LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
L.B.Reddy Nagar, Mylavaram – 521 230, N.T.R. District, Andhra Pradesh, India
Affiliated to JNTUK, Kakinada & Approved by AICTE New Delhi
Accredited by NBA under Tier - I, Accredited by NAAC
An ISO 21001:2018, 500001:2018, 14001:2015 Certified Institution
DEPARTMENT OF AEROSPACE ENGINEERING
Estd.: 1998 Website: https://www.lbrce.ac.in/ase/index.php Email: hodaero@lbrce.ac.in Phone:08659-222933 Ext:624/623

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. B. UDAYA LAKSHMI
Course Name & Code : Industrial Management & 23HS03
L-T-P Structure : 2-0-0 **Credits:** 2
Program/Sem : B. Tech / IV-Sem **A.Y.:** 2024-25

PREREQUISITE: Basic Sciences, Mathematics

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- Introduce the scope of industrial engineering and the techniques for optimal design of layouts.
- Illustrate how work study is used to improve productivity.
- Explain TQM and quality control techniques.
- Introduce financial management aspects and
- Discuss human resource management and value analysis.

COURSE OUTCOMES (COs): On Completion of the course, student should be able to

CO1	Learn how to design the optimal layout. (Remember_L1)
CO2	Demonstrate work study methods. (Apply_L3)
CO3	Explain Quality Control Techniques. (Understand_L2)
CO4	Discuss the financial management aspects and. (Understand_L2)
CO5	Understand the human resource management methods. (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	3	3	2	3		3					3	2			3
CO2	2	2	2	3	3	3					3	2			3
CO3	2	3	2	2	3	3					3	2			3
CO4	3	2	2	3		3					3	2			3
CO5	2	2	2	3	3	3					3	2			3
1 - Low					**2 –**Medium						**3 -** High				

TEXTBOOKS:

T1 Industrial Engg and management O.P.Khanna

T2 Financial Management by C.Paramasivan and T.Subramanian,New Age international publishers.

REFERENCE BOOKS:

R1 Bhattacharya DK,Industrial Management,S.Chand,publishers,2010.

R2 J.G Monks,Operations Management,3/e,McGraw Hill Publishers1987

R3 T.R.Banga,S.C.Sharma,N.K.Agarwal,Industrial Engg and Management science,Khanna Publishers,2008.

R4 R.C.Gupta,Statistical Quality Control,Khanna Publishers,1998

R5 R.K.Rajput, A Text book of Applied Mechanics, Laxmi Publications, 2011.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Industrial Engineering and Management

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 Industrial Engineering Course Outcomes, CEOs, POs, PEOs	1	12-12-24		TLM1	
2.	Definition of IE, Development, Applications	1	13-12-24		TLM1	
3.	Role of an IE, Differences between production management and IE	1	14-12-24		TLM1	
4.	Quantitative tools of IE and productivity measurement	1	19-12-24		TLM1	
5.	Concepts of Management, Importance, functions of management	1	20-12-24		TLM1	
6.	Scientific management, Taylors principle	1	21-12-24		TLM1	
7.	Theory Xand Theory Y	1	26-12-24		TLM1	
8.	**Tutorial-1**	1	26-12-24		TLM1	
9.	Fayal's principle of management	1	27-12-24		TLM1	
10.	Plant Layout: Factors governing plant location, Types of Plant Layout	1	28-12-24		TLM1	
11.	Applications, quantitative techniques for optimal design of layouts,	1	2-1-25		TLM1	
12.	plant maintenance, preventive and breakdown maintenance	1	2-1-25		TLM1	
13.	**Tutorial-2**	1	3-1-25		TLM1	
14.	Assignment -1/ Quiz-1	1	3-1-25		TLM1	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Work Study

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.	Importance of Work Study, Types of production	1	4-1-25		TLM1, 2	
16.	Applications of Work Study	1	9-1-25		TLM1,2	
17.	Method Study	1	10-1-25		TLM1,2	
18.	Time study, Work sampling	1	10-1-25		TLM1,2	
19.	PMTS, Micro-motion Study	1	11-1-25		TLM1	
20.	Rating Techniques, MTM	1	23-1-25		TLM1,2	

21.	Work Factor System	1	23-1-25		TLM2	
22.	Principles of Ergonomics, Flow process charts	1	24-1-25		TLM2	
23.	**Tutorial-3**	1	24-1-25		TLM3	
24.	String diagrams and Therbligs Assignment -II/ Quiz-I1	1	25-1-25		TLM2,3	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT-III: Statistical Quality Control

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Statistical Quality Control: Introduction to Quality Control	1	6-2-25		TLM2	
26.	Queuing Assurance and its importances	1	6-2-25		TLM1,2	
27.	Attribute Sampling inspection with single and double sampling	1	7-2-25		TLM2	
28.	Control Charts-X and R-charts	1	8-2-25		TLM2	
29.	X and S charts and their applications	1	13-2-25		TLM2	
30.	Numerical examples	1	14-2-25		TLM2	
31.	Numerical examples	1	15-2-25		TLM1	
32.	**Tutorial – 4**	1	15-2-25		TLM3	
33.	Numerical examples	1	20-2-25		TLM1	
34.	Total Quality Management: Introduction	1	20-2-25		TLM1	
35.	Zero defect concept, quality circles,	1	21-2-25		TLM2	
36.	Implementation applications	1	22-2-25		TLM1,2	
37.	ISO quality systems	1	22-2-25		TLM1,2	
38.	Six Sigma-definition,basic concepts	1	27-2-25		TLM2	
39.	Tutorial-5 & Assignment -III/ Quiz-III	1	27-2-25		TLM3	
No. of classes required to complete UNIT-III: 14				**No. of classes taken:**		

UNIT-IV: Financial Managemen

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.	Scope and nature of financial management	1	28-2-25		TLM1,2	
41.	Sources of finance, Ratio analysis	1	1-3-25		TLM1,2	
42.	Management of working capital	1	6-3-25		TLM1,2	
43.	**Tutorial-6**	1	6-3-25		TLM1,2	
44.	Estimation of working capital requirements	1	7-3-25		TLM3	
45.	Cost accounting and budget control and budgetary control, capital budgeting	1	8-3-25		TLM2	
46.	Nature of Investment Decisions-Investment Evaluation criteria	1	13-3-25		TLM2	
47.	NPV,IRR,PI,Payback period and ARR numerical problems	1	14-3-25		TLM1,2	
48.	numerical problems		15-3-25			
49.	**Tutorial-7 &** Assignment -III/ Quiz-III	1	15-3-25		TLM3	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Human Resource Management

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
50.	Concepts of HRM	1	20-3-25		TLM1,2	
51.	Personnel management and industrial relations	1	21-3-25		TLM1,2	
52.	Functions of Personnel management	1	22-3-25		TLM3	
53.	Job-Evaluation, its importance and types	1	27-3-25		TLM1,2	
54.	**Tutorial-8**	1	28-3-25		TLM2	
55.	Merit Rating, Quantitative methods	1	29-3-25		TLM1,2	
56.	Wage incentive plans and types	1	3-4-25		TLM1,3	
57.	Value Analysis: Value Engineering, implementation,procedure	1	3-4-25		TLM3	
58.	Enterprise Resource planning and supply chain management.	1	4-4-25		TLM1,2	
59.	Unit-V Revision	1	5-4-25		TLM2,3	
60.	Unit-III, IV, V Revision	1			TLM2,3	
No. of classes required to complete UNIT-V: 11				**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 (R17 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), 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 modelling 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 apply the knowledge of Aerodynamics, Propulsion, Aircraft structures and Flight Dynamics in Aerospace vehicle design
PSO 2	To prepare the students to work effectively in Aerospace and Allied Engineering organizations

Title	**Course Instructor**	**Module Coordinator**	**Head of the Department**
Signature			

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Phone: 08659-222933, Fax: 08659-222931

FRESHMAN ENGINEERING DEPARTMENT

COURSE HANDOUT

PART-A

Name of Course Instructor : **Dr. K. R. Kavitha**
Course Name & Code : Complex Variabes, Probability and Statistics & 23FE13
L-T-P Structure : **3**-0 -0 **Credits: 3**
Program/Sem/Sec : II B.Tech/IV sem/ASE **A.Y.:** 2024– 25.

PREREQUISITE: Complex numbers, Partial Differentiation

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- To familiarize the complex variables
- To familiarize the students with the foundations of probability and statistical methods
- To equip the students to solve application problems in their disciplines.

COURSE OUTCOMES (COs): Upon successful completion of the course, the student will be able to

CO1	Apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic. (L3)
CO2	Make use of Cauchy, residue theorem to evaluate certain integrals. (L3)
CO3	Infer the statistical inferential methods based on small and large sample tests. (L4)
CO4	Find the differentiation and integration of complex functions used in engineering problems. (L3)
CO5	Design the components of a classical hypothesis test. (L4)

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	-	-	-	-	-	-	-	-	1			
CO 2	3	2	1	-	-	-	-	-	-	-	-	1			
CO 3	3	2	2	3	-	-	-	-	-	-	-	1			
CO 4	3	2	1	-	-	-	-	-	-	-	-	1			
CO 5	3	3	2	3	-	-	-	-	-	-	-	1			
1 - Low						**2** –Medium						**3** - High			

TEXTBOOKS:

T1	Dr. B.S. Grewal, "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, New Delhi, 2015.
T2	Miller & Freund's "Probability and Statistics for Engineers", 7th edition. PHI, New Delhi, 2008.

REFERENCE BOOKS:

R1	J.W. Brown and R.V. Churchill, "Complex Variables and Applications", 9th edition, Mc.Graw Hill, 2013.
R2	S.C. Gupta, V.K. Kapoor, "Fundamentals of Mathematical Statistics", 11thEdition, Sultan Chand and sons, New Delhi,2012.
R3	Jay L. DeVore, "Probability and Statistics for engineering and the sciences." , 8th edition, Cengage Learning India, 2012.
R4	Sharon L. Myers, Keying Ye, Ronald E Walpole, "Probability and Statistics for Engineers and Scientists, 8th edition, Pearson Education International, 2017.
R5	Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 4th edition, Academic Foundation, 2011.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Functions of a Complex variable and complex Integration

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.	Continuity	1	09-12-2024		TLM1	
2.	Differentiability	1	10-12-2024		TLM1	
3.	Analytic functions	1	11-12-2024		TLM1	
4.	CR Equations – Cartesian form	1	12-12-2024		TLM1	
5.	CR Equations – Polar form	1	16-12-2024		TLM1	
6.	Harmonic and Conjugate Harmonic	1	17-12-2024		TLM1	
7.	Milne Thompson method	1	18-12-2024		TLM1	
8.	Line Integration	1	19-12-2024		TLM1	
9.	Cauchy's Integral theorem, formulas – problems	1	23-12-2024		TLM1	
10.	Generalized Cauchy's Integral formula	1	24-12-2024		TLM1	
11.	Tutorial 1	1	26-12-2024		TLM3	
No. of classes required to complete UNIT-I: 11				**No. of classes taken:**		

UNIT-II: Series Expansions and Residue theorem

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.	Radius of Convergence	1	30-12-2024		TLM1	
13.	Expansion of function in Taylor series	1	31-12-2024		TLM1	
14.	Expansion of function in Maclaurin's series	1	02-01-2025		TLM1	
15.	Expansion of function in Laurent series	1	06-01-2025		TLM1	
16.	Expansion of function in Laurent series	1	08-01-2025		TLM1	
17.	Singularities, Poles and Residues	1	09-01-2025		TLM1	
18.	Residue theorem problems	1	20-01-2025		TLM1	
19.	Evaluation of real integrals of Type-I	1	21-01-2025		TLM1	
20.	Evaluation of real integrals of Type-II	1	22-01-2025		TLM1	
21.	Tutorial 2	1	23-01-2025		TLM1	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

I MID EXAMINATIONS (27-01-2025 TO 01-02-2025)

UNIT-III: Probability and Distributions

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	1	03-02-2025		TLM1	
23.	Bayes' theorem, problems	1	04-02-2025		TLM1	
24.	Random variables, Expectations	1	05-02-2025		TLM1	
25.	Problems on PMF	1	06-02-2025		TLM1	
26.	Problems on PDF	1	10-02-2025		TLM2	
27.	Mathematical Expectations and Variance	1	11-02-2025		TLM1	
28.	Binomial distribution	1	12-02-2025		TLM1	
29.	Poisson distribution	1	13-02-2025		TLM1	
30.	Uniform distribution	1	17-02-2025		TLM1	
31.	Normal distribution	1	18-02-2025		TLM1	
32.	Normal distribution	1	19-02-2025		TLM1	
33.	Tutorial 3	1	20-02-2025		TLM3	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Sampling 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
34.	Introduction	1	24-02-2025		TLM1	
35.	Sampling distribution, definitions	1	25-02-2025		TLM1	
36.	Sampling distribution of mean, variance	1	27-02-2025		TLM1	
37.	Problems	1	03-03-2025		TLM1	
38.	Problems on central limit theorem	1	04-03-2025		TLM1	
39.	Estimation	1	05-03-2025		TLM1	
40.	Normal theory distributions	1	06-03-2025		TLM1	
41.	Estimation using t distribution	1	10-03-2025		TLM1	
42.	Estimation using χ^2 distribution	1	11-03-2025		TLM1	
43.	Estimation using F-distributions	1	12-03-2025		TLM1	
44.	Tutorial-4	1	13-03-2025		TLM3	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Tests of Hypothesis

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
45.	Testing of Hypothesis definitions	1	17-03-2025		TLM1	
46.	Z-test for means	1	18-03-2025		TLM1	
47.	Z-test for means	1	19-03-2025		TLM1	
48.	Z-test for proportions	1	20-03-2025		TLM1	
49.	Z-test for proportions	1	24-03-2025		TLM1	
50.	t-test for means	1	25-03-2025		TLM1	

51.	t-test for means		26-03-2025			
52.	F-test for variances	1	27-03-2025		TLM1	
53.	χ^2-test for goodness of fit	1	01-04-2025		TLM1	
54.	χ^2-test for independence of attributes	1	02-04-2025		TLM1	
55.	Tutorial-5	1	03-04-2025		TLM3	
No. of classes required to complete UNIT-V: 11				**No. of classes taken:**		
II MID EXAMINATIONS (07-04-2025 TO 12-04-2025)						

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 (R17 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), 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	**Ethic**s: 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.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. K.R. Kavitha**	**Dr. K.R. Kavitha**	**Dr. A. Rami Reddy**	**Dr. A. Rami Reddy**
Signature				

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF AEROSPACE ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. G V SURYA NARAYANA
Course Name & Code : **23AE04-MATERIALS AND MANUFACTURING TECHNOLOGY**
L-T-P Structure : 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech-IV SEM **A.Y.:** 2024-25

COURSE OBJECTIVES:

- The objectives of this course are to acquire knowledge on structure of metals and alloys, understand the concept of alloys.
- To learn equilibrium diagrams and to learn primary manufacturing processes, working of basic machines and various operations to be performed.
- Teach conventional and unconventional machining processes.

COURSE OUTCOMES (COs):

COs	Statements	Blooms Level
CO1	Understand the properties of the metals and alloys based on structures.	Understand
CO2	Classify, construct and analyze equilibrium diagrams, various ferrous, non-ferrous metals and alloys.	Understand
CO3	Acquire knowledge of the basic aspects of casting process.	Understand
CO4	Know the various basic concepts of welding process, metal forming process and sheet metal operations in the manufacturing of products.	Understand
CO5	Know different conventional and unconventional machining processes while manufacturing a product	Understand

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

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

1 - Low **2** –Medium **3** - High

TEXTBOOKS:

T1 V.D.Kotgire, S.V.Kotgire, Material Science and Metallurgy, Everest Publishing House, 42nd Edition, 2018

T2 Rao. P. N, Manufacturing Technology, Volume 1 and 2 Tata McGraw-Hill, 2018.

REFERENCE BOOKS:

R1 Ghosh. A, Malik. A. K, Manufacturing Science, Second Edition, East West Publisher, 2010.

R2 Kalpakjain. S, Schmid. S. R, Manufacturing Processes for Engineering Materials, 6th Edition, Pearson Education, 2017

R3 Richard A.Flinn, Paul K.Trojan, Engineering Materials and Their Applications, Jaico Publishing House, 4thEdition, 1999.

R4 William and callister, Materials Science and engineering, Wiley India private Ltd., 2011.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: STRUCTURE OF METALS:

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.	**STRUCTURE OF METALS:** Crystal Structures-	01	09-12-2024		TLM1, TLM2	
2.	Body-centered cubic,	01	12-12-2024		TLM1, TLM2	
3.	Face centered cubic,	01	13-12-2024		TLM1, TLM2	
4.	closed packed hexagonal,	01	14-12-2024		TLM1, TLM2	
5.	Mechanism of grain	01	16-12-2024		TLM1, TLM2	
6.	grain boundaries	01	19-12-2024		TLM1, TLM2	
7.	Effect of grain boundaries on the properties of metal/alloys,	01	20-12-2024		TLM1	
8.	Determination of grain size.	01	21-12-2024		TLM1	
9.	Solid solutions-Interstitial Solid Solutions	01	23-12-2024		TLM1, TLM2	
10.	Substitution Solid Solution,	01	26-12-2024		TLM1	
11.	Hume Rothery rules. Assignment-1	01	2712-2024		TLM1, TLM2	
No. of classes required to complete UNIT-I: 11				**No. of classes taken:**		

UNIT-II: EQUILIBRIUM DIAGRAMS AND TRANSFORMATIONS, STEEL, CAST IRON AND NON-FERROUS METALS AND ALLOYS:

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.	**EQUILIBRIUM DIAGRAMS AND TRANSFORMATIONS:** Classification of equilibrium diagrams-	01	28-12-2024		TLM1, TLM2	
13.	isomorphous, eutectic equilibrium diagrams.	01	30-12-2024		TLM1, TLM2	
14.	partial eutectic equilibrium diagrams.	01	02-01-2025		TLM1	
15.	Lever rule		03-01-2025		TLM1, TLM2	
16.	Study of Cu-Ni equilibrium diagram	01	04-01-2025		TLM1, TLM2	
17.	Iron-Iron carbide equilibrium diagram	01	06-01-2025		TLM1	
18.	**STEEL:** Classification of steels, structure,	01	09-01-2025		TLM1, TLM2	
19.	properties and applications of plain carbon steel,	01	10-01-2025		TLM1, TLM2	
20.	low carbon steel		11-01-2025		TLM1, TLM2	
21.	medium carbon steel,	01	13-01-2025		TLM1, TLM2	
22.	high carbon steel.		16-01-2025		TLM1, TLM2	
23.	**CAST IRONS:** structure, properties and applications of white cast iron,	01	17-01-2025		TLM1, TLM2	
24.	malleable cast iron, grey cast iron,	01	18-01-2025		TLM1, TLM2	
25.	spheroidal graphite cast iron	01	20-01-2025		TLM1, TLM2	
26.	**NON-FERROUS METALS AND ALLOYS:** structure,	01	23-01-2025		TLM1, TLM2	
27.	properties and applications of copper and its alloys,	01	24-01-2025		TLM1, TLM2	
28.	Aluminium and its alloys. Assignment-I	01	25-01-2025		TLM1	
No. of classes required to complete UNIT-II: 17				**No. of classes taken:**		

UNIT-III: INTRODUCTION TO MANUFACTURING AND CASTING

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 MANUFACTURING AND CASTING**: Classification of manufacturing processes	01	03-02-2025		TLM1	
30.	Engineering materials, Steps involved in making a casting	01	06-02-2025		TLM1	
31.	Advantages of castings and its applications	01	07-02-2025		TLM1	
32.	Types of patterns, pattern allowances.	01	08-02-2025		TLM1	
33.	principles of Gating ratio, types of raisers	01	10-02-2025		TLM1	
34.	**Special casting processes**: Centrifugal casting,	01	13-02-2025		TLM1, TLM2	
35.	Die casting	01	15-02-2025		TLM1, TLM2	
36.	Investment casting, Assignment-II	01	17-02-2025		TLM1, TLM2	
No. of classes required to complete UNIT-III: 08				**No. of classes taken:**		

UNIT-IV: WELDING, METAL FORMING PROCESSES, EXTRUSION OF METALS:

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.	**WELDING:** Classification of Welding Process-	01	20-02-2025		TLM1, TLM2	
38.	Types of Welds- Welded Joints,	01	21-02-2025		TLM1	
39.	Principle and Applications- Gas Welding	01	22-02-2025		TLM1	
40.	Arc Welding, Friction Welding,	01	24-02-2025		TLM1, TLM2	
41.	Soldering and Brazing.	01	27-02-2025		TLM1, TLM2	
42.	**METAL FORMING PROCESSES:** Types of Rolling Mills and Products;	01	28-02-2025		TLM1, TLM2	
43.	Principles of Forging	01	01-03-2025		TLM1	
44.	Types of Forging-Smith Forging, Drop Forging	01	06-03-2025		TLM1, TLM2	
45.		01	07-03-2025		TLM1, TLM2	

46.	**EXTRUSION OF METALS:** Hot Extrusion, Cold Extrusion	01	08-03-2025		TLM1, TLM2	
47.	Forward Extrusion, Backward Extrusion	01	10-03-2025		TLM1, TLM2	
48.	Impact Extrusion,	01	13-03-2025		TLM1, TLM2	
49.	Hydrostatic Extrusion. Assignment-II	01	15-03-2025		TLM1, TLM2	
No. of classes required to complete UNIT-IV: 13				**No. of classes taken:**		

UNIT-V: MACHINING PROCESSES, SHAPING, PLANNING, MILLING AND DRILLING MACHINES (UNCONVENTIONAL MACHINING PROCESSES), AND INTRODUCTION TO UNCONVENTIONAL MACHINING PROCESSES:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
50.	**MACHINING PROCESSES**: Tool Geometry	01	17-03-2025		TLM1	
51.	Cutting Tool & Tool Wear	01	20-03-2025		TLM1	
52.	Cutting Materials; Cutting Fluids;	01	21-03-2025		TLM1	
53.	Introduction and Working Principle of Lathe and Operations	01	24-03-2025		TLM1, TLM2	
54.	Principles of Working, Principal Parts, Specifications, Classification, Comparison and Operations Performed: SHAPING	01	27-03-2025		TLM1, TLM2	
55.	Planning, Milling	01	28-03-2025		TLM1, TLM2	
56.	Drilling Machines	01	29-03-2025		TLM1, TLM2	
57.	**INTRODUCTION TO UNCONVENTIONAL MACHINING PROCESSES**: Classification of Unconventional Machining Processes. Abrasive Jet Machining	01	31-03-2025		TLM1, TLM2	
58.	Ultrasonic Machining	01	03-04-2025		TLM1, TLM2	
59.	Laser Beam Machining, Assignment II	01	04-04-2025		TLM1, TLM2	
No. of classes required to complete UNIT-V: 10				**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.	Advanced Additive Manufacturing	01	05-04-2025		TLM2	
2.	Advance welding					
3.	Advanced material removing process (CNC & NC Program)					
No. of classes required to complete for advanced topics		**01**				

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 & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), 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**: To 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 modelling 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	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and teamwork**: 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 apply the knowledge of Aerodynamics, Propulsion, Aircraft structures, and Flight Dynamics in Aerospace vehicle design.
PSO 2	To prepare the students to work effectively in Aerospace and Allied Engineering organizations.

Title	**Course Instructor**	**Module Coordinator**	**Head of the Department**
Signature			
Name of the Faculty	Mr. G V SURYA NARAYANA	Mr. I DAKSHINA MURTHY	Dr. P. LOVARAJU

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DEPARTMENT OF AEROSPACE ENGINERRING

COURSE HANDOUT

PART-A

Name of Course Instructor: S.Indrasena Reddy
Course Name & Code **:** Solid Mechanics & 23AE05
L-T-P Structure **:3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/IV Sem **A.Y.:** 2024-25

PREREQUISITE: **Engineering Mechanics**

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- To learn the basic concepts of stress, strain and relations based on linear elasticity,
- Students can analyze beams and draw shear force and bending moment diagrams
- To learn theory of simple bending, Shear and torsion.
- Understand the principal stresses and shear stress distribution.
- Design and analysis of components subjected to deformation and internal pressure.

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

CO1	Describe the concept of stress and strain to analyze and design structural members and machine parts under various loading conditions.(L2)
CO2	Evaluate stress, shear force, bending moment, under different loading conditions.(L3)
CO3	Analyze Bending and torsional stresses of different components.(L3)
CO4	Understand shear stress distributions over different cross sections and concept of Principle Stresses.(L2)
CO5	Model and analyze the behavior of basic structural members subjected to deflection and internal pressure.(L4)

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

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

TEXTBOOKS:

T1 Ramamrutham. S, Narayanan R, Strength of Materials, Dhanpat Rai & Sons, 2017.
T2 B.C. Punmia, Strength of materials,10/e, Lakshmi publications Pvt. Ltd, New Delhi, 2018

REFERENCE BOOKS:

R1 Popov. E. P, Mechanics of Materials, Prentice Hall Inc, 1976
R2 Andrew. P, Singer F.L., Strength of Materials, Harper and Row Publishers, New York, 1987.
R3 Gambhir. M. L, Fundamentals of Solid Mechanics, PHI Learning, 2009. Subramanian. R, Strength of Materials, Second Edition, Oxford University Press, 2010.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: SIMPLE STRESSES AND STRAINS

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 Solid Mechanics	1	09-12-24		TLM1	
2.	Properties of material	1	10-12-24		TLM1	
3.	Types of stresses and strains	1	12-12-24		TLM1	
4.	Stress strain diagrams	1	14-12-24		TLM1	
5.	stepped bars, Bars of varying c/s	1	16-12-24		TLM1	
6.	Composite bar problems	1	17-12-24		TLM1	
7.	Bar Problems	1	19-12-24		TLM3	
8.	Temperature stresses	1	21-12-24		TLM1	
9.	strain energy due to axial force	1	23-12-24		TLM1	
10.	Strain energy problems	1	24-12-24		TLM1	
11.	Problems on Strain Energy	1	26-12-24		TLM3	
12.	Change in Volume	1	28-12-24		TLM1	
13.	stresses due to sudden loads and impact	1	30-12-24		TLM1	
14.	Relation between elastic Constants	1	31-12-24		TLM1	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: SHEAR FORCE AND BENDING MOMENT

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.	Introduction to SF and BM	1	02-01-25		TLM1	
16.	Relationship Between SF and B.M	1	04-01-25		TLM1	
17.	SFD & BMD for cantilever beam	1	06-01-25		TLM1	
18.	cantilever beam subjected to UDL	1	07-01-25		TLM1	
19.	Cantilever beam problems	1	09-01-25		TLM3	
20.	SFD & BMD for S.S.B	1	16-01-25		TLM1	
21.	Combination of loads for S.S.B	1	18-01-25		TLM1	
22.	SFD and BMD for Overhang beams	1	20-01-25		TLM1	
23.	Maximum Bending Moment	1	21-01-25		TLM1	
24.	Overhang beam Problems	1	23-01-25		TLM3	
25.	Point of contra flexure	1	25-01-25		TLM1	
No. of classes required to complete UNIT-II: 11				**No. of classes taken:**		

UNIT-III: STRESSES IN BEAMS

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.	Theory of simple bending	1	03-02-25		TLM1	
27.	Derivation of Flexural equation	1	04-02-25		TLM1	
28.	Section modulus of various cross section	1	06-02-25		TLM1	
29.	Flexural stresses	1	08-02-25		TLM1	
30.	Normal stresses due to flexure	1	10-02-25		TLM1	
31.	Theory of pure torsion & Assumptions	1	11-02-25		TLM1	
32.	Bending Stresses problems	1	13-02-25		TLM3	
33.	Derivation of Torsion equations	1	15-02-25		TLM1	
34.	Torsion problems	1	17-02-25		TLM1	

35.	Power transmitted by shaft	1	18-02-25		TLM1	
36.	Stresses in solid and hollow shafts	1	20-02-25		TLM1	
No. of classes required to complete UNIT-III: 11			**No. of classes taken:**			

UNIT-IV: SHEAR STRESSES, Principal STRESSES

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 to shear stress	1	22-02-25		TLM1	
38.	Shear stress distribution across different C/S's	1	24-02-25		TLM1	
39.	Shear stress distribution across I,T sections	1	25-02-25		TLM1	
40.	Shear stress distribution problems	1	27-02-25		TLM3	
41.	Principal Stresses	1	01-03-25		TLM1	
42.	Member Subjected to Direct Stresses	1	03-03-25		TLM1	
43.	Normal & Tangential stresses on inclined planes	1	04-03-25		TLM1	
44.	Member Subjected to Direct Stresses	1	06-03-25		TLM3	
45.	Two Mutually Perpendicular Planes	1	10-03-25		TLM1	
46.	Perpendicular loads with Simple Shear	1	11-03-25		TLM1	
47.	Graphical Method (Mohr's Circle Method).	1	13-03-25		TLM1	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: DEFLECTION OF BEAMS

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.	Introduction to deflection of beams	1	15-03-25		TLM1	
49.	Differential equation of Elastic line	1	17-03-25		TLM1	
50.	Deflection in statically determinate beams	1	18-03-25		TLM1	
51.	Deflection of beams double integration	1	20-03-25		TLM3	
52.	Macaulay's Method for prismatic members	1	22-03-25		TLM1	
53.	Deflection of overhang beams	1	24-03-25		TLM1	
54.	Introduction- Thin, Thick cylindrical shell	1	25-03-25		TLM1	
55.	Hoop and longitudinal stresses thin cylinder	1	27-03-25		TLM1	
56.	Thin cylindrical shells	1	29-03-25		TLM1	
57.	Hoop and longitudinal stresses thick	1	31-03-25		TLM1	
58.	Spherical shells changes in dimensions	1	01-04-25		TLM1	
No. of classes required to complete UNIT-V: 11				**No. of classes taken:**		

Advanced Topics/ beyond Syllabus in SM

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.	Applications of Stresses in beams	1	03-04-25		TLM1	
2.	Statically indeterminate beams	1	05-04-25		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 modelling 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	**Ethic**s: 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 apply the knowledge of Aerodynamics, Propulsion, Aircraft structures and Flight Dynamics in the Aerospace vehicle design
PSO 2	To prepare the students to work effectively in Aerospace and Allied Engineering organizations

Course Instructor	Module Coordinator	HOD
(S.Indrasena Reddy)	(S.Indrasena Reddy)	(Dr.P.Lovaraju)

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L.B. REDDY NAGAR, MYLAVARAM, N.T.R.DIST., A.P.-521 230.
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DEPARTMENT OF AEROSPACE ENGINEERING

COURSE HANDOUT
PART-A

PROGRAM : B.Tech., IV-Sem., ASE

ACADEMIC YEAR : 2024-25

COURSE NAME & CODE : **Aerodynamics-23AE06**

L-T-P STRUCTURE : 3-0-0

COURSE CREDITS : 3

COURSE INSTRUCTOR : **Dr. P. Lovaraju**

PRE-REQUISITE: Nil

Course Objective:

- To learn the theoretical methods to solve the potential flow problems
- To familiarize potential flow theory to solve for airfoil characteristics
- To familiarize the finite wing theory and properties of viscous flows and boundary layer development over flat plate

Course Outcomes:

COs	Statements	Blooms Level
CO1	Apply Laplace equation for obtaining 2D and axisymmetric solutions	**Apply**
CO2	Apply conformal transformation to form aerodynamic shapes	**Apply**
CO3	Apply potential flow theory to solve airfoil characteristics	**Apply**
CO4	Apply Prandtl's lifting line theory to predict finite wing properties	**Apply**
CO5	Illustrate the effect of boundary layer on flow over objects	**Understand**

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

Course Code	Cos	Program Outcomes												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
20AE06	CO1	3	1	2	1	-	-	1	-	-	-	-	-	3	2
	CO2	3	3	3	3	-	-	1	-	-	-	-	-	3	3
	CO3	3	2	3	3	-	-	1	-	-	-	-	-	3	3
	CO4	3	3	3	2	-	-	1	-	-	-	-	-	3	3
	CO5	3	3	2	2	-	-	1	-	-	-	-	-	3	2
1 = Slight (Low)				**2 = Moderate (Medium)**						**3-Substantial(High)**					

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-' 1-** Slight(Low), **2 -** Moderate(Medium), **3 -** Substantial (High).

TEXT BOOKS:

T1 Anderson, J.D., Fundamentals of Aerodynamics", Sixth Edition, McGraw-Hill Book Co., New York, 2017

T2 Rathakrishnan. E, Theoretical Aerodynamics, Wiley, 2013

REFERENCE BOOKS:

R1 Houghton. E. L., Carpenter P. W, Collicott. C. H, Valentine. D. T, Aerodynamics for Engineering students, Seventh Edition, Elseveir, 2017

R2 Milne-Thomson. L. H., Theoretical aerodynamics, Courier Corporation, 2012.

R3 Clancy. J. L, Aerodynamics, Sterling Book House, 2006

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: POTENTIAL FLOW

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.	Overview of the course and course outcomes	1	09-12-2024		TLM1	
2.	Review of Fluid Mechanics and Introduction to the Potential flow	1	11-12-2024		TLM1	
3.	Basic Flows-Uniform parallel flow, Source and Sink Flows	2	12-12-2024 13-12-2024		TLM1	
4.	Source and Sink Pair-Doublet, Simple vortex	1	16-12-2024		TLM1	
5.	Tutorial	1	18-12-2024		TLM3	

6.	Combination of uniform flow and Source-Flow past half body	1	19-12-2024		TLM1	
7.	Rankine oval	1	20-12-2024		TLM1	
8.	Flow over circular Cylinder without circulation	2	23-12-2024, 26-12-2024		TLM1	
9.	Flow over circular Cylinder with circulation	2	27-12-2024 30-12-2024		TLM1	
10.	Kutta-Joukowsky Theorem	1	01-01-2025		TLM1	
11.	Tutorial	1	02-01-2025		TLM3	
No. of classes required to complete UNIT-I		14		**No. of classes taken:**		

UNIT-II: CONFORMAL TRANSFORMATION

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	Conformal Mapping Introduction, Basic Principles, Methods for Performing Transformation	1	03-01-2025, 06-01-2025		TLM1	
13	Examples of Simple Transformation	2	08-01-2025, 09-01-2025		TLM	
14	Kutta-Joukowski Transformation	1	10-01-2025		TLM1	
15	Transformation of Circle to Straight Line, Transformation of Circle to Ellipse	3	20-01-2025, 22-01-2025, 23-01-2025		TLM1	
16	Transformation of Circle to Symmetrical Aerofoil	2	24-01-2025, 27-01-2025		TLM1	
17	Transformation of Circle to Cambered Aerofoil	2	29-01-2025, 30-01-2025		TLM1	
18	Tutorial	1	31-01-2025		TLM3	
No. of classes required to complete UNIT-II		12		**No. of classes taken:**		

I Mid Examination (03-02-2025 to 08-02-2025)

UNIT-III: THIN AEROFOIL 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
19	Introduction to Aerofoil Theory	1	10-02-2025		TLM1	
20	Airfoil Characteristics	1	12-02-2025		TLM1	
21	Vortex Sheet	1	13-02-2025		TLM1	
22	Kutta Condition, Kelvin's Circulation Theorem, Starting Vortex	2	14-02-2025 17-02-2025		TLM1	
23	Thin Aerofoil Theory and its applications	2	19-02-2025 20-02-2025		TLM1	
24.	Application of thin aerofoil theory-Analysis of flow	2	21-02-2025 24-02-2025		TLM1	

	over symmetric airfoil					
25.	Application of thin aerofoil theory-Analysis of flow over cambered airfoil	2	27-02-2025 28-02-2025		TLM1	
26.	Tutorial	1	03-03-2025		TLM3	
No. of classes required to complete UNIT-III		12		**No. of classes taken:**		

UNIT-IV: FINITE WING 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
27.	Finite Wing Theory-Introduction	1	05-03-2025		TLM1	
28.	Down wash and Induced drag, Trailing vortex	1	06-03-2025		TLM1	
29.	Vortex filament	1	07-03-2025		TLM1	
30.	Biot-Savart's law, Infinite and semi-infinite vortex filament	2	10-03-2025, 12-03-2025		TLM1	
31.	Helmholtz theorems	1	13-03-2025		TLM1	
32.	Horseshoe Vortex, Prandtl's Classical Lifting Line Theory	2	17-03-2025, 19-03-2025		TLM1	
33.	Elliptic Lift Distribution	2	20-03-2025,		TLM1	
34.	General Lift Distribution	1	21-03-2025		TLM1	
35.	Tutorial	1	24-03-2025		TLM3	
No. of classes required to complete UNIT-IV		12		**No. of classes taken:**		

UNIT-V: BOUNDARY LAYER

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, Boundary Layer Development	1	26-03-2025		TLM1	
37.	Boundary layer Thickness, Boundary layer Displacement Thickness	1	27-03-2025		TLM1	
38.	Momentum Thickness, Energy Thickness	1	28-03-2025		TLM1	

39.	Types of Boundary layer, Momentum Integral Estimates	1	31-03-2025		TLM1	
40.	Karman Analysis of Flat plate	1	02-04-2025		TLM1	
41.	Navier Stokes Equations-Boundary Layer Equations-2D	2	03-04-2025 & 04-04-2025		TLM1	
42.	Boundary layer growth on a Flat Plate, Blasius Solution	1	07-04-2025		TLM1	
43.	Boundary Layer with Pressure Gradient	1	09-04-2025		TLM1	
44.	Tutorial	1	10-04-2025		TLM3	
45.	Revision	1	11-04-2025		TLM2	
No. of classes required to complete UNIT-V		**10**		**No. of classes taken:**		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (lab or 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 & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), 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

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

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 Investigation 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.

PO5: Modern Tool Usage: Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including predictions and modeling to complex engineering activities with an understanding of the limitations.

PO6: 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.

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: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team Work: 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 member and 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 engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: To apply the knowledge of Aerodynamics, Propulsion, Aircraft structures and Flight Dynamics in the Aerospace vehicle design
PSO2: To prepare the students to work effectively in Aerospace and Allied Engineering organizations

Course Instructor	**Module Coordinator**	**HOD**

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF AEROSPACE ENGINEERING

MANUFACTURING TECHNOLOGY LAB-23AE53

TIMETABLE

Name of Course Instructor: Mr. G V SURYA NARAYANA/Mr. Nazumuddin Shaik
Course Name & Code : Manufacturing Technology Lab-23AE53 **Regulation**: R23
L-T-P Structure : 0-0-3 **Credits:** 1.5
Program/Sem/Sec : B.Tech/IV-SEM **A.Y.:** 2024-25

DAY	1	2	3		4	5	6
	09.00 to 10.00	10.00 to 11.00	11.00 To 12.00		01.00 to 02.00	02.00 to 03.00	03.00 to 04.00
MON							
TUE							
WED	MT LAB – BATCH I						
THU							
FRI					MT LAB – BATCH II		
SAT							

LUNCH

LAB IN-CHARGE **HOD**

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L-T-P Structure : 0-0-3 **Credits:** 1.5
Program/Sem/Sec : B.Tech/IV-SEM **A.Y.:** 2024-25

I Cycle Schedule (MT LAB): BATCH-I &II

S. No.	1st Batch Dates	2nd Batch Dates	Exp. No.	Experiment Name
1	11-12-2024	13-12-2024	--	Introduction
2	18-12-2024	20-12-2024	E1	Moulding, Melting and Casting
3	08-01-2025	27-12-2024	E2	Pattern Design and making
4	15-01-2025	03-01-2025	E3	ARC Welding Butt Joint and Lap joint
5	23-01-2025	10-01-2025	E4	Spot Welding (chain), Spot Welding (Zigzag)
6	05-02-2025	17-01-2025	E5	Injection Moulding
7	12-02-2025	24-01-2025	---	Repetition Lab

II Cycle Schedule (MT LAB): BATCH-I & II

S. No.	1st Batch Dates	2nd Batch Dates	Exp. No.	Experiment Name
8	19-02-2025	07-02-2025	E6	Introduction, Lathe Operations: step turning, Tapper turning.
9	05-03-2025	14-02-2025	E7	Lathe Operations: knurling, Threading.
10	12-03-2025	21-02-2025	E8	Special Machines: Surface Grinding, Drilling and Tapping.
11	19-03-2025	28-02-2025	E9	Special Machines: Shaping.
12	26-03-2025	07-03-2025	E10	Special Machines: Milling.
13	28-03-2025	21-03-2025	--	Repetition
14	02-04-2025	04-04-2025	--	Lab Exam

LAB IN-CHARGE **HOD**

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Course Name & Code **:** Manufacturing Technology Lab-23AE53 **Regulation**: R23
L-T-P Structure **:** 0-0-3 **Credits:** 1.5
Program/Sem/Sec **:** B.Tech/IV-SEM **A.Y.:** 2024-25

MT LAB BATCHS

SECTION	ROLL NUMBERS	TOTAL NO OF STUDENTS
BATCH -A	23761A5601 to 23761A5633	31
BATCH -B	23761A5634 to 23761A5651 24765A5601 to 23765A5612	30

LAB IN-CHARGE **HOD**

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MANUFACTURING TECHNOLOGY LAB-23AE53

Name of Course Instructor: Mr. G V SURYA NARAYANA/Mr. Nazumuddin Shaik
Course Name & Code : Manufacturing Technology Lab-23AE53 **Regulation**: R23
L-T-P Structure : 0-0-3 **Credits:** 1.5
Program/Sem/Sec : B.Tech/IV-SEM **A.Y.:** 2024-25

I CYCLE SCHEDULE - BATCH -A

Date/Exp. No	B-I	B-II	B-III	B-IV	B-V
	Introduction				
	E1	E2	E3	E4	E5
	E2	E3	E4	E5	E1
	E3	E4	E5	E1	E2
	E4	E5	E1	E2	E3
	E5	E1	E2	E3	E4

II CYCLE SCHEDULE- BATCH -A

Date/Exp. No	B-I	B-II	B-III	B-IV	B-V
	E6	E7	E8	E9	E10
	E7	E8	E9	E10	E6
	E8	E9	E10	E6	E7
	E9	E10	E6	E7	E8
	E10	E6	E7	E8	E9

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Course Name & Code : Manufacturing Technology Lab-23AE53 **Regulation**: R23
L-T-P Structure : 0-0-3 **Credits:** 1.5
Program/Sem/Sec : B.Tech/IV-SEM **A.Y.:** 2024-25

I CYCLE SCHEDULE - BATCH -B

Date/Exp. No	B-I	B-II	B-III	B-IV	B-V
	Introduction				
	E1	E2	E3	E4	E5
	E2	E3	E4	E5	E1
	E3	E4	E5	E1	E2
	E4	E5	E1	E2	E3
	E5	E1	E2	E3	E4

II CYCLE SCHEDULE- BATCH -B

Date/Exp. No	B-I	B-II	B-III	B-IV	B-V
	E6	E7	E8	E9	E10
	E7	E8	E9	E10	E6
	E8	E9	E10	E6	E7
	E9	E10	E6	E7	E8
	E10	E6	E7	E8	E9

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MANUFACTURING TECHNOLOGY LAB-23AE53

Name of Course Instructor: Mr. G V SURYA NARAYANA/Mr. Nazumuddin Shaik

Course Name & Code : Manufacturing Technology Lab-23AE53 **Regulation**: R23

L-T-P Structure : 0-0-3 **Credits:** 1.5

Program/Sem/Sec : B.Tech/IV-SEM **A.Y.:** 2024-25

EXPREMENTS

CYCLE-I

1. Moulding Melting and Casting.
2. Pattern Design and making.
3. ARC Welding Butt Joint and Lap joint,
4. Spot Welding (chain joint) and (Zigzag joint).
5. Injection Moulding.

CYCLE-II

6. Lathe Operations: Step turning, Tapper turning.
7. Lathe Operations: Knurling, Thread Cutting.
8. Special Machines: Drilling, Surface Grinding and Tapping.
9. Special Machines: shaping.
10. Special Machines: Milling

LAB IN-CHARGE **HOD**

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DEPARTMENT OF AEROSPACE ENGINEERING

MANUFACTURING TECHNOLOGY LAB-23AE53

Name of Course Instructor: Mr. G V SURYA NARAYANA/Mr. Nazumuddin Shaik
Course Name & Code : Manufacturing Technology Lab-23AE53 **Regulation**: R23
L-T-P Structure : 0-0-3 **Credits:** 1.5
Program/Sem/Sec : B.Tech/IV-SEM **A.Y.:** 2024-25

Course Outcomes:

After completion of the course students will be able to:

CO1	Develop various products using casting **(Apply-L3)**
CO2	Fabricate machine components with suitable welding, lathe and other machining operations **(Apply-L3)**
CO3	Manufacture plastic components using various plastic processing techniques **(Apply-L3).**

CO and PO Mapping:

23AE53-COs	Manufacturing Technology lab	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Develop various products using casting. **(Apply-L3)**	**3**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**3**
CO2	Fabricate machine components with suitable welding, lathe, and other machining operations **(Apply-L3)**	**3**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**3**
CO3	Manufacturing plastic components using various plastic processing techniques **(Apply-L3).**	**3**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**3**

LAB IN-CHARGE **HOD**

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DEPARTMENT OF AEROSPACE ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: S.Indrasena Reddy/ B.Udaya Lakshmi

Course Name & Code **:** Solid Mechanics Lab& 23AE54 **Regulation**: R23

L-T-P Structure **: 0-0-3** **Credits:** 1.5

Program/Sem/Sec : B.Tech/IV **A.Y.:** 2024-25

Prerequisites: Engineering Mechanics and Strength of Materials

Course Educational Objectives: To learn the methods to predict the response of a structure under loading and it susceptibility to various failure modes

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

CO 1	Analyze the various materials under different equilibrium loading conditions. (Analyze-L4)
CO 2	Perform tests and analyze materials subjected to tension, torsion, bending, and bucking (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
CO1	3	3	2	1								2	2	2
CO2	3	3	2	1								2	3	3

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**

1- Slight (Low), **2 –** Moderate (Medium), **3 -** Substantial (High).

PART-B

COURSE DELIVERY PLAN (LESSON PLAN)

Strength of Materials Lab

Batch-A (Wednesday)

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign Weekly
1.	Lab Demo	3	11-12-24		
2.	Experiment-I	3	18-12-24		
3.	Experiment-II	3	08-01-25		
4.	Experiment-III	3	22-01-25		
5.	Experiment-IV	3	05-02-25		
6.	Experiment-V	3	12-02-25		
7.	Experiment-VI	3	19-02-25		
8.	Experiment-VII	3	26-02-25		
9.	Experiment-VIII	3	05-03-25		
10.	Experiment-IX	3	12-03-25		
11.	Experiment-X	3	19-03-25		
12.	Repetition Lab	3	26-03-25		
13.	Internal Test	3	02-04-25		
No. of classes required to complete: 13					

Batch-B (Friday)

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign Weekly
1.	Lab Demo (I-Cycle)	3	13-12-24		
2.	Experiment-I	3	20-12-24		
3.	Experiment-II	3	27-12-24		
4.	Experiment-III	3	03-01-25		
5.	Experiment-IV	3	10-01-25		
6.	Experiment-V	3	24-01-25		
7.	Lab Demo (II-Cycle)	3	07-02-25		
8.	Experiment-VI	3	14-02-25		
9.	Experiment-VII	3	21-02-25		
10.	Experiment-VIII	3	28-02-25		
11.	Experiment-IX	3	07-03-25		
12.	Experiment-X	3	21-03-25		
13.	Repetition Lab	3	28-03-25		
14.	Internal Test	3	04-04-25		
No. of classes required to complete: 14					

PART-C

EVALUATION PROCESS (R23 Regulations):

Evaluation Task	Marks
Day to Day work = **A**	A=10
Record = **B**	B=05
Internal Test = **C**	C = 15
Cumulative Internal Examination : A + B + C	**30**
Semester End Examinations = D	**D = 70**
Total Marks: A + B + C + D	**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 modelling 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	**Ethic**s: 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 apply the knowledge of Aerodynamics, Propulsion, Aircraft structures and Flight Dynamics in the Aerospace vehicle design
PSO 2	To prepare the students to work effectively in Aerospace and Allied Engineering organizations

Title	Course Instructor	Module Coordinator	Head of the Department
Name of the Faculty	(S.Indrasena Reddy)	(S.Indrasena Reddy)	(Dr.P.Lovaraju)
Signature			

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
L.B.Reddy Nagar, Mylavaram – 521 230, N.T.R. District, Andhra Pradesh, India
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DEPARTMENT OF AEROSPACE ENGINEERING
Website: https://www.lbrce.ac.in/ase/index.php Email: hodaero@lbrce.ac.in Phone:08659-222933 Ext:624/623

COURSE HANDOUTS

PROGRAM	: B. Tech, IV Sem, Aerospace Engineering
ACADEMIC YEAR	: 2024-2025
COURSE NAME AND CODE	: 23AES2- MATLAB APPLICATIONS IN ENGINEERING LAB
L-T-P STRUCUTRE	: 0-1-2
COURSE CREDITS	: 2
COURSE INSTRUCTOR	: Dr. Sreenadh Chevula
COURSE COORDINAOTR	: Dr. Sreenadh Chevula

PRE-REQISITE

Course educational objectives : Engineering Mechanics and Numerical methods

COURSE OUTCOMES(CO's) : At the end of the course students are able to

CO1	Apply the basic MATLAB operations in basic engineering problems (Apply-L3)
CO2	Solve the system of linear algebraic equation using matrix operation (Apply-L3)
CO3	Apply the graphical user interface to write the code as more user friendly (Apply-L3)

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

BOS APPROVED TEXTBOOKS

T1 Laboratory Manual & online MATLAB Help portal

COURSE DELIVERY PLAN (LESSON PLAN)

S. No	Experiment name	No of classes required	Tentative date of completion	Actual Date of completion	Teaching Learning method	Learning Outcomes	Text Book Followed	HoD Sign Weekly
	Part I: Introduction to MATLAB							
1	(a) Find the sum of first100 natural numbers (b) Perform Basic matric operations?	3	10-12-2024		TLM5 & TLM8	CO1	T1	
2	a) Write a MATLAB program that adds all elements of an array named S with even indices. (b) Perform double integration problems?	2	17-Dec-24		TLM5 & TLM8	CO1	T1	
3	Find the roots of a linear equation by using Newton's and Secant Method	2	24-Dec-24		TLM5 & TLM8	CO1	T1	
4	4. (a) Introduction to basic plots 2D, 3D (b) MATLAB Graphical user interface addition and subtraction	3	31-Dec-24		TLM5 & TLM8	CO1	T1	
	Part II: Application of MATLAB							
5	Write a MATLAB Code to determine Lift Curve Slope from the given parameters?							
6	Solving of ordinary differential equation using Runge-Kutta method a numerical approach	3	07-01-2025		TLM5 & TLM8	CO2	T1	
7	(a) Write a MATLAB Code to determine Compute the Laplace transform of 1/sqrt(x) (b) Write a MATLAB Code to determine Eigenvalues and eigenvectors of a linear algebraic equations	6	21, 28-01-2025		TLM5 & TLM8	CO2	T1	
	03-02-2025 to 08-02-2025 MID-1 Examination							
8	(a) Solve System of Linear Equations (b) Solve system of nonlinear equations	3	11-Feb-25		TLM5 & TLM8	CO2	T1	
9	Graphics kinematics of particle position, velocity, and acceleration	6	18,25-02-2025		TLM5 & TLM8	CO2	T1	
10	Develop the graphical user interface to identify the area moment of inertia of simple section trapezoidal and triangle	6	04,11-03-2025		TLM5 & TLM8	CO3	T1	
11	Identification of shear force and bending moment diagram of cantilever beam with point load	6	18, 25-03-2025		TLM5 & TLM8	CO2	T1	
12	MATLAB Graphical user interface: Design and develop a scientific calculator	6	01,08-4-2025		TLM5 & TLM8	CO3	T1	
Total No of classes required		46	No of Classes Taken:					

14-04-2025 to 19-04-2025 MID-II Examination

28-04-2025 to 10-05-2025 Semester end examination

Teaching Learning Method

TLM5	Programming
TLM8	Lab Demo

Delivery Methods			
TLM1	Chalk and Talk	**TLM4**	Assignment/Test/Quiz
TLM2	ICT Tools	**TLM5**	Laboratory/Field Visit
TLM3	Tutorial	**TLM6**	Web-based Learning

Title	**Course Instructor**	**Head of the Department**
Name of the Faculty	**Dr. Sreenadh Chevula**	**Dr. P. Lovaraju**
Signature		

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PART-A

Name of Course Instructor : **Dr. Sreenadh Chevula**
Course Name & Code : **23ME57-DESIGN THINKING & INNOVATION**
Regulation : **R23**
L-T-P Structure : **1-0-2** Credits **: 2**
Program/Semester/Section : **B.Tech.–ASE/IV Semester** A.Y. **: 2024-25**

PRE-REQUISITE: NO

COURSE EDUCATIONAL OBJECTIVE (CEO):

Bring awareness on innovative design and new product development.

- Explain the basics of design thinking.
- Familiarize the role of reverse engineering in product development.
- Train how to identify the needs of society and convert into demand.
- Introduce product planning and product development process.

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

CO1:	Define the concepts related to design thinking.	Remember-L1
CO2:	Explain the fundamentals of Design Thinking and innovation.	Understand-L2
CO3:	Apply the design thinking techniques for solving problems in various sectors.	Apply-L3
CO4:	Analyze to work in a multidisciplinary environment.	Analyze-L4
CO5:	Evaluate the value of creativity.	Evalute-L5

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	1			3							2			
CO2	1	2	2		3							2			
CO3	3	3		2	3							3			
CO4	1	1			3							2			

TEXTBOOKS:

T1: Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
T2: Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

REFERENCE BOOKS:

R1: David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
R2: Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
R3: William Lidwell, Kritina Holden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.

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	Teaching Learning Methods	
UNIT - I INTRODUCTION TO DESIGN THINKING						
1.	Introduction to elements and principles of Design, Fundamental design components. **Activity**: To understand the importance of design	3	14-12-2024		TLM2 TLM5	
2.	Basics of design-dot, line, shape, form as fundamental design components **Activity**: Developing sketches using dot, line and form	3	21-12-2024		TLM2 TLM5	
3.	History of Design Thinking, New materials in Industry. **Activity:** To understand the importance of team work	3	28-12-2024		TLM2 TLM5	
UNIT - II DESIGN THINKING						
4.	Process Design thinking process (empathize, analyze, idea & prototype) Design thinking process: Empathy. **Activity**: To understand the significance of Empathy	3	04-01-2025		TLM2 TLM5	
5.	Design thinking process: Define or Analyze **Activity:** To understand the significance of Define/analyze.	3	25-01-2025		TLM2 TLM5	
6.	Design thinking process: Ideate, prototype **Activity:** To understand the significance of Ideate ,Prototype.	3	01-02-2025		TLM2 TLM5	
7.	Tools of design thinking in social innovations **Activity:** Students should present their understanding of DTI elements using example	3	15-02-2025		TLM2 TLM5	
UNIT - III INNOVATION						
8.	Art of innovation, Difference between innovation and creativity, Role of creativity and innovation in organizations. **Activity**: Debate on innovation and creativity ,Flow and planning from idea to innovation	3	22-02-2025		TLM2 TLM5	
8.	Teams for innovation, Measuring the impact and value of creativity. **Activity:** Debate on value-based innovation.	3	01-03-2025		TLM2 TLM5	
UNIT - IV PRODUCT DESIGN						
9.	Problem formation, introduction to product design, Product strategies, Product value **Activity:** Importance of modeling, how to set specifications,	6	08, 15-03-2025		TLM2 TLM5	
10.	Product planning, product specifications. Innovation towards product design Case studies. **Activity:** Explaining their own product design.	6	22, 29-03-2025		TLM2 TLM5	

UNIT V DESIGN THINKING IN BUSINESS PROCESSES DESIGN						
11.	Business & Strategic Innovation, Business challenges, Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes **Activity:** Marketing strategies of our own product, its maintenance, Reliability and plan for startup	3	12-04-2025		TLM2 TLM5	
I Mid Exams: 03-02-2025 to 08-02-2025						
II Mid Exams: 14-04-2025 to 19-04-2025						
No. of classes required to complete 42			**No. of classes taken:**			

Delivery Methods			
TLM1	Chalk and Talk	**TLM4**	Assignment/Test/Quiz
TLM2	ICT Tools	**TLM5**	Laboratory/Field Visit
TLM3	Tutorial	**TLM6**	Web-based Learning

Title	**Course Instructor**	**Head of the Department**
Name of the Faculty	**Dr. Sreenadh Chevula**	**Dr. P. Lovaraju**
Signature		