursive Functions,	1	25-08-2026		TLM1	
25.	Tutorial on Functions& Recursive Functions	1	28-08-2026		TLM3	
26.	Lattice and its Properties	1	29-08-2026		TLM1	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: COMBINATORICS AND RECURRENCE RELATIONS:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
27.	Basis of Counting, Permutations, Permutations with Repetitions	1	31-08-2026		TLM1	
28.	Circular and Restricted Permutations, Combinations,	1	01-09-2026		TLM1	
29.	Tutorial on Permutations, Combinations,	1	05-09-2026		TLM3	
30.	Restricted Combinations	1	11-09-2026		TLM1	
31.	Binomial and Multinomial Coefficients and Theorems.	1	12-09-2026		TLM1	
32.	Tutorial on Binomial and Multinomial Coefficients and Theorems.	1	15-09-2026		TLM3	
33.	Recurrence Relations: Generating Functions, Function of Sequences,	1	18-09-2026		TLM1	
34.	Partial Fractions, Calculating Coefficient of Generating Functions	1	19-09-2026		TLM1	
35.	Recurrence Relations, Formulation as Recurrence Relations	1	21-09-2026		TLM1	
36.	Tutorial on Partial Fractions, Recurrence Relations	1	22-09-2026		TLM3	
37.	Solving Recurrence Relations by Substitution and Generating Functions	1	25-09-2026		TLM1	
38.	Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations	2	26-09-2026 28-09-2026		TLM1	
39.	Tutorial on UNIT III	1	29-09-2026		TLM3	
No. of classes required to complete UNIT-III: 14				**No. of classes taken:**		

UNIT-IV: Graph Theory:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
40.	Basic Concepts, Graph Theory and its Applications	1	03-10-2026		TLM1	
41.	Subgraphs, Graph Representations: Adjacency and Incidence Matrices	1	05-10-2026		TLM1	
42.	Isomorphic Graphs,	1	06-10-2026		TLM1	
43.	Paths and Circuits	1	09-10-2026		TLM1	
44.	Tutorial on Graphs	1	10-10-2026		TLM3	
45.	Eulerian and Hamiltonian Graphs,	1	12-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 6				**No. of classes taken:**		

UNIT-V: Multi Graphs

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Multigraphs	1	13-10-2026		TLM1	
47.	Bipartite and Planar Graphs	1	16-10-2026		TLM1	
48.	Tutorial on Bipartite and Planar Graphs	1	17-10-2026		TLM3	
49.	Euler's Theorem	1	26-10-2027		TLM1	
50.	Graph Colouring	1	27-10-2026		TLM1	
51.	Covering	1	30-10-2026		TLM1	
52.	Tutorial on Graph Colouring, Euler Theorem	1	31-10-2026		TLM3	
53.	Chromatic Number	1	02-11-2026		TLM1	
54.	Spanning Trees, Prim's and Kruskal's Algorithms	1	03-11-2026		TLM1	
55.	BFS Spanning Trees.	1	06-11-2026		TLM1	
56.	Tutorial on UNIT V	1	07-11-2026		TLM3	
57.	DFS Spanning Trees	1	09-11-2026		TLM1	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Pigeon Hole Principle	1	10-11-2026		**TLM1**	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I,II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To inculcate algorithmic thinking, formulation techniques and visualization, leading to problem solving skills using different programming paradigms.
PSO 2	To inculcate an ability to analyze, design and implement data driven applications into the students
PSO 3	Develop an ability to implement various processes/methodologies/practices employed in design, validation, testing and maintenance of software products.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. Y. Babu**	**Mrs. B. Swathi**	**Dr. D. Venkata Subbaiah**	**Dr. S. Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),
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Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. G. SAMBI REDDY
Course Name & Code : ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB & 23CS53
L-T-P Structure : **0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE/III/F **A.Y.:** 2026-27

PREREQUISITE: DATA STRUCTURES LAB

COURSE EDUCATIONAL OBJECTIVE:
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 (CO):
CO1: Implement balanced binary trees, heaps and graph traversals using arrays and linked list. **(Apply-L3)**
CO2: Implement Various Sorting Techniques. **(Apply - L3)**
CO3: : Implement optimization problems using greedy, dynamic programming, backtracking and branch-and-bound techniques. **(Apply - L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	1	-		-	-	-	-	-	-	-	3	3	3
CO2	-	2	1	-		-	-	-	-	-	-	-	3	3	3
CO3	-	2	1	-		-	-	-	-	-	-	-	3	3	3
CO4	-	-	-	-	-	-	-	2	2	2	-	-		-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:
COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	Introduction problems	03	16-07-2026		
2.	AVL tree	03	23-07-2026		
3.	B-Tree	03	30-07-2026		
4.	Heap Construction	03	06-08-2026		
5.	BFT	03	13-08-2026		
6.	DFT	03	20-08-2026		
7.	Finding Biconnected Components	03	27-08-2026		
8.	Finding Maximum and Minimum	03	03-09-2026		
9.	Merge sort, Quick sort	03	10-09-2026		
10.	Single source shortest path	03	17-09-2026		
11.	Job sequencing with dead lines	03	24-09-2026		
12.	0/1 knapsack -Dynamic Programming	03	01-10-2026		
13.	N-queens Problem	03	08-10-2026		
14.	Travelling Sales person Problem-Branch and bound	03	15-10-2026		
15.	Internal Exam	03	29-10-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr. G. Sambi Reddy	Dr. D. Srinivasa Rao (AI& DS)	Dr. Y.V.B Reddy	Dr. S. Nagarjuna Reddy
Signature				

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hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. G. SAMBI REDDY
Course Name & Code : ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS & 23CS04
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE/III /F **A.Y.:** 2026-27

PREREQUISITE: Data Structures

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course is to

1. Provide knowledge on advance data structures frequently used in Computer Science domain
2. Develop skills in algorithm design techniques popularly used
3. Understand the use of various data structures in the algorithm design

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Identify the characteristics of an algorithm, analyze its time and space complexity and construct balanced binary trees. **(Apply-L3)**
CO2	Understand Heap structures and graph terminology to perform various operations on non-linear data structures. **(Understand-L2)**
CO3	Apply Divide and Conquer, Greedy algorithm and dynamic programming for solving problems**. (Apply - L3)**
CO4	Analyze the backtracking and branch-and-bound search methods on optimization problems **(Apply - L3)**
CO5	Summarize the importance of NP-Hard and its applications. **(Understand-L2)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	-	-	-	-	3	3	3
CO2	2	2	-	-	-	-	-	-	-	-	-	-	3	3	3
CO3	2	2	3	-	-	-	-	-	-	-	-	-	3	3	1
CO4	2	2	3	-	-	-	-	-	-	-	-	-	3	2	3
CO5	2	2	-	1	-	-	-	-	-	-	-	-	-	-	-
1 - Low						**2 –**Medium						**3 -** High			

TEXTBOOKS:

T1 Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2ndEdition Universities Press

T2 Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition University Press

REFERENCE BOOKS:

R1 Data Structures and program design in C, Robert Kruse, Pearson Education Asia

R2 An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

R3 The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth,

Addison-Wesley, 1997.

R4 Data Structures using C & C++: Langsam, Augenstein &Tanenbaum, Pearson, 1995 Algorithms + Data Structures & Programs: N.Wirth, PHI

R5 Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.

R6 Data structures in Java: Thomas Standish, Pearson Education Asia

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction, AVL Tree, B-Tree

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and CO discussion	1	13-07-2026		TLM1	
2.	Introduction to Algorithm-Characteristics	1	14-07-2026		TLM1	
3.	Pseudo code specifications-Sample Algorithms	1	15-07-2026		TLM1	
4.	writing algorithms using Pseudo Code	1	16-07-2026		TLM3	
5.	Algorithm Analysis- Time and Space Complexity - Examples	2	17-07-2026& 20-07-2026		TLM1	
6.	Asymptotic Notations	2	21-07-2026 & 22-07-2026		TLM1	
7.	Examples on finding space & time complexity of algorithms	1	23-07-2026		TLM3	
8.	AVL Tree Operations	2	24-07-2026 & 27-07-2026		TLM1	
9.	B-Tree operations	2	28-07-2026 & 29-07-2026		TLM1	
10.	Practice on AVL & B Tree operations	1	30-07-2026		TLM3	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Heap Tress, Graphs, Divide and Conquer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Heap Trees (Priority Queue) - Introduction	1	31-07-2026		TLM1	
12.	Max Heap, Min Heap Construction-operations	1	03-08-2026		TLM1	
13.	Implementation of Heap Tree	1	04-08-2026		TLM1	
14.	Graph Terminology, Representations of Graphs	1	05-08-2026		TLM1	
15.	Tutorial on Heap Tree Construction	1	06-08-2026		TLM3	
16.	Basic Search and Traversal Techniques– DFS	2	07-08-2026 & 10-08-2026		TLM1	
17.	BFS – Example, Implementation	1	11-08-2026		TLM1	
18.	Examples on BFS & DFS traversals	1	12-08-2026		TLM3	
19.	Connected Components, Biconnected Components	2	13-08-2026 & 14-08-2026		TLM1	
20.	Divide and Conquer General Method, Finding Max and Min	1	17-08-2026		TLM1	
21.	Merge Sort	1	18-08-2026		TLM1	
22.	Tutorial on Merge Sort Analysis	1	19-08-2026		TLM3	

23.	Quick sort	2	20-08-2026		TLM1	
24.	Strassen' Matrix Multiplication	1	21-08-2026		TLM1	
25.	Practice on Divide & Conquer Technique problems	1	24-08-2026		TLM3	
No. of classes required to complete UNIT-II: 18				**No. of classes taken:**		

UNIT-III: Greedy Method:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Introduction to Greedy Method	1	25-08-2026		TLM1	
27.	Job Sequencing with dead Lines	1	27-08-2026		TLM1	
28.	Knapsack Problem	1	28-08-2026		TLM1	
29.	Minimum Cost Spanning Tree- Kruskal Algorithm	1	31-08-2026		TLM1	
30.	Tutorial on different knapsack problem instances	1	01-09-2026		TLM3	
31.	Prims Algorithm	2	02-09-2026 & 03-09-2026		TLM1	
32.	Single Source Shortest Path	1	05-09-2026		TLM1	
I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)						
33.	Tutorial on analysis of prims & kruskal's algorithm	1	10-09-2026		TLM3	
34.	Optimal Storage on tapes	1	11-09-2026		TLM1	
35.	Huffman Coding	1	15-09-2026		TLM1	
No. of classes required to complete UNIT-III: 11				**No. of classes taken:**		

UNIT-IV: Dynamic Programming

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Introduction to Dynamic Programming	1	16-09-2026		TLM1	
37.	All pairs shortest path	1	17-09-2026		TLM1	
38.	Tutorial on Tabular & Memorization methods in Dynamic Proraming	1	18-09-2026		TLM3	
39.	Bellman Ford Algorithm	1	21-09-2026		TLM1	
40.	0/1 knapsack problem	2	22-09-2026 &23-09-2026		TLM1	
41.	Tutorial on Analysis of Bellman Ford & Floyd Warshall Algorithms	1	24-09-2026		TLM3	
42.	Optimal binary search tree	2	25-09-2026 & 28-09-2026		TLM1	
43.	String editing	2	29-09-2026 & 30-09-2026		TLM1	
44.	Travelling salesperson problem	2	01-10-2026 & 05-10-2026		TLM1	
45.	Tutorial on Analysis of OBST	1	06-10-2026		TLM3	
No. of classes required to complete UNIT-IV: 14				**No. of classes taken:**		

UNIT-V: Back tracking & Branch and bound

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Backtracking Introduction	1	07-10-2026		TLM1	
47.	N-queens Problem	2	08-10-2026 & 09-10-2026		TLM1	
48.	Graph Coloring	1	12-10-2026		TLM1	
49.	Tutorial on Analysis of N-Queens	2	13-10-2026 & 14-10-2026			
50.	Sum of subsets problem	1	15-10-2026		TLM1	
51.	Introduction to Branch and Bound	1	16-10-2026		TLM1	
52.	0/1 Knapsack-LCBB, FIFOBB	2	26-10-2026 & 27-10-2026		TLM1	
53.	Tutorial on 0/1 Knapsack	1	28-10-2026			
54.	Travelling Salesperson Problem -LC Search	2	29-10-2026 & 30-10-2026		TLM1	
55.	Introduction to P and NP	1	02-11-2026		TLM1	
56.	NP-Complete Problems	2	03-11-2026 & 04-11-2026		TLM1	
57.	Revision	2	05-11-2026 & 06-11-2026		TLM1	
No. of classes required to complete UNIT-V: 17				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Np-Hard Problems	1	09-11 -2026		TLM2			
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (11-11-2024 TO 16-11-2024)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. G. Sambi Reddy**	**Dr. D. Srinivasa Rao (AI& DS)**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. D. SAINATH
Course Name & Code : OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB & 23CS54
L-T-P Structure : **0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE/III/F **A.Y.:** 2026-27

PREREQUISITE: Computer Programming Lab

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the course are 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.
- Construct Threads, Event Handling, implement packages, Java FX GUI.

COURSE OUTCOMES (CO):

CO1: Implement basic concepts of the java programming language. **(Apply-L3)**
CO2: Implement object-oriented programming concepts and exception handling **(Apply- L3)**
CO3: Design multithreaded and GUI based applications. **(Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	2	-	-	-	-	-	-	2	2	-	-
CO2	3	2	2	-	2	-	-	-	-	-	-	2	2	-	-
CO3	3	2	2	-	2	-	-	-	-	-	-	2	2	-	-
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	Exercise – 1	03	17-07-2026		
2.	Exercise – 2	03	24-07-2026		
3.	Exercise – 3	06	31-07-2026 07-08-2026		
4.	Exercise – 4	06	14-08-2026 21-08-2026		
5.	Exercise – 5	03	28-08-2026		
6.	Exercise – 6	06	04-09-2026 11-09-2026		
7.	Exercise – 7	06	18-09-2026 25-09-2026		
8.	Exercise – 8	03	09-10-2026		
9.	Exercise – 9	03	30-10-2026		
10.	Internal Exam	03	06-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
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PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. D. Sainath**	**Dr. Y. V. B. Reddy**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. D. Sainath
Course Name & Code : OBJECT ORIENTED PROGRAMMING THROUGH JAVA & 23CS05
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE/III /F **A.Y.:** 2026-27

PREREQUISITE: **Introduction to Programming**

COURSE EDUCATIONAL OBJECTIVES(CEO):

The learning objectives of this course are to:
1. Identify Java language components and how they work together in applications
2. Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
3. Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
4. Understand how to design applications with threads in Java
5. Understand how to use Java APIs for program development

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Identify the syntax and semantics of java programming language and basic concepts of Java. **(Understand-L2)**
CO2	Understand the basic concepts of object-oriented programming **(Understand-L2)**
CO3	Develop reusable programs using the concepts of inheritance, polymorphism, and interfaces. **(Apply-L3)**
CO4	Apply the concepts of packages, exception handling & I/O streams to develop secure, error free, and efficient applications **(Apply-L3)**
CO5	Design multithreaded and GUI based applications which mimic the real word scenarios. **(Apply-L3)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	2	2	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	2	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	2	3	3
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	3	3
CO5	3	2	-	-	-	-	-	-	-	-	-	2	2	2	2
1 - Low						2 –Medium						3 - High			

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. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

REFERENCE BOOKS:

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Object Oriented Programming, Data Types,Operators, Control Statements

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Basic concepts, Principles, Program Structure in Java	1	13-07-2026		TLM1	
2.	Writing Simple Java Programs, Elements or Tokens in Java Programs	1	14-07-2026		TLM1	
3.	Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.	2	15-07-2026 16-07-2026		TLM1	
4.	Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final	2	17-07-2026 18-07-2026		TLM1	
5.	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.	2	20-07-2026 21-07-2026		TLM1	
6.	Introduction, if Expression, Nested if Expressions,if–else Expressions , TernaryOperator?:	3	14-07-2026 15-07-2026 17-07-2026		TLM1	
7.	Switch Statement, Iteration Statements , while Expression, do–while Loop ,for Loop, Nested for Loop,For–Each for Loop ,Break Statement, Continue Statement.	3	18-07-2026 20-07-2026 21-07-2026		TLM1	
No. of classes required to complete UNIT-I: 13				**No. of classes taken:**		

UNIT-II: Classes and Objects, Constructors and Methods, String Handling in Java

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
8.	Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another	1	22-07-2026		TLM1	
9.	Access Control for Class Members, Accessing Private Members of Class.	1	23-07-2026		TLM1	
10.	Introduction, Defining Methods, Constructor Methods for Class	1	24-07-2026		TLM1	
11.	Constructors and Methods: Introduction, Defining Methods	1	25-07-2026		TLM1	
12.	Constructor Methods for Class, Overloaded Constructor Methods, Overloaded Methods	1	27-07-2026		TLM1	

13.	Nested Classes, Passing Arguments by Value and by Reference Keyword this.	2	29-08-2026 31-08-2026		TLM1	
14.	Class Objects as Parameters in Methods	1	03-08-2026		TLM1	
15.	Access Control, Recursive Methods	2	04-08-2026 05-08-2026		TLM1	
16.	Nesting of Methods	1	06-08-2026		TLM1	
17.	Attributes Final and Static.	1	07-08-2026		TLM1	
18.	Introduction, Interface Char Sequence	2	10-08-2026 11-08-2026		TLM1	
19.	Class String, Methods for Extracting Characters from Strings	2	12-08-2026 14-08-2026		TLM1	
20.	Comparison, Modifying, Searching; Class String Buffer	2	17-08-2026 18-08-2026		TLM1	
No. of classes required to complete UNIT-II: 18				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)						

UNIT-III: Arrays, Inheritance, Interfaces

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
21.	Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays	1	19-08-2026		TLM1	
22.	Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays	2	20-08-2026 21-08-2026		TLM1	
23.	Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.	2	24-08-2026 25-08-2026		TLM1	
24.	Introduction, Relationship between classes- Has-a, Is-a, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final	2	28-08-2026 29-08-2026		TLM1	
25.	Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes.	2	31-08-2026 01-09-2026		TLM1	
26.	Introduction, Declaration of Interface, Implementation of Interface	2	02-09-2026 03-09-2026		TLM1	
27.	Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces	1	10-09-2026		TLM1	
28.	Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.	1	11-09-2026		TLM1	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Packages and Java Library, Exception Handling, Java I/O and File

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	Introduction, Defining Package, Importing Packages and Classes into	1	15-09-2026		TLM1	

	Programs, Path and Class Path, Access Control, Packages in Java SE- Java. Lang Package and its Classes					
30.	Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing. Java util Classes and Interfaces	2	16-09-2026 17-09-2026		TLM1	
31.	Formatter Class, Random Class, Time Package, Formatting for Date/Time in Java , Temporal Adjusters Class	2	21-09-2026		TLM1	
32.	Introduction, Hierarchy of Standard Exception Classes, Keywords try, catch, throw, throws, and finally Blocks, Multiple Catch Clauses	2	24-09-2026 25-09-2026		TLM1	
33.	Class Throwable, Unchecked Exceptions, Checked Exceptions, Generating user defined exception.	2	28-09-2026 29-09-2026		TLM1	
34.	Java I/O API, standard I/O streams, types, Byte streams	2	05-10-2026 06-10-2026		TLM1	
35.	Character streams, Scanner class, Files in Java	2	09-10-2026 10-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: Multithreaded Programming, Java Collections, Java FX GUI

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Introduction, Need for Multiple Threads ., Multithreaded Programming for Multi-core Processor	1	12-10-2026		TLM1	
37.	Thread Class, Main Thread - Creation of New Threads, Thread States	2	13-10-2026 14-10-2026		TLM1	
38.	Thread Priorities, Synchronization, Inter-thread Communication- producer consumer problem.	1	16-10-2026		TLM1	
39.	Introduction, Purpose of Collection Framework, Hierarchy of collection Interfaces / classes, Methods defined in Collection Interface	2	17-10-2026 26-10-2026		TLM1	
40.	Interface Iterator, Collection classes/Interfaces –List, Set, Map	1	27-10-2026		TLM1	
41.	Overview of AWT & Swings API, limitations	2	29-10-2026 30-10-2026		TLM1	
42.	Java FX Scene Builder, Java FX App Window Structure	2	31-10-2026 02-10-2026		TLM1	
43.	Displaying text and image	1	03-11-2205		TLM1	
44.	Event handling, laying out nodes in scene graph, mouse events	1	05-11-2026		TLM1	
45.	Revision	1	06-11-2026		TLM1	
No. of classes required to complete UNIT-V: 15				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Java new features	2	07-11-2026 09-11-2026		TLM1			

2.	JDBC	1	11-11-2026		TLM1			
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
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PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success oforganization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. D. Sainath**	**Dr. Y. V. B. Reddy**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. Y.Babu

Course Name & Code : Discrete Mathematics & Graph Theory & 23FE11

L-T-P Structure : 3-0-0 **Credits:** 3

Program/Sem/Sec : B.Tech/III/G **A.Y.:** 2026-27

Regulations : R23

PREREQUISITE: Mathematics courses of first year of study.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- 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 (COs): At the end of the course, student will be able to

CO1	Construct mathematical arguments using logical connectives and quantifiers and verify them. **(Apply- L3)**
CO2	Demonstrate the basic terminology of functions, relations, lattices and their operations. **(Understand -L2)**
CO3	Illustrate the basic principles/techniques to solve different combinatorial problems and linear recurrence relations**.(Apply- L3)**
CO4	Demonstrate the different types of graphs.**(Understand -L2)**
CO5	Apply the properties of graphs to solve the graph theory problems in computer science**.(Apply- L3)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1													
CO2	3	2	1												
CO3	3	3	1	1											
CO4	3	3	1												
CO5	3	3	1	1											1
1 - Low			**2 –**Medium						**3 -** High						

TEXTBOOKS:

T1 Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.

T2 Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.

T3 Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill

REFERENCE BOOKS:

R1	Discrete Mathematics for Computer Scientists and Mathematicians, J. L.Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
R2	Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
R3	Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.
R4	Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: MATHEMATICAL LOGIC

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Propositional Calculus: Statements and Notations, Connectives	1	15-07-2026		TLM1	
2.	Well Formed Formulas, Truth Tables	1	16-07-2026		TLM1	
3.	Tutorial on : Statements and Notations, Connectives,TruthTables	1	17-07-2026		TLM3	
4.	Tautologies, Equivalence of Formulas, Duality Law	1	18-07-2026		TLM1	
5.	Tautological Implications, Normal Forms,	1	22-07-2026		TLM1	
6.	Theory of Inference for Statement Calculus, Consistency of Premises,	1	23-07-2026		TLM1	
7.	Tutorial on : Theory of Inference for Statement Calculus, Consistency of Premises	1	24-07-2026		TLM3	
8.	Indirect Method of Proof, Predicate Calculus: Predicates	1	25-07-2026		TLM1	
9.	Predicative Logic, Statement Functions	1	29-07-2026		TLM1	
10.	Variables and Quantifiers	1	30-07-2026		TLM1	
11.	Tutorial on : Predicates, Predicative Logic, Statement Functions,	1	31-07-2026		TLM3	
12.	Free and Bound Variables	1	01-08-2026		TLM1	
13.	Inference Theory for Predicate Calculus	2	05-08-2026 06-08-2026		TLM1	
14.	Tutorial on Unit 1	1	07-08-2026		TLM3	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: SET THEORY

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Sets: Operations on Sets	1	08-08-2026		TLM1	
16.	Principle of Inclusion-Exclusion	1	12-08-2026		TLM1	
17.	Relations: Properties, Operations	1	13-08-2026		TLM1	
18.	Tutorial on Practice the sets and Relations Problems	1	14-08-2026		TLM3	
19.	Partition and Covering,	1	19-08-2026		TLM1	
20.	Transitive Closure, Equivalence,	1	20-08-2026		TLM1	

21.	Compatibility and Partial Ordering, Hasse Diagrams	1	21-08-2026		TLM1	
22.	Tutorial on Transitive Closure, Equivalence,Hasse Diagrams	1	22-08-2026		TLM3	
23.	Functions: Bijective, Composition, Inverse,	1	27-08-2026		TLM1	
24.	Permutation, and Recursive Functions,	1	28-08-2026		TLM1	
25.	Tutorial on Functions& Recursive Functions	1	29-08-2026		TLM3	
26.	Lattice and its Properties	1	02-09-2026		TLM1	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: COMBINATORICS AND RECURRENCE RELATIONS:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
27.	Basis of Counting, Permutations, Permutations with Repetitions	1	03-09-2026		TLM1	
28.	Circular and Restricted Permutations, Combinations,	1	05-09-2026		TLM1	
29.	Tutorial on Permutations, Combinations,	1	10-09-2026		TLM3	
30.	Restricted Combinations	1	11-09-2026		TLM1	
31.	Binomial and Multinomial Coefficients and Theorems.	1	12-09-2026		TLM1	
32.	Tutorial on Binomial and Multinomial Coefficients and Theorems.	1	16-09-2026		TLM3	
33.	Recurrence Relations: Generating Functions, Function of Sequences,	1	17-09-2026		TLM1	
34.	Partial Fractions, Calculating Coefficient of Generating Functions	1	18-09-2026		TLM1	
35.	Recurrence Relations, Formulation as Recurrence Relations	1	19-09-2026		TLM1	
36.	Tutorial on Partial Fractions, Recurrence Relations	1	23-09-2026		TLM3	
37.	Solving Recurrence Relations by Substitution and Generating Functions	1	24-09-2026		TLM1	
38.	Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations	2	25-09-2026 26-09-2026		TLM1	
39.	Tutorial on UNIT III	1			TLM3	
No. of classes required to complete UNIT-III: 14				**No. of classes taken:**		

UNIT-IV: Graph Theory:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
40.	Basic Concepts, Graph Theory and its Applications	1	30-09-2026		TLM1	
41.	Subgraphs, Graph Representations: Adjacency and Incidence Matrices	1	01-10-2026		TLM1	
42.	Isomorphic Graphs,	1	03-10-2026		TLM1	
43.	Paths and Circuits	1	07-10-2026		TLM1	
44.	Tutorial on Graphs	1	08-10-2026		TLM3	
45.	Eulerian and Hamiltonian Graphs,	1	09-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 6				**No. of classes taken:**		

UNIT-V: Multi Graphs

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Multigraphs	1	10-10-2026		TLM1	
47.	Bipartite and Planar Graphs	1	13-10-2026		TLM1	
48.	Tutorial on Bipartite and Planar Graphs	1	14-10-2026		TLM3	
49.	Euler's Theorem	1	15-10-2026		TLM1	
50.	Graph Colouring	1	16-10-2026		TLM1	
51.	Covering	1	17-10-2026		TLM1	
52.	Tutorial on Graph Colouring, Euler Theorem	1	28-10-2026 29-10-2026		TLM3	
53.	Chromatic Number	1	30-10-2026		TLM1	
54.	Spanning Trees, Prim's and Kruskal's Algorithms	1	31-10-2026		TLM1	
55.	BFS Spanning Trees.	1	04-11-2026		TLM1	
56.	Tutorial on UNIT V	1	05-11-2026		TLM3	
57.	DFS Spanning Trees	2	06-11-2026 07-11-2026		TLM1	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Pigeon Hole Principle	1	11-11-2026		**TLM1**	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I,II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To inculcate algorithmic thinking, formulation techniques and visualization, leading to problem solving skills using different programming paradigms.
PSO 2	To inculcate an ability to analyze, design and implement data driven applications into the students
PSO 3	Develop an ability to implement various processes/methodologies/practices employed in design, validation, testing and maintenance of software products.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. Y. Babu**	**Mrs. B. Swathi**	**Dr. D. Venkata Subbaiah**	**Dr. S. Nagarjuna Reddy**
Signature				

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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: B.Nirosha

Course Name & Code : UHV 2 – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT -20HS01
L-T-P Structure : **2-1-0** **Credits: 3**
Program/Sem/Sec : II B.Tech., III-Sem, G-Sec **A.Y.: 2026-27**

PRE-REQUISITE: Nil

AIM of Course UHV2: The course "Universal Human Values" aims to help individuals understand and internalize fundamental human values to live a more fulfilling and ethical life. It focuses on developing a holistic perspective, promoting self-awareness, and fostering harmony within oneself and with others. The course content typically includes exploring concepts like happiness, prosperity, and ethical conduct, and their implications for personal and professional life.

COURSE EDUCATIONAL OBJECTIVES(CEO):

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

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Describe the terms like Natural Acceptance, Happiness and Prosperity (L2)
CO2	Identify one's self, and one's surroundings (family, society nature) (L2)
CO3	Relate human values with human relationship and human society. (L2)
CO4	Illustrate the need for universal human values and harmonious existence (L2)
CO5	Develop as socially and ecologically responsible engineers (L3)

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

CO	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-

CO2	-	-	2	-	-	-	-	3	-	-	-	-	-	-	-
CO3	-	-	-	-	-	2	-	3	2	-	-	-	-	-	-
CO4	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	2	3	-	-	-	1	-	-	-

TEXTBOOKS:

T1 Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

REFERENCE BOOKS:

R1 Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

R2 Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

R3 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi**.**

R4 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

R5 Small is Beautiful - E. F Schumacher.

R6 Slow is Beautiful - Cecile Andrews.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and need of Value Education.	2	13-07-26 15-07-26		TLM1	
2.	Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)	2	16-07-26 18-07-26		TLM1	
3.	Understanding Value Education	1	20--07-26		TLM2	
4.	Practice Session PS1 Sharing about Oneself	1	22-07-26		TLM6	
5.	self-exploration as the Process for Value Education	1	23-07-26		TLM2	
6.	Continuous Happiness and Prosperity – the Basic Human Aspirations	2	25-07-26 27-07-26		TLM1	
7.	Practice Session PS2 Exploring Human Consciousness	1	29-07-26		TLM1	
8.	Happiness and Prosperity – Current Scenario	1	30-07-26		TLM1	
9.	Method to Fulfill the Basic Human Aspirations	1	01-08-26		TLM1	
10.	Practice Session PS3 Exploring Natural Acceptance	1	03-08-26		TLM6	
11.	Activity/tutorial	1	05-08-26			
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
12.	Understanding Human being as the Co-existence of the self and the body.	2	06-08-26 10-08-26		TLM2	
13.	Distinguishing between the Needs of the self and the body	1	12-08-26		TLM2	
14.	Practice Session PS4 Exploring the difference of Needs of self and body.	1	13-08-26		TLM2	
15.	The body as an Instrument of the self	2	17-08-26 19-08-26		TLM1	
16.	Understanding Harmony in the self	2	20-08-26 22-08-26		TLM2	
17.	Practice Session PS5 Exploring Sources of Imagination in the self	1	24-08-26		TLM6	
18.	Harmony of the self with the body	2	27-08-26 29-08-26		TLM2	
19.	Program to ensure self-regulation and Health	2	31-08-26 02-09-26		TLM1	
20.	Practice Session PS6 Exploring Harmony of self with the body	1	03-09-26		TLM2	
21.	Activity/tutorial	1	05-09-26			
No. of classes required to complete UNIT-II: 15				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-202026 TO 09-09-202026)						

UNIT-III

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Harmony in the Family – the Basic Unit of Human Interaction	1	10-09-26		TLM2	
23.	'Trust' – the Foundational Value in Relationship	2	12-09-26 16-09-26		TLM1	
24.	Practice Session PS7 Exploring the Feeling of Trust	1	17-09-26		TLM6	
25.	'Respect' – as the Right Evaluation	1	19-09-26		TLM1	
26.	Other Feelings, Justice in Human-to-Human Relationship	1	21-09-26		TLM1	
27.	Practice Session PS8 Exploring the Feeling of Respect	1	23-09-26		TLM6	

28.	Understanding Harmony in the Society	1	24-09-26		TLM1	
29.	Vision for the Universal Human Order	1	26-09-26		TLM1	
30.	Practice Session PS9 Exploring Systems to fulfil Human Goal	1	28-09-26		TLM6	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT-IV

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31.	Understanding Harmony in the Nature	1	30-09-26		TLM2	
32.	Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature	2	01-10-26 03-10-26		TLM2	
33.	Practice Session PS10 Exploring the Four Orders of Nature	1	05-10-26		TLM6	
34.	Realizing Existence as Co-existence at All Levels	2	07-10-26 08-10-26		TLM2	
35.	The Holistic Perception of Harmony in Existence	2	12-10-26 14-10-26		TLM2	
36.	Practice Session PS11 Exploring Co-existence in Existence.	1	15-10-26 17-10-26		TLM6	
No. of classes required to complete UNIT-IV: 09				**No. of classes taken:**		

UNIT-V

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Natural Acceptance of Human Values	1	26-10-26		TLM2	
38.	Definitiveness of (Ethical) Human Conduct	1	28-10-26		TLM2	
39.	Practice Session PS12 Exploring Ethical Human Conduct	1	29-10-26		TLM2	
40.	A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order	1	31-10-26		TLM2	

41.	Competence in Professional Ethics	1	02-11-26		TLM2	
42.	Practice Session PS13 Exploring Humanistic Models in Education	1	04-11-26		TLM6	
43.	Holistic Technologies, Production Systems and Management Models-Typical Case Studies	1	05-11-26 07-11-26		TLM2	
44.	Strategies for Transition towards Value-based Life and Profession	1	07-11-26		TLM2	
45.	Practice Session PS14 Exploring Steps of Transition towards Universal Human Order	1	09-11-26		TLM6	
No. of classes required to complete UNIT-V: 09				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Pollution-Human Role	1	11/11/2026		TLM2			
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (12-11-202026 TO 14-11-202026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15

II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	B.Nirosha	Dr. B. Srinivasa Rao	Dr. B. Srinivasa Rao	Dr. Nagarjuna Reddy
Signature				

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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.P.Veera Swamy
Course Name & Code **:** DL&CO &20IT01
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : II B.Tech., III-Sem, G-Sec **A.Y.: 2026-27**

Prerequisites:

Course Objectives: The main objective of the course is to

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

COURSE OUTCOMES (COs): At the end of the course, students will be able to

CO1	Evaluate digital number systems and use Boolean algebra theorems, Properties and Canonical forms for digital logic circuit design. **(Understand- L2)**
CO2	Design Sequential logic circuits and understand basic functional blocks of a computer system . **(Apply- L3)**
CO3	Understand computer architecture and Data representation to perform computer arithmetic operations and processor organization. **(Understand- L2)**
CO4	Analyze the memory hierarchy in a computer system. **(Understand- L2)**
CO5	Understand the I/O operations and the interfaces **(Understand-L2)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

CO	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	1	-	-	-	-	-	-	-	-	-	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation**, put '-'**
1- Slight (Low**), 2 –** Moderate (Medium), **3 -** Substantial (High).

Textbooks:

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

Reference Books:

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Data Representation

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to DL&CO	1	13-07-2026		TLM1	
2.	Binary numbers, Number base Conversions	2	14-07-2026 15-07-2026		TLM1	
3.	Fixed Point Representation, Floating Point Representation	1	18-07-2026		TLM1	
4.	Octal and Hexadecimal numbers, Compliments	1	20-07-2026		TLM1	
5.	Signed Binary numbers, Binary codes	1	21-07-2026		TLM1	
6.	Digital Logic Circuits-I: Basic Logic Functions, Logic gates	2	22-07-2026 25-07-2026		TLM2	
7.	Universal logic gates	1	27-07-2026		TLM2	
8.	Minimization of logic expressions	2	28-07-2026 29-07-2026		TLM1	
9.	K-Maps Simplications	1	01-08-2026		TLM1	
10.	Combinational circuits, Decoder and Multiplexers	2	03-08-2026 04-08-2026		TLM1	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Digital Logic Circuits-II

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Sequential Circuits,	1	08-08-2026		TLM1	
12.	Flip-Flops (RS,J,T,D),	2	10-08-2026		TLM2	
13.	Binary Counters	1	11-08-2026		TLM1	
14.	Registers, Shift Registers	1	12-08-2026		TLM1	
15.	Ripple Counters	1	17-08-2026		TLM1	
16.	Basic structure of computer: Computer types	1	18-08-2026		TLM2	
17.	Functional Units, Basic Operational Concepts	2	19-08-2026 22-08-2026		TLM2	
18.	Bus structures, Software	1	24-08-2026		TLM2	
19.	Performance	1	25-08-2026		TLM2	
20.	Multi processors and Multi computers	1	29-08-2026		TLM2	
21.	Computer Generations	1	31-08-2026		TLM2	
22.	Von- Neumann Architecture	1	01-09-2026		TLM2	

23.	**Activity Based Learning**	1	05-09-2026		TLM2	
No. of classes required to complete UNIT-II: 14				**No. of classes taken:**		
MID-1 Examinations From 07-09-2026 to 09-09-2026						

UNIT-III: Computer Arithmetic

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Addition and Subtraction of Signed Numbers	1	10-09-2026		TLM1	
25.	Design of Fast Adders	1	15-09-2026		TLM1	
26.	Multiplication of Positive Numbers	1	16-09-2026		TLM1	
27.	Signed-operand Multiplication	1	19-09-2026		TLM1	
28.	Fast Multiplication	1	21-09-2026		TLM1	
29.	Integer Division	1	22-09-2026		TLM1	
30.	Floating-Point Numbers and Operations	1	23-09-2026		TLM1	
31.	Processor Organization of Fundamental Concepts	1	26-09-2026		TLM1	
32.	Execution of a Complete Instruction, Multiple-Bus Organization	1	28-09-2026		TLM1	
33.	Hardwired Control, Micro programmed Control	1	29-09-2026		TLM2	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT-IV: Memory organization

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34.	Memory organization: Basic Concepts	1	30-09-2026		TLM2	
35.	Semiconductor RAM Memories	1	03-10-2026		TLM2	
36.	Concept of memory hierarchical organization	1	05-10-2026		TLM2	
37.	Read-Only Memories, Speed, Size and Cost	1	06-10-2026		TLM2	
38.	Cache memory	1	07-10-2026		TLM2	
39.	Performance Metrics	1	10-10-2026		TLM2	
40.	Virtual Memory	1	12-10-2026		TLM2	
41.	Memory Management Requirements	1	13-10-2026		TLM2	
42.	Secondary Storage	2	14-10-2026 17-10-2026		TLM2	
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V: Input/Output Organization

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
43.	Accessing I/O Devices and Interfaces	1	26-10-2026		TLM2	
44.	Data Transfer Techniques	2	27-10-2026 28-10-2026		TLM2	
45.	Direct Memory Access	1	31-10-2026		TLM2	
46.	Buses, Interface Circuits	2	02-11-2026 03-11-2026		TLM2	
47.	Standard I/O interfaces	1	04-11-2026		TLM2	
48.	**Activity Based Learning**	1	07-11-2026			
49.	Revision	2	10-11-2026 11-11-2026		TLM2	
No. of classes required to complete UNIT-V: 07				**No. of classes taken:**		
MID-2 Examinations from 12-11-2026 to 14-11-2026						

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actually Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	Addressing modes,Associative memory,I/O Processor	1	09/11/2026		**TLM 2**	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM2	PPT	**TLM6**	Group Discussion/Project
TLM3	Tutorial	**TLM7**	Activity Based Learning
TLM4	Demonstration (Lab/Field Visit)		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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 public health and safety, and the cultural, societal, and environmental considerations.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and Society**: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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, making effective presentations, and give and receiving clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineer**ing 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.
PO 12	**Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr .P.Veera Swamy**	**Dr.Ch.Venkata Narayana**	**Dr .D.Venkata Subbaiah**	**Dr.S.Nagarjuna Reddy**
Signature				

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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. R. Ashok
Course Name & Code : ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS & 23CS04
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE/III /G **A.Y.:** 2026-27

PREREQUISITE: Data Structures

COURSE EDUCATIONAL OBJECTIVES (CEO):

The main objectives of the course is to

1. Provide knowledge on advance data structures frequently used in Computer Science domain
2. Develop skills in algorithm design techniques popularly used
3. Understand the use of various data structures in the algorithm design

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Identify the characteristics of an algorithm, analyze its time and space complexity and construct balanced binary trees. **(Apply-L3)**
CO2	Understand Heap structures and graph terminology to perform various operations on non-linear data structures. **(Understand-L2)**
CO3	Apply Divide and Conquer, Greedy algorithm and dynamic programming for solving problems**. (Apply - L3)**
CO4	Analyze the backtracking and branch-and-bound search methods on optimization problems **(Apply - L3)**
CO5	Summarize the importance of NP-Hard and its applications. **(Understand-L2)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	-	-	-		3	3	3
CO2	2	2	-	-	-	-	-	-	-	-	-	-	3	3	3
CO3	2	2	3	-	-	-	-	-	-	-	-	-	3	3	1
CO4	2	2	3	-	-	-	-	-	-	-	-	-	3	2	3
CO5	2	2	-	1	-	-	-	-	-	-	-	-		-	-
1 - Low			**2 –**Medium							**3 -** High					

TEXTBOOKS:

T1 Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2ndEdition Universities Press

T2 Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition University Press

REFERENCE BOOKS:

R1 Data Structures and program design in C, Robert Kruse, Pearson Education Asia

R2 An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

R3 The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth,

Addison-Wesley, 1997.

R4 Data Structures using C & C++: Langsam, Augenstein &Tanenbaum, Pearson, 1995 Algorithms + Data Structures & Programs: N.Wirth, PHI

R5 Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.

R6 Data structures in Java: Thomas Standish, Pearson Education Asia

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction, AVL Tree, B-Tree

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and CO discussion	1	13-07-2026		TLM1	
2.	Introduction to Algorithm-Characteristics	1	14-07-2026		TLM1	
3.	Pseudo code specifications-Sample Algorithms	1	15-07-2026		TLM1	
4.	Tutorial on writing algorithms using Pseudo Code	1	16-07-2026		TLM3	
5.	Algorithm Analysis- Time and Space Complexity	2	17-07-2026 20-07-2026		TLM1	
6.	Tutorial on finding space & time complexity of algorithms	1	21-07-2026		TLM3	
7.	Asymptotic Notations	2	22-07-2026 23-07-2026		TLM1	
8.	AVL Tree Operations	3	24-07-2026 27-07-2026 28-07-2026		TLM1	
9.	B-Tree operations	3	29-07-2026 30-07-2026 31-08-2026		TLM1	
10.	Tutorial on AVL Tree and Trees	1	03-08-2026		TLM3	
No. of classes required to complete UNIT-I: 16				**No. of classes taken:**		

UNIT-II: Heap Tress, Graphs, Divide and Conquer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Heap Trees (Priority Queue) - Introduction	1	04-08-2026		TLM1	
12.	Max Heap, Min Heap Construction-operations	1	05-08-2026		TLM1	
13.	Implementation of Heap Tree	1	06-08-2026		TLM1	
14.	Tutorial on Heap Tree Construction	1	07-08-2026		TLM3	
15.	Graph Terminology	1	10-08-2026		TLM1	
16.	Representations of Graphs	1	11-08-2026		TLM1	
17.	Basic Search and Traversal Techniques – DFS	1	12-08-2026		TLM1	
18.	BFS – Example, Implementation	1	13-08-2026		TLM1	
19.	Connected Components, Biconnected Components	3	14-08-2026 17-08-2026 18-08-2026		TLM1	
20.	Divide and Conquer General Method	2	19-08-2026 20-08-2026		TLM1	
21.	Finding Max and Min	2	21-08-2026 24-08-2026		TLM1	
22.	Merge Sort	2	25-08-2026 27-08-2026		TLM1	
23.	Quick sort	2	28-08-2026 31-08-2026		TLM1	

24.	Strassen' Matrix Multiplication	1	01-09-2026		TLM1	
25.	Tutorial on Divide and Conquer Problems	2	02-09-2026 03-09-2026		TLM3	
No. of classes required to complete UNIT-II: 22				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)						

UNIT-III: Greedy Method:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Introduction to Greedy Method	1	10-09-2026		TLM1	
27.	Job Sequencing with dead Lines	1	11-09-2026		TLM1	
28.	Knapsack Problem	1	12-09-2026		TLM1	
29.	Minimum Cost Spanning Tree- Kruskal Algorithm	2	15-09-2026 16-09-2026		TLM1	
30.	Tutorial on different knapsack problem instances	1	17-09-2026		TLM3	
31.	Prims Algorithm	1	18-09-2026		TLM1	
32.	Single Source Shortest Path	2	21-09-2026 22-09-2026		TLM1	
33.	Tutorial on analysis of prims & kruskal's algorithm	1	23-09-2026			
34.	Optimal Storage on tapes	1	24-09-2026		TLM1	
35.	Huffman Coding	1	25-09-2026		TLM1	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Dynamic Programming

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Introduction to Dynamic Programming	1	28-09-2026		TLM1	
37.	All pairs shortest path	1	29-09-2026		TLM1	
38.	Tutorial on Tabular & Memorization methods in Dynamic Programing	1	30-09-2026		TLM3	
39.	Bellman Ford Algorithm	1	01-10-2026		TLM1	
40.	0/1 knapsack problem	2	05-10-2026 06-10-2026		TLM1	
41.	Tutorial on Analysis of Bellman Ford & Floyd Warshall Algorithms	1	07-10-2026		TLM3	
42.	Optimal binary search tree	2	08-10-2026 09-10-2026		TLM1	
43.	String editing	2	12-10-2026 13-10-2026		TLM1	
44.	Travelling salesperson problem	1	14-10-2026		TLM1	
45.	Tutorial on Analysis of OBST	1	15-10-2026		TLM3	
No. of classes required to complete UNIT-IV: 13				**No. of classes taken:**		

UNIT-V: Back tracking & Branch and bound

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Backtracking Introduction	1	16-10-2026		TLM1	
47.	N-queens Problem	1	21-10-2026		TLM1	
48.	Graph Coloring	1	22-10-2026		TLM1	
49.	Tutorial on Analysis of N-Queens	1	23-10-2026		TLM3	
50.	Sum of subsets problem	1	26-10-2026		TLM1	
51.	Introduction to Branch and Bound	1	27-10-2026		TLM1	
52.	0/1 Knapsack-LCBB, FIFOBB	2	28-10-2026 29-10-2026		TLM1	
53.	Tutorial on 0/1 Knapsack	1	30-10-2026			
54.	Travelling Salesperson Problem -LC Search	2	02-11-2026 03-11-2026		TLM1	
55.	Introduction to P and NP	2	04-11-2026 05-11-2026		TLM1	
56.	NP-Complete Problems	2	06-11-2026 09-11-2026		TLM1	
57.	Revision	1	10-11-2026		TLM1	
No. of classes required to complete UNIT-V: 13				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Np-Hard Problems	1	11-11-2025					
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5

II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Dr. R.Ashok**	**Dr. D.Srinivasa rao**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. D. Anil Kumar
Course Name & Code : Object Oriented Programming Through JAVA &23CS05
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE/III /G **A.Y.:** 2026-27

PREREQUISITE: Introduction to Programming

COURSE EDUCATIONAL OBJECTIVES(CEO):

The learning objectives of this course are to:
1. Identify Java language components and how they work together in applications
2. Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
3. Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
4. Understand how to design applications with threads in Java
5. Understand how to use Java APIs for program development

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Identify the syntax and semantics of java programming language and basic concepts of Java. **(Understand-L2)**
CO2	Understand the basic concepts of object-oriented programming **(Understand-L2)**
CO3	Develop reusable programs using the concepts of inheritance, polymorphism, and interfaces. **(Apply-L3)**
CO4	Apply the concepts of packages, exception handling & I/O streams to develop secure, error free, and efficient applications **(Apply-L3)**
CO5	Design multithreaded and GUI based applications which mimic the real word scenarios. **(Apply-L3)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	2	2	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	2	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	2	3	3
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	3	3
CO5	3	2	-	-	-	-	-	-	-	-	-	2	2	2	2
1 - Low						2 –Medium						3 - High			

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. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

REFERENCE BOOKS:

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Object Oriented Programming, Data Types,Operators, Control Statements

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
	Cos and Introduction	**1**	13-07-2026			
1.	Basic concepts, Principles, Program Structure in Java	1	14-07-2026		TLM1	
2.	Writing Simple Java Programs, Elements or Tokens in Java Programs	1	15-07-2026		TLM1	
3.	Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.	2	17-07-2026 18-07-2026		TLM1	
4.	Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final	2	20-07-2026 21-07-2026		TLM1	
5.	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.	2	22-07-2026 24-07-2026		TLM1	
6.	Introduction, if Expression, Nested if Expressions,if–else Expressions , TernaryOperator?:	3	25-07-2026 27-07-2026 28-07-2026		TLM1	
7.	Switch Statement, Iteration Statements , while Expression, do–while Loop ,for Loop, Nested for Loop,For–Each for Loop ,Break Statement, Continue Statement.	3	29-07-2026 31-07-2026 01-08-2026		TLM1	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Classes and Objects, Constructors and Methods, String Handling in Java

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
8.	Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another	1	03-08-2026		TLM1	
9.	Access Control for Class Members, Accessing Private Members of Class.	1	04-08-2026		TLM1	
10.	Introduction, Defining Methods, Constructor Methods for Class	1	05-08-2026		TLM1	
11.	Constructors and Methods: Introduction, Defining Methods	1	07-08-2026		TLM1	
12.	Constructor Methods for Class, Overloaded Constructor Methods, Overloaded Methods	1	08-08-2026		TLM1	
13.	Nested Classes, Passing Arguments by	2	10-08-2026		TLM1	

	Value and by Reference Keyword this.		11-08-2026			
14.	Class Objects as Parameters in Methods	1	12-08-2026		TLM1	
15.	Access Control, Recursive Methods	2	14-08-2026 15-08-2026		TLM1	
16.	Nesting of Methods	1	17-08-2026		TLM1	
17.	Attributes Final and Static.	1	18-08-2026		TLM1	
18.	Introduction, Interface Char Sequence	2	19-08-2026 21-08-2026		TLM1	
19.	Class String, Methods for Extracting Characters from Strings	2	22-08-2026 24-08-2026		TLM1	
20.	Comparison, Modifying, Searching; Class String Buffer	2	25-08-2026 26-08-2026		TLM1	
No. of classes required to complete UNIT-II: 18				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-2026 to 09-09-2026)						

UNIT-III: Arrays, Inheritance, Interfaces

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
21.	Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays	1	28-08-2026		TLM1	
22.	Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays	2	29-08-2026 31-08-2026		TLM1	
23.	Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.	2	01-09-2026 02-09-2026		TLM1	
24.	Introduction, Relationship between classes- Has-a, Is-a, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final	2	04-09-2026 05-09-2026		TLM1	
25.	Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes.	2	11-09-2026 12-09-2026		TLM1	
26.	Introduction, Declaration of Interface, Implementation of Interface	2	14-09-2026 15-09-2026		TLM1	
27.	Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces	1	16-09-2026		TLM1	
28.	Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.	1	18-09-2026		TLM1	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Packages and Java Library, Exception Handling, Java I/O and File

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	Introduction, Defining Package, Importing Packages and Classes into	1	19-09-2026		TLM1	

	Programs, Path and Class Path, Access Control, Packages in Java SE- Java. Lang Package and its Classes					
30.	Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing. Java util Classes and Interfaces	2	21-09-2026 22-09-2026		TLM1	
31.	Formatter Class, Random Class, Time Package, Formatting for Date/Time in Java , Temporal Adjusters Class	2	23-09-2026 25-09-2026		TLM1	
32.	Introduction, Hierarchy of Standard Exception Classes, Keywords try, catch, throw, throws, and finally Blocks, Multiple Catch Clauses	2	26-09-2026 28-09-2026		TLM1	
33.	Class Throwable, Unchecked Exceptions, Checked Exceptions, Generating user defined exception.	2	29-09-2026 30-09-2026		TLM1	
34.	Java I/O API, standard I/O streams, types, Byte streams	2	02-10-2026 03-10-2026		TLM1	
35.	Character streams, Scanner class, Files in Java	2	05-10-2026 06-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: Multithreaded Programming, Java Collections, Java FX GUI

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Introduction, Need for Multiple Threads ., Multithreaded Programming for Multi-core Processor	1	07-10-2026		TLM1	
37.	Thread Class, Main Thread - Creation of New Threads, Thread States	2	09-10-2026 10-10-2026		TLM1	
38.	Thread Priorities, Synchronization, Inter-thread Communication- producer consumer problem.	2	12-10-2026 13-10-2026		TLM1	
39.	Introduction, Purpose of Collection Framework, Hierarchy of collection Interfaces / classes, Methods defined in Collection Interface	2	14-10-2026 16-10-2026		TLM1	
40.	Interface Iterator, Collection classes/Interfaces –List, Set, Map	1	17-10-2026		TLM1	
41.	Overview of AWT & Swings API, limitations	2	26-10-2026 27-10-2026		TLM1	
42.	Java FX Scene Builder, Java FX App Window Structure	2	28-10-2026 30-10-2026		TLM1	
43.	Displaying text and image	1	31-10-2026		TLM1	
44.	Event handling, laying out nodes in scene graph, mouse events	1	02-11-2026		TLM1	
45.	Revision	4	03-11-2026 04-11-2026 06-11-2026 07-11-2026		TLM1	
No. of classes required to complete UNIT-V: 18				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes	Tentative Date of	Actual Date of	Teaching Learning	Learning Outcome	Text Book followed	HOD Sign

		Required	Completion	Completion	Methods	COs		Weekly
1.	JDBC	3	09-11-2026 10-11-2026 11-11-2026					
No. of classes		3			No. of classes taken:			
II MID EXAMINATIONS ()								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success oforganization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr.D. Anil kumar**	**Dr. Y.V.B Reddy**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. R. Ashok
Course Name & Code **:** ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB & 23CS53
L-T-P Structure **: 0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE/III/G **A.Y.:** 2026-27

PREREQUISITE: DATA STRUCTURES LAB

COURSE EDUCATIONAL OBJECTIVE:
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 (CO):
CO1: Implement balanced binary trees, heaps and graph traversals using arrays and linked list. **(Apply-L3)**
CO2: Implement Various Sorting Techniques. **(Apply - L3)**
CO3: : Implement optimization problems using greedy, dynamic programming, backtracking and branch-and-bound techniques. **(Apply - L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	1	-		-	-	-	-	-	-		3	3	3
CO2	-	2	1	-		-	-	-	-	-	-	-	3	3	3
CO3	-	2	1	-		-	-	-	-	-	-	-	3	3	3
CO4	-	-	-	-	-	-	-	2	2	2	-	-		-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	BST	03	17-07-2026		
2.	AVL tree	03	24-07-2026		
3.	B-Tree	03	31-07-2026		
4.	Heap Construction	03	07-08-2026		
5.	BFT & DFT	03	14-08-2026		
6.	Finding Biconnected Components	03	21-08-2026		
7.	Finding Max and Min	03	28-08-2026		
8.	Merge sort, Quick sort	03	11-09-2026		
9.	Single source shortest path	03	18-09-2026		
10.	Job sequencing with dead lines	03	25-09-2026		
11.	0/1 knapsack -Dynamic Programming	03	09-10-2026		
12.	N-queens Problem	03	16-10-2026		
13.	Travelling Sales person Problem-Branch and bound	03	23-10-2026		
14.	Practice lab	03	30-10-2026		
15.	Internal Exam	03	06-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
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PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. R. Ashok**	**Dr. D.Srinivasa Rao**	**Dr. Y.V.B Reddy**	**Dr. S.Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. D. Anil Kumar
Course Name & Code : Object Oriented Programming Through JAVA Lab&23CS54
L-T-P Structure : **0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE/III/G **A.Y.:** 2026-27

PREREQUISITE: Computer Programming Lab

COURSE EDUCATIONAL OBJECTIVE:
The objectives of the course is to
1. Practice object-oriented programming in the Java programming language .
2.Implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
3.Illustrate inheritance, Exception handling mechanism, JDBC connectivity .
4.Construct Threads, Event Handling, implement packages, Java FX GUI.

COURSE OUTCOMES (CO):
CO1 : Implement basic concepts of the java programming language. **(Apply-L3)**
CO2 : Implement object-oriented programming concepts and exception handling**(Apply-L3)**
CO3 : Design multithreaded, database and GUI based applications. **(Apply-L3)**
CO4 : Improve individual / teamwork skills, communication & report writing skills with ethical values. **(Apply-L3)**

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	2	-	-	-	-	-	-	2	2	2	
CO2	3	2	2	-	2	-	-	-	-	-	-	2	2	2	2
CO3	3	2	2	-	2	-	-	-	-	-	-	2	2	2	2
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	Basic Java Programs	06	16-07-2026 23-07-2026		
2.	a.Write a JAVA program to display default value of all primitive data type of JAVA b.Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.	03	30-07-2026		
3.	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.	03	06-08-2026		
4.	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 Overloading. c.Write a JAVA program to implement constructor. d.Write a JAVA program to implement constructor overloading.	03	13-08-2026		
5.	a.Write a JAVA program to implement Single Inheritance b.Write a JAVA program to implement multilevel Inheritance c.Write a JAVA program for abstract class to find areas of different shape	03	20-08-2026		
6.	Practice Lab	03	27-08-2026		
7.	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	03	03-09-2026		
8.	a.Write a JAVA program that describes exception handling mechanism b.Write a JAVA program Illustrating Multiple catch clauses c.Write a JAVA program for creation of Java Built-in Exceptions d.Write a JAVA program for creation of User Defined Exception	03	10-09-2026		
9.	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	03	17-09-2026		
10.	a.Write a JAVA program that import and use the user defined packages b.Without writing any code, build a GUI that display text in	03	24-09-2026		

	label and image in an ImageView (use JavaFX) c.Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI				
11.	Practice Lab	03	01-10-2026		
12.	a.Implement the programs using List Interface and its implemented classes. b.Implement the programs using Set Interface and its implemented classes. c.Implement the programs using Map Interface and its implemented classes.	03	08-10-2026		
13.	Practice Lab	06	15-10-2026 29-10-2026		
14.	Internal Exam	03	05-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
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PO 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.
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PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success oforganization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr.D. Anil kumar**	**Dr. Y.V.B Reddy**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Ms. T. VINEETHA
Course Name & Code : PYTHON PROGRAMMING **(SEC-1)** & 23CSS1
L-T-P Structure : **0-1-2** **Credits:** 2
Program/Sem/Sec : B.Tech/CSE/III/G **A.Y.:** 2026-27

PREREQUISITE: INTRODUCTION TO PROGRAMMING

COURSE EDUCATIONAL OBJECTIVE:
The main objectives of the course are to

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

COURSE OUTCOMES (CO):
CO1: Implement the core programming concepts of Python programming language**. (Apply-L3)**
CO2: Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries **(Apply-L3)**
CO3: Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications**. (Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO2	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO3	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

	Topic to be covered	Number of Hours	Tentative Date of Completion	Actual Date of Completion	HOD Signature
1.	**UNIT-1:** Introduction, Course Outcomes, Introduction to Python, Installation, Variables, Data types.	1	13-07-2026		
2.	Reading Input, Print output, Comments	3	14-07-2026		
3.	Types of operators, Working on operators, Sample Programs, Type Conversion	1	20-07-2026		
4.	Control statements – if, else, nestedif, elif	3	21-07-2026		
5.	Loop statements, Programs on Loop statements	1	27-07-2026		
6.	pass, continue and break	3	28-07-2026		
7.	Exception Handling	1	03-08-2026		
8.	Programs on exception handling.	3	04-08-2026		
9.	**UNIT-2:** Function Definition and Calling the function, return Statement and void Function	1	10-08-2026		
10.	Scope and Lifetime of Variables,	3	11-08-2026		
11.	Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments, sample programs.Strings Introduction, Basic String Operations	1	17-08-2026		
12.	Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings., Sample Programs on strings	3	18-08-2026		
13.	Creating Lists, Basic List Operations,	1	24-08-2026		
14.	Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement., Programs on Lists **Unit-3:** Introduction to Dictionaries, Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries,	3	25-08-2026		
15.	Built-In Functions Used on Dictionaries, Dictionary	1	31-08-2026		

	Methods, del Statement. Sample programs on dictionaries.				
16.	Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Sample Programs on tuples.	3	01-09-2026		
17.	Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function	3	15-09-2026		
18.	Sets, Set Methods, Frozenset., Sample Programs on sets, tuples.	1	21-09-2026		
19.	**Unit-4**: Introduction to files	3	22-09-2026		
20.	Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, sample programs on files.	1	28-09-2026		
21.	Pickle Module	3	29-09-2026		
22.	Reading and Writing CSV Files, Python os and os.path Modules. Sample programs.	1	05-10-2026		
23.	**Object-Oriented Programming**: Classes and Objects, Creating Classes in Python	3	06-10-2026		
24.	Creating Objects in Python, Constructor Method,	1	12-10-2026		
25.	Classes with Multiple Objects, Class Attributes Vs Data Attributes, sample programs.	3	13-10-2026		
26.	Encapsulation, Inheritance, Polymorphism,	1	26-10-2026		
27.	Sample Python programs on object-oriented programming.	3	27-10-2026		
28.	**Unit 5: Introduction to Data Science**: Functional Programming	1	02-11-2026		
29.	JSON and XML in Python, NumPy with Python, Pandas.	3	03-11-2026		
30.	Example Programs on NumPy and pandas.	1	09-11-2026		
31.	**Internal Exam**	3	10-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Ms. T. Vineetha**	**Dr. Y.V.B Reddy**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Ms. T. VINEETHA
Course Name & Code : Discrete Mathematics & Graph Theory & 23FE11
L-T-P Structure : **3-1-0** **Credits:** 3
Program/Sem/Sec : B.Tech/III/H **A.Y.:** 2026-27
Regulations : R23

PREREQUISITE: Mathematics courses of first year of study.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- 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 (COs): At the end of the course, student will be able to

CO1	Construct mathematical arguments using logical connectives and quantifiers and verify them. **(Apply- L3)**
CO2	Demonstrate the basic terminology of functions, relations, lattices and their operations. **(Understand -L2)**
CO3	Illustrate the basic principles/techniques to solve different combinatorial problems and linear recurrence relations**.(Apply- L3)**
CO4	Demonstrate the different types of graphs.**(Understand -L2)**
CO5	Apply the properties of graphs to solve the graph theory problems in computer science**.(Apply- L3)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1													
CO2	3	2	1												
CO3	3	3	1	1											
CO4	3	3	1												
CO5	3	3	1	1											1
1 - Low					**2 –**Medium						**3 -** High				

TEXTBOOKS:

T1 Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.

T2 Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.

T3 Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill

REFERENCE BOOKS:

R1	Discrete Mathematics for Computer Scientists and Mathematicians, J. L.Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
R2	Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
R3	Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.
R4	Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: MATHEMATICAL LOGIC

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Propositional Calculus: Statements and Notations, Connectives	1	13-07-2026		TLM1	
2.	Well Formed Formulas, Truth Tables	1	16-07-2026		TLM1	
3.	Tutorial on : Statements and Notations, Connectives,TruthTables	1	17-07-2026		TLM3	
4.	Tautologies, Equivalence of Formulas, Duality Law	1	18-07-2026		TLM1	
5.	Tautological Implications, Normal Forms,	2	20-07-2026 23-07-2026		TLM1	
6.	Theory of Inference for Statement Calculus, Consistency of Premises,	1	24-07-2026		TLM1	
7.	Tutorial on : Theory of Inference for Statement Calculus, Consistency of Premises	1	25-07-2026		TLM3	
8.	Indirect Method of Proof, Predicate Calculus: Predicates	1	27-07-2026		TLM1	
9.	Predicative Logic, Statement Functions	1	30-07-2026		TLM1	
10.	Variables and Quantifiers	1	31-07-2026		TLM1	
11.	Tutorial on : Predicates, Predicative Logic, Statement Functions,	1	01-08-2026		TLM3	
12.	Free and Bound Variables	1	03-08-2026		TLM1	
13.	Inference Theory for Predicate Calculus	1	06-08-2026		TLM1	
14.	Tutorial on Unit 1/ Activity	1	07-08-2026		TLM3	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: SET THEORY

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Sets: Operations on Sets	1	08-08-2026		TLM1	
16.	Principle of Inclusion-Exclusion	1	10-08-2026		TLM1	
17.	Relations: Properties, Operations	1	13-08-2026		TLM1	
18.	Tutorial on Practice the sets and Relations Problems	1	14-08-2026		TLM3	
19.	Partition and Covering,	1	17-08-2026		TLM1	

20.	Transitive Closure, Equivalence,	1	20-08-2026		TLM1	
21.	Compatibility and Partial Ordering, Hasse Diagrams	1	21-08-2026		TLM1	
22.	Tutorial on Transitive Closure, Equivalence,Hasse Diagrams	1	22-08-2026		TLM3	
23.	Functions: Bijective, Composition, Inverse,	1	24-08-2026		TLM1	
24.	Permutation, and Recursive Functions,	1	27-08-2026		TLM1	
25.	Tutorial on Functions& Recursive Functions	1	28-08-2026		TLM3	
26.	Lattice and its Properties & Activity	1 1	29-08-2026 31-08-2026		TLM1	
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		

UNIT-III: COMBINATORICS AND RECURRENCE RELATIONS:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
27.	Basis of Counting, Permutations, Permutations with Repetitions	1	03-09-2026		TLM1	
28.	Circular and Restricted Permutations, Combinations,	1	05-09-2026		TLM1	
29.	Tutorial on Permutations, Combinations,	1	10-09-2026		TLM3	
30.	Restricted Combinations	1	11-09-2026		TLM1	
31.	Binomial and Multinomial Coefficients and Theorems.	1	12-09-2026		TLM1	
32.	Tutorial on Binomial and Multinomial Coefficients and Theorems.	1	17-09-2026		TLM3	
33.	Recurrence Relations: Generating Functions, Function of Sequences,	1	18-09-2026		TLM1	
34.	Partial Fractions, Calculating Coefficient of Generating Functions	1	19-09-2026		TLM1	
35.	Recurrence Relations, Formulation as Recurrence Relations	1	21-09-2026		TLM1	
36.	Tutorial on Partial Fractions, Recurrence Relations	1	24-09-2026		TLM3	
37.	Solving Recurrence Relations by Substitution and Generating Functions	1	25-09-2026		TLM1	
38.	Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations	1	26-09-2026		TLM1	
39.	Tutorial on UNIT III/ Activity	1	28-09-2026		TLM3	
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: Graph Theory:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
40.	Basic Concepts, Graph Theory and its Applications	1	01-10-2026		TLM1	
41.	Subgraphs, Graph Representations: Adjacency and Incidence Matrices	1	03-10-2026		TLM1	
42.	Isomorphic Graphs,	1	05-10-2026		TLM1	
43.	Paths and Circuits	1	08-10-2026		TLM1	
44.	Tutorial on Graphs/ Activity	1	09-10-2026		TLM3	
45.	Eulerian and Hamiltonian Graphs,	1	10-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 6				**No. of classes taken:**		

UNIT-V: Multi Graphs

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Multigraphs,	1	12-10-2026		TLM1	
47.	Bipartite and Planar Graphs	1	15-10-2026		TLM1	
48.	Tutorial on Bipartite and Planar Graphs	1	16-10-2026		TLM3	
49.	Euler's Theorem	1	17-10-2026		TLM1	
50.	Graph Colouring	1	26-10-2026		TLM1	
51.	Covering	1	29-10-2026		TLM1	
52.	Tutorial on Graph Colouring, Euler Theorem	1	30-10-2026		TLM3	
53.	Chromatic Number	1	31-10-2026		TLM1	
54.	Spanning Trees, Prim's and Kruskal's Algorithms	2	02-11-2026 05-11-2026		TLM1	
55.	BFS Spanning Trees.	1	06-11-2026		TLM1	
56.	Tutorial on UNIT V/ Activity	1	07-11-2026		TLM3	
57.	DFS Spanning Trees	1	09-11-2026		TLM1	
No. of classes required to complete UNIT-V: 14				**No. of classes taken:**		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Pigeon Hole Principle	1	07-11-2025		**TLM1**	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I,II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To inculcate algorithmic thinking, formulation techniques and visualization, leading to problem solving skills using different programming paradigms.
PSO 2	To inculcate an ability to analyze, design and implement data driven applications into the students
PSO 3	Develop an ability to implement various processes/methodologies/practices employed in design, validation, testing and maintenance of software products.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Ms. T. Vineetha**	**Mrs. B. Swathi**	**Dr. D. Venkata Subbaiah**	**Dr. S. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr CH V NARAYANA

Course Name & Code : UHV 2 – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT -20HS01
L-T-P Structure : **2-1-0** **Credits: 3**
Program/Sem/Sec : II B.Tech., III-Sem, H-Sec **A.Y.: 2026-27**

PRE-REQUISITE: Nil

AIM of Course UHV2: The course "Universal Human Values" aims to help individuals understand and internalize fundamental human values to live a more fulfilling and ethical life. It focuses on developing a holistic perspective, promoting self-awareness, and fostering harmony within oneself and with others. The course content typically includes exploring concepts like happiness, prosperity, and ethical conduct, and their implications for personal and professional life.

COURSE EDUCATIONAL OBJECTIVES(CEO):

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

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Describe the terms like Natural Acceptance, Happiness and Prosperity (L2)
CO2	Identify one's self, and one's surroundings (family, society nature) (L2)
CO3	Relate human values with human relationship and human society. (L2)
CO4	Illustrate the need for universal human values and harmonious existence (L2)
CO5	Develop as socially and ecologically responsible engineers (L3)

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

CO	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	3	-	-	-	-	-	-	-
CO3	-	-	-	-	-	2	-	3	2	-	-	-	-	-	-
CO4	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	2	3	-	-	-	1	-	-	-

TEXTBOOKS:

T1 Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

REFERENCE BOOKS:

R1 Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

R2 Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

R3 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi**.**

R4 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

R5 Small is Beautiful - E. F Schumacher.

R6 Slow is Beautiful - Cecile Andrews.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and need of Value Education.	1	14/07/2026		TLM1	
2.	Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)	2	15/07/2026 & 16/07/2026		TLM1	
3.	Understanding Value Education	1	18/07/2026		TLM2	
4.	Practice Session PS1 Sharing about Oneself	1	21/07/2026		TLM6	
5.	self-exploration as the Process for Value Education	1	22/07/2026		TLM2	
6.	Continuous Happiness and Prosperity – the Basic Human Aspirations	1	23/07/2026		TLM1	
7.	Practice Session PS2 Exploring Human Consciousness	1	25/07/2026		TLM1	
8.	Happiness and Prosperity – Current Scenario	1	28/07/2026		TLM1	
9.	Method to Fulfill the Basic Human Aspirations	1	29/07/2026		TLM1	

10.	Practice Session PS3 Exploring Natural Acceptance	1	30/07/2026		TLM6	
No. of classes required to complete UNIT-I: 11				**No. of classes taken:**		

UNIT-II

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Understanding Human being as the Co-existence of the self and the body.	2	01/08/2026 & 04/08/2026		TLM2	
12.	Distinguishing between the Needs of the self and the body	1	06/08/2026		TLM2	
13.	Practice Session PS4 Exploring the difference of Needs of self and body.	1	11/08/2026		TLM2	
14.	The body as an Instrument of the self	2	12/08/2026 & 13/08/2026		TLM1	
15.	Understanding Harmony in the self	1	18/08/2026		TLM2	
16.	Practice Session PS5 Exploring Sources of Imagination in the self	1	19/08/2026		TLM6	
17.	Harmony of the self with the body	2	20/08/2026 & 22/08/2026		TLM2	
18.	Program to ensure self-regulation and Health	2	25/08/2026		TLM1	
19.	Practice Session PS6 Exploring Harmony of self with the body	1	27/08/2026		TLM2	
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		

UNIT-III

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
20.	Harmony in the Family – the Basic Unit of Human Interaction	1	29/08/2026		TLM2	
21.	'Trust' – the Foundational Value in Relationship	2	01/09/2026 & 02/09/2026		TLM1	
22.	Practice Session PS7 Exploring the Feeling of Trust	1	05/09/2026		TLM6	

23.	'Respect' – as the Right Evaluation	1	10/09/2026		TLM1	
24.	Other Feelings, Justice in Human-to-Human Relationship	1	12/09/2026		TLM1	
25.	Practice Session PS8 Exploring the Feeling of Respect	1	15/09/2026		TLM6	
26.	Understanding Harmony in the Society	1	16/09/2026		TLM1	
27.	Vision for the Universal Human Order	1	17/09/2026		TLM1	
28.	Practice Session PS9 Exploring Systems to fulfil Human Goal	1	19/09/2026		TLM6	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT-IV

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	Understanding Harmony in the Nature	2	22/09/2026 & 23/09/2026		TLM2	
30.	Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature	2	24/09/2026 & 26/09/2026		TLM2	
31.	Practice Session PS10 Exploring the Four Orders of Nature	1	29/09/2026		TLM6	
32.	Realizing Existence as Co-existence at All Levels	2	30/09/2026 & 03/10/2026		TLM2	
33.	The Holistic Perception of Harmony in Existence	2	06/10/2026 & 07/10/2026		TLM2	
34.	Practice Session PS11 Exploring Co-existence in Existence.	1	07/10/2026		TLM6	
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
35.	Natural Acceptance of Human Values	2	08/10/2026 & 10/10/2026		TLM2	
36.	Definitiveness of (Ethical) Human Conduct	1	13/10/2026 & 14/10/2026		TLM2	
37.	Practice Session PS12 Exploring Ethical Human Conduct	1	15/10/2026		TLM2	
38.	A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order	2	17/10/2026 & 27/10/2026		TLM2	
39.	Competence in Professional Ethics	2	28/10/2026 & 29/10/2026		TLM2	
40.	Practice Session PS13 Exploring Humanistic Models in Education	1	31/10/2026		TLM6	
41.	Holistic Technologies, Production Systems and Management Models-Typical Case Studies	2	03/11/2026 & 04/11/2026		TLM2	
42.	Strategies for Transition towards Value-based Life and Profession	2	05/10/2026 & 07/11/2026		TLM2	
43.	Practice Session PS14 Exploring Steps of Transition towards Universal Human Order	1	10/11/2026		TLM6	
No. of classes required to complete UNIT-V: 14				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Pollution-Human Role	1	11/11/2026		TLM2			

No. of classes	1	No. of classes taken:
II MID EXAMINATIONS (03-11-202026 TO 08-11-202026)		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Dr CH V NARAYANA**	**Dr. B. Srinivasa Rao**	**Dr. B. Srinivasa Rao**	**Dr. Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.P.Veera Swamy
Course Name & Code **:** DL&CO &20IT01
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : II B.Tech., III-Sem, H-Sec **A.Y.: 2026-27**

Prerequisites:

Course Objectives: The main objective of the course is to

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

COURSE OUTCOMES (COs): At the end of the course, students will be able to

CO1	Evaluate digital number systems and use Boolean algebra theorems, Properties and Canonical forms for digital logic circuit design. **(Understand- L2)**
CO2	Design Sequential logic circuits and understand basic functional blocks of a computer system . **(Apply- L3)**
CO3	Understand computer architecture and Data representation to perform computer arithmetic operations and processor organization. **(Understand- L2)**
CO4	Analyze the memory hierarchy in a computer system. **(Understand- L2)**
CO5	Understand the I/O operations and the interfaces **(Understand-L2)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

CO	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	1	-	-	-	-	-	-	-	-	-	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation**, put '-'**
1- Slight (Low**), 2 –** Moderate (Medium), **3 -** Substantial (High).

Textbooks:

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

Reference Books:

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Data Representation

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to DL&CO	1	14-07-2026		TLM1	
2.	Binary numbers, Number base Conversions	2	15-07-2026 16-07-2026		TLM1	
3.	Fixed Point Representation, Floating Point Representation	1	17-07-2026		TLM1	
4.	Octal and Hexadecimal numbers, Compliments	1	21-07-2026		TLM1	
5.	Signed Binary numbers, Binary codes	1	22-07-2026		TLM1	
6.	Digital Logic Circuits-I: Basic Logic Functions, Logic gates	2	23-07-2026 24-07-2026		TLM2	
7.	Universal logic gates	1	28-07-2026		TLM2	
8.	Minimization of logic expressions	2	29-07-2026 30-07-2026		TLM1	
9.	K-Maps Simplications	1	31-07-2026		TLM1	
10.	Combinational circuits, Decoder and Multiplexers	2	04-08-2026 05-08-2026		TLM1	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Digital Logic Circuits-II

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Sequential Circuits,	1	06-08-2026		TLM1	
12.	Flip-Flops (RS,J,T,D),	2	07-08-2026		TLM2	
13.	Binary Counters	1	11-08-2026		TLM1	
14.	Registers, Shift Registers	1	12-08-2026		TLM1	
15.	Ripple Counters	1	13-08-2026		TLM1	
16.	Basic structure of computer: Computer types	1	14-08-2026		TLM2	
17.	Functional Units, Basic Operational Concepts	2	18-08-2026 19-08-2026		TLM2	
18.	Bus structures, Software	1	20-08-2026		TLM2	
19.	Performance	1	21-08-2026		TLM2	
20.	Multi processors and Multi computers	1	25-08-2026		TLM2	
21.	Computer Generations	1	27-08-2026		TLM2	
22.	Von- Neumann Architecture	1	01-09-2026		TLM2	

23.	**Activity Based Learning**	1	03-09-2026		TLM2	
No. of classes required to complete UNIT-II: 14				**No. of classes taken:**		
MID-1 Examinations From 07-09-2026 to 09-09-2026						

UNIT-III: Computer Arithmetic

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Addition and Subtraction of Signed Numbers	1	10-09-2026		TLM1	
25.	Design of Fast Adders	1	15-09-2026		TLM1	
26.	Multiplication of Positive Numbers	1	16-09-2026		TLM1	
27.	Signed-operand Multiplication	1	17-09-2026		TLM1	
28.	Fast Multiplication	1	18-09-2026		TLM1	
29.	Integer Division	1	22-09-2026		TLM1	
30.	Floating-Point Numbers and Operations	1	23-09-2026		TLM1	
31.	Processor Organization of Fundamental Concepts	1	24-09-2026		TLM1	
32.	Execution of a Complete Instruction, Multiple-Bus Organization	1	25-09-2026		TLM1	
33.	Hardwired Control, Micro programmed Control	1	29-09-2026		TLM2	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT-IV: Memory organization

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34.	Memory organization: Basic Concepts	1	30-09-2026		TLM2	
35.	Semiconductor RAM Memories	1	01-10-2026		TLM2	
36.	Concept of memory hierarchical organization	1	06-10-2026		TLM2	
37.	Read-Only Memories, Speed, Size and Cost	1	07-10-2026		TLM2	
38.	Cache memory	1	08-10-2026		TLM2	
39.	Performance Metrics	1	09-10-2026		TLM2	
40.	Virtual Memory	1	13-10-2026		TLM2	
41.	Memory Management Requirements	1	14-10-2026		TLM2	
42.	Secondary Storage	2	15-10-2026 16-10-2026		TLM2	
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V: Input/Output Organization

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
43.	Accessing I/O Devices and Interfaces	1	27-10-2026		TLM2	
44.	Data Transfer Techniques	2	28-10-2026 29-10-2026		TLM2	
45.	Direct Memory Access	1	30-10-2026		TLM2	
46.	Buses, Interface Circuits	2	03-11-2026 04-11-2026		TLM2	
47.	Standard I/O interfaces	1	05-11-2026		TLM2	
48.	**Activity Based Learning**	1	06-11-2026			
49.	Revision	2	10-11-2026 11-11-2026		TLM2	
No. of classes required to complete UNIT-V: 07				**No. of classes taken:**		
MID-2 Examinations from 12-11-2026 to 14-11-2026						

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actually Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	Addressing modes,Associative memory,I/O Processor	1	09/11/2026		**TLM 2**	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM2	PPT	**TLM6**	Group Discussion/Project
TLM3	Tutorial	**TLM7**	Activity Based Learning
TLM4	Demonstration (Lab/Field Visit)		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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 public health and safety, and the cultural, societal, and environmental considerations.
PO 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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and Society**: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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, making effective presentations, and give and receiving clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineer**ing 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.
PO 12	**Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr .P.Veera Swamy**	**Dr.Ch.Venkata Narayana**	**Dr .D.Venkata Subbaiah**	**Dr.S.Nagarjuna Reddy**
Signature				

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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. SUNILKUMAR KETINENI
Course Name & Code : ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS & 23CS04
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B. Tech/CSE/III /H **A.Y.:** 2026-27

PREREQUISITE: Data Structures

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course are to

1. Provide knowledge on advance data structures frequently used in Computer Science domain.
2. Develop skills in algorithm design techniques popularly used.
3. Understand the use of various data structures in the algorithm design.

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Identify the characteristics of an algorithm, analyze its time and space complexity and construct balanced binary trees. **(Apply-L3)**
CO2	Understand Heap structures and graph terminology to perform various operations on non-linear data structures. **(Understand-L2)**
CO3	Apply Divide and Conquer, Greedy algorithm and dynamic programming for solving problems**. (Apply - L3)**
CO4	Analyze the backtracking and branch-and-bound search methods on optimization problems **(Apply - L3)**
CO5	Summarize the importance of NP-Hard and its applications. **(Understand-L2)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	2	2	-	-	-	-	-	-	-	-	-	-		-	1
CO3	2	2	3	-	-	-	-	-	-	-	-	-		-	2
CO4	2	2	3	-	-	-	-	-	-	-	-	-		-	2
CO5	2	2	-	1	-	-	-	-	-	-	-	-		-	1
1 - Low **2 –**Medium **3 -** High															

TEXTBOOKS:

T1 Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2ndEdition Universities Press

T2 Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition University Press.

REFERENCE BOOKS:

R1 Data Structures and program design in C, Robert Kruse, Pearson Education Asia

R2 An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

R3 The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.

R4 Data Structures using C & C++: Langsam, Augenstein &Tanenbaum, Pearson, 1995 Algorithms + Data Structures & Programs: N.Wirth, PHI

R5 Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.

R6 Data structures in Java: Thomas Standish, Pearson Education Asia

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction, AVL Tree, B-Tree

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and CO discussion	1	13-07-2026		TLM1	
2.	Introduction to Algorithm- Characteristics	1	14-07-2026		TLM1	
3.	Pseudo code specifications- Sample Algorithms	2	15-07-2026 16-07-2026		TLM1	
4.	Algorithm Analysis- Time and Space Complexity - Examples	2	18-07-2026 20-07-2026		TLM1	
5.	Asymptotic Notations	2	21-07-2026 22-07-2026		TLM1	
6.	AVL Tree Operations	3	23-07-2026 25-07-2026 27-07-2026		TLM1	
7.	B-Tree operations	3	28-07-2026 29-07-2026 31-07-2026		TLM1	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Heap Tress, Graphs, Divide and Conquer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
8.	Heap Trees (Priority Queue) - Introduction	1	01-08-2026		TLM1	
9.	Max Heap, Min Heap Construction- operations	1	03-08-2026		TLM1	
10.	Implementation of Heap Tree	1	04-08-2026		TLM1	
11.	Graph Terminology	1	05-08-2026		TLM1	
12.	Representations of Graphs	1	06-08-2026		TLM1	
13.	Basic Search and Traversal Techniques – DFS	2	08-08-2026 10-08-2026		TLM1	
14.	BFS – Example, Implementation	1	11-08-2026		TLM1	
15.	Connected Components, Biconnected Components	2	12-08-2026 13-08-2026		TLM1	
16.	Divide and Conquer General Method	1	17-08-2026		TLM1	
17.	Finding Max and Min	1	18-08-2026		TLM1	
18.	Merge Sort	2	19-08-2026 20-08-2026		TLM1	
19.	Quick sort	2	22-08-2026 24-08-2026		TLM1	
20.	Strassen' Matrix Multiplication	2	25-08-2026 27-08-2026		TLM1	
No. of classes required to complete UNIT-II: 18				**No. of classes taken:**		
I MID EXAMINATIONS (25-08-2025 TO 30-08-2025)						

UNIT-III: Greedy Method:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
21.	Introduction to Greedy Method	1	29-08-2026		TLM1	
22.	Job Sequencing with dead Lines	2	31-08-2026 01-09-2026		TLM1	
23.	Knapsack Problem	2	02-09-2026 03-09-2026		TLM1	
24.	Minimum Cost Spanning Tree- Kruskal Algorithm	2	05-09-2026 10-09-2026		TLM1	
25.	Prims Algorithm	2	12-09-2026 15-09-2026		TLM1	
26.	Single Source Shortest Path	2	16-09-2026 17-09-2026		TLM1	
27.	Optimal Storage on tapes	1	19-09-2026		TLM1	
28.	Huffman Coding	1	21-09-2026		TLM1	
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: Dynamic Programming

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	Introduction to Dynamic Programming	1	22-09-2026		TLM1	
30.	All pairs shortest path	2	23-09-2026 24-09-2026		TLM1	
31.	Bellman Ford Algorithm	2	26-09-2026 28-09-2026		TLM1	
32.	0/1 knapsack problem	2	29-09-2026 30-09-2026		TLM1	
33.	Optimal binary search tree	2	01-10-2026 03-10-2026		TLM1	
34.	String editing	2	05-10-2026 06-10-2026		TLM1	
35.	Travelling salesperson problem	2	07-10-2026 08-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 13				**No. of classes taken:**		

UNIT-V: Back tracking & Branch and bound

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Backtracking Introduction	2	10-10-2026 12-10-2026		TLM1	
37.	N-queens Problem	2	13-10-2026 14-10-2026		TLM1	
38.	Graph Coloring	2	15-10-2026 17-10-2026		TLM1	
39.	Sum of subsets problem	2	26-10-2026 27-10-2026		TLM1	
40.	Introduction to Branch and Bound	2	28-10-2026 29-10-2026		TLM1	
41.	0/1 Knapsack-LCBB, FIFOBB	2	31-10-2026 02-11-2026		TLM1	
42.	Travelling Salesperson Problem -LC Search	2	03-11-2026 04-11-2026		TLM1	
43.	Introduction to P and NP	2	05-11-2026 07-11-2026		TLM1	
44.	NP-Complete Problems	1	09-11-2026		TLM1	
45.	Revision	1	10-11-2026		TLM1	
No. of classes required to complete UNIT-V: 18				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Np-Hard Problems	1	11-11-2026					
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (03-11-2025 TO 08-11-2025)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation o f data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. SUNILKUMAR KETINENI**	**Dr. D.SRINIVASA RAO**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. A. Sree Rama Chandra Murthy
Course Name & Code : OBJECT ORIENTED PROGRAMMING THROUGH JAVA & 23CS05
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE/III/H **A.Y.:** 2026-27

PREREQUISITE: Introduction to Programming

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course is to:

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

COURSE OUTCOMES (COs): At the end of the course, students will be able to

CO1	Identify the syntax and semantics of java programming language and basic concepts of Java. **(Understand-L2)**
CO2	Understand the basic concepts of object-oriented programming **(Understand-L2)**
CO3	Develop reusable programs using the concepts of inheritance, polymorphism, and interfaces. **(Apply-L3)**
CO4	Apply the concepts of packages, exception handling & I/O streams to develop secure, error free, and efficient applications. **(Apply-L3)**
CO5	Design multithreaded and GUI based applications which mimic the real word scenarios. **(Apply-L3)**

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	2	2	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	2	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	2	3	3
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	3	3
CO5	3	2	-	-	-	-	-	-	-	-	-	2	2	2	2
1 - Low					**2** –Medium							**3** - High			

TEXTBOOKS:

T1 JAVA one step ahead, Anitha Seth, B. L. Juneja, Oxford.
T2 Joy with JAVA, Fundamentals of Object-Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
T3 JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

REFERENCE BOOKS:

R1 The complete Reference Java, 11thedition, Herbert Schildt, TMH
R2 Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Object Oriented Programming, Data Types, Variables, Introduction to Operators and Control Statements

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and CO discussion	1	13-07-2026		TLM1	
2.	Basic concepts, Principles	1	14-07-2026		TLM1	
3.	Program Structure in Java	2	16-07-2026 17-07-2026		TLM1	
4.	Command Line Arguments, User Input to Programs.	2	18-07-2026 20-07-2026		TLM1	
5.	Data Types, Variables	2	21-07-2026 23-07-2026		TLM1	
6.	Static Variables and Methods, Attribute Final	2	24-07-2026 25-07-2026		TLM1	
7.	Introduction to Operators	2	27-07-2026 28-07-2026		TLM1	
8.	Control Statements	2	30-07-2026 31-07-2026		TLM1	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Classes and Objects, Constructors and Methods and String Handling in Java

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
9.	Classes and Objects	1	01-08-2026		TLM1	
10.	Class Declaration and Modifiers, Class Members	1	03-08-2026		TLM1	
11.	Declaration of Class Objects, Assigning One Object to Another	1	04-08-2026		TLM1	
12.	Access Control for Class Members, Accessing Private Members of Class.	1	06-08-2026		TLM1	
13.	Constructors and Methods Introduction	1	07-08-2026		TLM1	
14.	Defining Methods, Constructor Methods for Class	2	08-08-2026 10-08-2026		TLM1	
15.	Overloaded Constructor Methods	1	11-08-2026		TLM1	
16.	Overloaded Methods, Nested Classes	2	13-08-2026 14-08-2026		TLM1	
17.	Passing Arguments by Value and by Reference, Keyword this	1	17-08-2026		TLM1	
18.	Class Objects as Parameters in Methods, Access Control	1	18-08-2026		TLM1	
19.	Recursive Methods, Nesting of Methods, Attributes Final and Static	2	20-08-2026 21-08-2026		TLM1	
20.	String Handling in Java, String class	2	22-08-2026 24-08-2026		TLM1	
21.	StringTokenizer, StringBuffer classes	2	25-08-2026 27-08-2026		TLM1	
No. of classes required to complete UNIT-II: 18				**No. of classes taken:**		
I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)						

UNIT-III: Arrays, Inheritance and Interfaces

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Introduction to Arrays	1	28-08-2026		TLM1	
23.	Operations on Array Elements	1	29-08-2026		TLM1	
24.	Sorting & Searching values in Arrays	1	31-08-2026		TLM1	
25.	Two & Three-Dimensional Arrays and Vectors	2	01-09-2026 03-09-2026		TLM1	
26.	Inheritance and Polymorphism	2	05-09-2026 10-09-2026		TLM1	
27.	Method overloading & overriding, abstract classes	2	11-09-2026 12-09-2026		TLM1	
28.	Interface concepts	1	15-09-2026		TLM1	
29.	Functional Interfaces, Annotations	1	17-09-2026		TLM1	
No. of classes required to complete UNIT-III: 11				**No. of classes taken:**		

UNIT-IV: Packages and Java Library, Exception Handling and Java I/O, File

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
30.	Packages and Java Library Introduction	1	18-09-2026		TLM1	
31.	Packages related concepts	2	19-09-2026 21-09-2026		TLM1	
32.	Wrapper Classes, Auto-boxing and Auto-unboxing	1	22-09-2026		TLM1	
33.	Java util Classes and Interfaces	1	24-09-2026		TLM1	
34.	Exception Handling Hierarchy & keywords	2	25-09-2026 26-09-2026		TLM1	
35.	Generating user defined exception	2	28-09-2026 29-09-2026		TLM1	
36.	Java I/O streams and Files	2	01-10-2026 03-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Multithreaded Programming, Java Collections and Java FX GUI

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Multithreaded Programming	1	05-10-2026		TLM1	
38.	Thread life cycle, naming, priories of the threads, states	2	06-10-2026 08-10-2026		TLM1	
39.	Synchronization & Inter-thread communication	2	09-10-2026 10-10-2026		TLM1	
40.	Java Collections & Hierarchy	2	12-10-2026 13-10-2026		TLM1	
41.	List, Set Interfaces	1	15-10-2026		TLM1	
42.	Map Interface with examples	2	16-10-2026 17-10-2026		TLM1	
43.	Java FX, Overview of AWT & Swings API	2	26-10-2026 27-10-2026		TLM1	
44.	Event handling	1	29-10-2026		TLM1	
45.	Layouts, mouse events	1	30-10-2026		TLM1	
46.	Revision	1	31-10-2026		TLM1	
No. of classes required to complete UNIT-V: 15				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text book followed	HOD Sign Weekly
1.	Java new features	2	02-11-2026 03-11-2026		TLM1			
2.	Realtime applications examples	3	05-11-2026 06-11-2026 07-11-2026		TLM1			
3.	Java JDBC	2	09-11-2026 10-11-2026		TLM1			
No. of classes required to complete - 2					No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
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PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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PO 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.

PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success oforganization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. A. Sree Rama Chandra Murthy**	**Dr. Y.V.B Reddy**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. SUNILKUMAR KETINENI

Course Name & Code : ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB & 23CS53

L-T-P Structure : **0-0-3** **Credits:** 1.5

Program/Sem/Sec : B. Tech/CSE/III/H **A.Y.:** 2026-27

PREREQUISITE: DATA STRUCTURES LAB

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the course are to

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

COURSE OUTCOMES (CO):

CO1: Implement balanced binary trees, heaps and graph traversals using arrays and linked list. **(Apply-L3)**

CO2: Implement Various Sorting Techniques. **(Apply - L3)**

CO3: Implement optimization problems using greedy, dynamic programming, backtracking and branch-and-bound techniques. **(Apply - L3)**

CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	1	-		-	-	-	-	-	-	-		-	3
CO2	-	2	1	-		-	-	-	-	-	-	-		-	3
CO3	-	2	1	-		-	-	-	-	-	-	-		-	3
CO4	-	-	-	-	-	-	-	2	2	2	-	-		-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	AVL tree	03	13-07-2026		
2.	B-Tree	06	20-07-2026 27-07-2026		
3.	Heap Construction	06	03-08-2026 10-08-2026		
4.	BFT & DFT	03	17-08-2026		
5.	Finding Biconnected Components	03	24-08-2026		
6.	Finding Max and Min	03	31-08-2026		
7.	Merge sort, Quick sort	03	21-09-2026		
8.	Single source shortest path	03	28-09-2026		
9.	Job sequencing with dead lines	03	05-10-2026		
10.	0/1 knapsack -Dynamic Programming	03	12-10-2026		
11.	N-queens Problem	03	26-10-2026		
12.	Travelling Sales person Problem-Branch and bound	03	02-11-2026		
13.	Internal Exam	03	09-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation o f data, and synthesis of the information to provide valid conclusions.
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PO 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.
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PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Dr. SUNILKUMAR KETINENI**	**Dr. D. SRINIVASA RAO**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. A. Sree Rama Chandra Murthy
Course Name & Code : OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB & 23CS54
L-T-P Structure : **0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE/III/H **A.Y.:** 2026-27

PREREQUISITE: Computer Programming Lab

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the 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.
- Construct Threads, Event Handling, implement packages, Java FX GUI.

COURSE OUTCOMES (CO):

CO1: Implement basic concepts of the java programming language. **(Apply-L3)**
CO2: Implement object-oriented programming concepts and exception handling **(Apply- L3)**
CO3: Design multithreaded and GUI based applications. **(Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	2	-	-	-	-	-	-	2	2	2	-
CO2	3	2	2	-	2	-	-	-	-	-	-	2	2	2	2
CO3	3	2	2	-	2	-	-	-	-	-	-	2	2	2	2
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	Exercise – 1	03	15-07-2026		
2.	Exercise – 2	03	22-07-2026		
3.	Exercise – 3	06	29-07-2026 05-08-2026		
4.	Exercise – 4	06	12-08-2026 19-08-2026		
5.	Exercise – 5	03	02-09-2026		
6.	Exercise – 6	03	16-09-2026 23-09-2026		
7.	Exercise – 7	06	30-09-2026 07-10-2026		
8.	Exercise – 8	03	14-10-2026		
9.	Exercise – 9	06	28-10-2026 04-11-2026		
10.	Internal Exam	03	11-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
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PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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PO 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.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success oforganization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. A. Sree Rama Chandra Murthy**	**Dr. Y.V.B Reddy**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),
An ISO 21001:2018,14001:2015,50001:2018 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. K. VENKATRAO
Course Name & Code : PYTHON PROGRAMMING **(SEC-1)** & 23CSS1
L-T-P Structure : **0-1-2** **Credits:** 2
Program/Sem/Sec : B.Tech/CSE/III/H **A.Y.:** 2026-27

PREREQUISITE: INTRODUCTION TO PROGRAMMING

COURSE EDUCATIONAL OBJECTIVE:
The main objectives of the course are to

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

COURSE OUTCOMES (CO):
CO1: Implement the core programming concepts of Python programming language**. (Apply-L3)**
CO2: Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries **(Apply-L3)**
CO3: Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications**. (Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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CO3	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

	Topic to be covered	Number of Hours	Tentative Date of Completion	Actual Date of Completion	HOD Signature
1.	**UNIT-1:** Introduction, Course Outcomes, Introduction to Python, Installation, Variables, Data types.	1	13-07-2026		
2.	Reading Input, Print output, Comments	3	10-07-2026		
3.	Types of operators, Working on operators, Sample Programs, Type Conversion	1	14-07-2026		
4.	Control statements – if, else, nestedif, elif	3	17-07-2026		
5.	Loop statements, Programs on Loop statements	1	21-07-2026		
6.	pass, continue and break	3	24-07-2026		
7.	Exception Handling	1	28-07-2026		
8.	Programs on exception handling.	3	31-07-2026		
9.	**UNIT-2:** Function Definition and Calling the function, return Statement and void Function	1	04-08-2026		
10.	Scope and Lifetime of Variables,	3	07-08-2026		
11.	Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments, sample programs.Strings Introduction, Basic String Operations	1	11-08-2026		
12.	Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings., Sample Programs on strings	3	14-08-2026		
13.	Creating Lists, Basic List Operations,	1	18-08-2026		
14.	Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement., Programs on Lists **Unit-3:** Introduction to Dictionaries, Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries,	3	21-08-2026		
15.	Built-In Functions Used on Dictionaries, Dictionary	1	25-08-2026		

	Methods, del Statement. Sample programs on dictionaries.				
16.	Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Sample Programs on tuples.	3	28-08-2026		
17.	Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function	3	11-09-2026		
18.	Sets, Set Methods, Frozenset., Sample Programs on sets, tuples.	1	15-09-2026		
19.	**Unit-4**: Introduction to files	3	18-09-2026		
20.	Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, sample programs on files.	3	22-09-2026		
21.	Pickle Module	3	25-09-2026		
22.	Reading and Writing CSV Files, Python os and os.path Modules. Sample programs.	1	29-09-2026		
23.	**Object-Oriented Programming**: Classes and Objects, Creating Classes in Python	1	06-10-2026		
24.	Creating Objects in Python, Constructor Method,	3	09-10-2026		
25.	Classes with Multiple Objects, Class Attributes Vs Data Attributes, sample programs.	1	13-10-2026		
26.	Encapsulation, Inheritance, Polymorphism,	3	16-10-2026		
27.	Sample Python programs on object-oriented programming.	1	27-10-2026		
28.	**Unit 5: Introduction to Data Science**: Functional Programming	3	30-10-2026		
29.	JSON and XML in Python, NumPy with Python, Pandas.	1	03-11-2026		
30.	Example Programs on NumPy and pandas.	1	06-11-2026		
31.	**Internal Exam**	3	10-11-2026		

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