LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
Accredited by NAAC & NBA (CSE, IT, ECE, EEE & ME)
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

DEPARTMENT OF AEROSPACE ENGINEERING

COURSE HANDOUT

PART-A

PROGRAM :II B. Tech., II-Sem., ASE
ACADEMIC YEAR : 2021-22
COURSE NAME & CODE : PROBABILITY AND STATISTICS
L-T-P STRUCTURE : 3-0-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : Y. P. C. S. Anil Kumar
COURSE COORDINATOR : M. Rami Reddy
PRE-REQUISITES : None

COURSE EDUCATIONAL OBJECTIVES (CEO): The objective of this course is to provide students with the foundations and applications of probabilistic and statistical methods mainly used in varied applications in engineering and science.

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

CO1: Understand various probabilistic situations using the laws of probability and Random variables. (Understand - L2)
CO2: Apply probability distributions like Binomial, Poisson, Normal and Exponential distributions in solving engineering problems. (Apply - L3)
CO3: Calculate the standard error of sampling distribution and confidence intervals for parameters like mean and proportion based on sample data. (Apply - L3)
CO4: Analyze the data scientifically with the appropriate statistical methodologies to apply the suitable test of hypothesis. (Analyze - L4)
CO5: Construct the regression lines to predict the dependent variables and calculate the Correlation Coefficient for a bivariate statistical data. (Apply - 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
CO1	3	2	1	2	-	-	-	-	-	-	-	2	-	-	-
CO2	3	2	2	3	-	-	-	-	-	-	-	2	-	-	-
CO3	3	2	2	2	-	-	-	-	-	-	-	2	-	-	-
CO4	3	3	3	3	-	-	-	-	-	-	-	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).

BOS APPROVED TEXT BOOKS:

T1 Jay L.Devore "Probability and Statistics for engineering and the sciences." , 8th edition, Cengage Learning india, 2012
T2 S.C.Gupta, V.K.Kapoor, "Fundamentals of Mathematical Statistics", 11thEdition, Sultan Chand and sons, New Delhi,2014.

BOS APPROVED REFERENCE BOOKS:

R1 Miller & Freund's "Probability and Statistics for Engineers",8th edition. PHI, New Delhi,2011.
R2 B.V. Ramana, "Higher Engineering Mathematics", 1st Edition, TMH, New Delhi, 2010.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I :Probability and Random Variables

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 class, course outcomes	1	7-3-22		TLM2	
2.	Basic concepts of probability	1	9-3-22		TLM2	
3.	problems on basic probability	1	11-3-22		TLM2	
4.	problems on addition theorem	1	12-3-22		TLM2	
5.	Conditional probability	1	14-3-22		TLM2	
6.	Multiplication theorem, examples	1	16-3-22		TLM2	
7.	Independent events, theorems	1	19-3-22		TLM2	
8.	Problems on multiplication theorem, independent events	1	21-3-22		TLM2	
9.	Baye's theorem, problems	1	23-3-22		TLM2	
10.	Random variables, Expections	1	25-3-22		TLM2	
11.	Problems on PMF	1	26-3-22		TLM2	
12.	Problems on PDF	1	29-3-22		TLM2	
13.	Tutorial-1	1	31-3-22		TLM3	
No. of classes required to complete UNIT-I: 13				No. of classes taken:		

UNIT-II: Probability 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
1.	Binomial Distribution- mean & variance	1	1-4-22		TLM2	
2.	Problems on Binomial distribution	1	4-4-22		TLM2	
3.	Fitting of binomial distribution	1	6-4-22		TLM2	
4.	Poisson distribution, mean and variance	1	8-4-22		TLM2	
5.	Problems on Poisson distribution and fitting of Poisson distribution	1	9-4-22		TLM2	
6.	Normal distribution: mean &variance	1	11-4-22		TLM2	
7.	Problems on Normal Distribution	1	13-4-22		TLM3	
8.	Exponential distribution:	1	16-4-22		TLM2	
9.	Tutorial -2	1	18-4-22		TLM3	
No. of classes required to complete UNIT-II: 9				No. of classes taken:		

UNIT-III: Sampling distribution and Estimation

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.	Sampling distribution ,definitions	1	20-4-22		TLM2	
2.	Sampling distribution of mean, variance	1	22-4-22		TLM2	
3.	Problems	1	23-4-22		TLM2	
4.	Problems on central limit theorem	1	2-5-22		TLM2	
5.	Estimation	1	4-5-22		TLM2	
6.	Point and interval estimation	1	6-5-22		TLM2	
7.	Interval estimation of mean and proportions in large samples	1	7-5-22		TLM2	
8.	Interval estimation of mean in small samples	1	9-5-22		TLM2	
9.	Problems	1	11-5-22		TLM2	
10.	Tutorial-3	1	13-5-22		TLM3	
No. of classes required to complete UNIT-III: 10				No. of classes taken:		

UNIT-IV :Tests of Hypothesis

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

		Required	Completion	Completion	Methods	Weekly
1.	Testing of Hypothesis , definitions	1	14-5-22		TLM2	
2.	Z-test for means	1	16-5-22		TLM2	
3.	Z-test for proportions	1	18-5-22		TLM2	
4.	t-test for means	1	20-5-22		TLM2	
5.	paired t-test	1	21-5-22		TLM2	
6.	F-test for variances	1	23-5-22		TLM2	
7.	χ^2-test for goodness of fit	1	25-5-22		TLM2	
8.	χ^2-test for independence of attributes	1	27-5-22		TLM2	
9.	Tutorial-4	1	28-5-22		TLM3	
No. of classes required to complete UNIT-IV: 9				No. of classes taken:		

UNIT-V :Correlation and Regression

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.	Simple Bi-variate Correlation	1	30-5-22		TLM2	
2.	Problems on Pearson's Correlation	1	1-6-22		TLM2	
3.	Regression lines	1	3-6-22		TLM2	
4.	Problems on Regression lines	1	4-6-22		TLM2	
5.	Properties of Regression coefficients	1	6-6-22		TLM2	
6.	Rank correlation	1	8-6-22		TLM2	
7.	Problems on rank Correlation	1	10-6-22		TLM2	
8.	Problems on repeated rank	1	13-6-22		TLM2	
9.	Tutorial-5	1	15-6-22		TLM3	
10.	Revision	1	17-6-22		TLM2	
11.	Revison	1	18-6-22		TLM2	
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/SwayamPrabha/MOOCS)
TLM3	Tutorial	TLM6	Group Discussion/Project

PART-C

EVALUATION PROCESS (R17 Regulations):

Evaluation Task	**Marks**
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40
Semester End Examination (SEE)	60
Total Marks = CIE + SEE	100

Course Instructor	Course Coordinator	Module Coordinator	HOD
(Y.P.C.S.Anil Kumar)	(M.Rami Reddy)	(Dr.A.Rami Reddy)	(Dr.A.Rami Reddy)

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DEPARTMENT OF AEROSPACE ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. G V SURYA NARAYANA
Course Name & Code : **17AE05-AEROSPACE MATERIALS AND MANUFACTURING**
L-T-P Structure : 0-0-3 **Credits:** 3
Program/Sem/Sec : B.Tech-IV SEM **A.Y.:** 2021-22

PREREQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objectives of this course are to acquire knowledge on structure of metals and alloys, understand the concept of alloys and equilibrium diagrams and to learn primary manufacturing processes, working of basic machines and various operations to be performed and also about conventional and unconventional machining processes

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

CO1	Estimate the properties of the metals and alloys based on structures. (Understand-L2)
CO2	Classify, construct and analyze equilibrium diagrams, various ferrous, non-ferrous metals and alloys. (Understand-L2)
CO3	Acquire knowledge of the basic aspects of casting process. (Understand-L2)
CO4	Know the various basic concepts of welding process, metal forming process and sheet metal operations in the manufacturing of products. (Understand-L2)
CO5	Know different conventional and unconventional machining processes while manufacturing a product. (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
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, 24th Edition, 2008

T2 Rao. P. N, Manufacturing Technology, Volume 1 and 2 Tata McGraw-Hill, 2013.

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-Body centered cubic,	01	07-03-2022		TLM1, TLM2	
2.	Face cantered cubic, closed packed hexagonal,	01	08-03-2022		TLM1, TLM2	
3.	Mechanism of grain and grain boundaries,	01	10-03-2022		TLM1, TLM2	
4.	Effect of grain boundaries on the properties of metal / alloys,	01	14-03-2022		TLM1	
5.	Determination of grain size.	01	15-03-2022		TLM1	
6.	Solid solutions-Interstitial Solid Solution and	01	17-03-2022		TLM1, TLM2	
7.	Substitution Solid Solution,	01	19-03-2022		TLM1	
8.	Hume Rothery rules. Assignment-1	01	21-03-2022		TLM1, TLM2	
No. of classes required to complete UNIT-I: 8				**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
9.	**EQUILIBRIUM DIAGRAMS AND TRANSFORMATIONS:** Classification of equilibrium diagrams-	01	22-03-2022		TLM1	
10.	isomorphous, eutectic equilibrium diagrams.	01	24-03-2022		TLM1, TLM2	
11.	partial eutectic equilibrium diagrams. Lever rule	01	26-03-2022		TLM1	

12.	Study of Cu-Ni equilibrium diagram	01	28-03-2022		TLM1, TLM2	
13.	Iron-Iron carbide equilibrium diagram	01	29-03-2022		TLM1	
14.	**STEEL:** Classification of steels, structure, properties and applications of plain carbon steel,	01	31-03-2022		TLM1, TLM2	
15.	low carbon steel, medium carbon steel and high carbon steel.	01	04-04-2022		TLM1, TLM2	
16.	**CAST IRONS:** structure, properties and applications of white cast iron, malleable cast iron,	01	07-04-2022		TLM1, TLM2	
17.	grey cast iron, spheroidal graphite cast iron	01	11-04-2022		TLM1, TLM2	
18.	**NON-FERROUS METALS AND ALLOYS:** structure, properties and applications of copper and its alloys,	01	12-04-2022		TLM1, TLM2	
19.	Aluminium and its alloys. Assignment-II	01	16-04-2022		TLM1	
No. of classes required to complete UNIT-II: 10				**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
20.	**INTRODUCTION TO MANUFACTURING AND CASTING:** Classification of manufacturing processes	01	18-04-2022		TLM1	
21.	Engineering materials, Steps involved in making a casting	01	19-04-2022		TLM1	
22.	Advantages of castings and its applications	01	21-04-2022		TLM1	
23.	Types of patterns, pattern allowances.	01	23-04-2022		TLM1	
24.	principles of Gating ratio, types of raisers	01	02-05-2022		TLM1	
25.	Special casting processes: Centrifugal casting	01	05-05-2022		TLM1, TLM2	
26.	Die casting	01	07-05-2022		TLM1, TLM2	
27.	Investment casting, Assignment-III	01	09-05-2022		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
28.	**WELDING:** Classification of Welding Process-	01	10-05-2022		TLM1, TLM2	
29.	Types of Welds- Welded Joints,	01	12-05-2022		TLM1	
30.	Principle and Applications- Gas Welding	01	16-05-2022		TLM1	
31.	Arc Welding	01	17-05-2022		TLM1, TLM2	
32.	Friction Welding,	01	19-05-2022		TLM1, TLM2	
33.	Soldering and Brazing.	01	21-05-2022		TLM1, TLM2	
34.	**METAL FORMING PROCESSES:** Types of Rolling Mills and Products;	01	23-05-2022		TLM1	
35.	Principles of Forging	01	24-05-2022		TLM1	
36.	Types of Forging-Smith Forging,	01	26-05-2022		TLM1, TLM2	
37.	Drop Forging	01	28-05-2022		TLM1, TLM2	
38.	**EXTRUSION OF METALS:** Hot Extrusion	01	30-05-2022		TLM1, TLM2	
39.	Cold Extrusion	01	31-05-2022		TLM1, TLM2	
40.	Forward Extrusion	01	02-06-2022		TLM1, TLM2	
41.	Backward Extrusion	01	04-06-2022		TLM1, TLM2	
42.	Impact Extrusion, Hydrostatic Extrusion. Assignment-IV	01	06-06-2022		TLM1, TLM2	
No. of classes required to complete UNIT-IV: 15				**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
43.	**MACHINING PROCESSES**: Tool Geometry	01	07-06-2022		TLM1	
44.	Cutting Tool & Tool Wear	01	09-06-2022		TLM1	

45.	Cutting Materials;	01	11-06-2022		TLM1	
46.	Cutting Fluids;	01	13-06-2022		TLM1	
47.	Introduction and Working Principle of Lathe and Operations	01	14-06-2022		TLM1, TLM2	
48.	Principles of Working, Principle Parts, Specifications, Classification, Comparison and Operations Performed: SHAPING	01	16-06-2022		TLM1, TLM2	
49.	PLANNING, MILLING	01	18-06-2022		TLM1, TLM2	
50.	DRILLING MACHINES	01	20-06-2022		TLM1, TLM2	
51.	**INTRODUCTION TO UNCONVENTIONAL MACHINING PROCESSES**: Classification of Unconventional Machining Processes. Abrasive Jet Machining	01	21-06-2022		TLM1, TLM2	
52.	Ultrasonic Machining	01	23-06-2022		TLM1, TLM2	
53.	Laser Beam Machining, Assignment-V	01	25-06-2022		TLM1, TLM2	
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),	M=30

(M2+Q2+A2))	
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	prepare the students to work effectively in Aerospace and Allied Engineering organizations.

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

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L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT
PART-A

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

ACADEMIC YEAR : 2021-22

COURSE NAME & CODE : **Aerodynamics-20AE06**

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

COURSE CREDITS : 3

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

PRE-REQUISITE: Nil

Course Educational Objective: To learn the theoretical methods to solve the potential flow problems, potential flow theory to solve for airfoil characteristics, the finite wing theory and properties of viscous flows and boundary layer development over flat plate.

Course Outcomes: At the end of the semester, the student will be able to

CO1: Apply Laplace equation for obtaining 2D and axisymmetric solutions. (Apply-L3)
CO2: Apply conformal transformation to from aerodynamic shapes. (Apply-L3)
CO3: Apply potential flow theory to solve for airfoil characteristics. (Apply-L3)
CO4: Apply the Prandtl's lifting line theory to predict finite wing properties. (Apply-L3)
CO5: Analyze the effect of boundary layer on flow over objects. (Analyze-L4)

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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	7-03-2022		TLM1	
2.	Review of Fluid Mechanics and Introduction to the Potential flow	1	9-03-2022		TLM1	
3.	Basic Flows-Uniform parallel flow, Source and Sink Flows	2	11-03-2022 12-03-2022		TLM1	
4.	Source and Sink Pair-Doublet, Simple vortex	1	14-03-2022		TLM1	
5.	Tutorial	1	16-03-2022		TLM3	
6.	Combination of uniform flow and Source-Flow past half body	1	19-03-2022		TLM1	
7.	Rankine oval	1	21-03-2022		TLM1	
8.	Flow over circular Cylinder without circulation	1	23-03-2022		TLM1	
9.	Flow over circular Cylinder with circulation	1	25-03-2022		TLM1	
10.	Kutta-Joukowsky Theorem	1	26-03-2022		TLM1	
11.	Tutorial	1	28-03-2022		TLM3	
No. of classes required to complete UNIT-I		**12**		**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	30-03-2022		TLM1	
13	Examples of Simple Transformation	1	1-04-2022		TLM	
14	Kutta-Joukowski Transformation	1	4-04-2022		TLM1	
15	Transformation of Circle to Straight Line, Transformation of Circle to Ellipse	1	6-04-2022		TLM1	
16	Transformation of Circle to Symmetrical Aerofoil	2	8-04-2022 9-04-2022		TLM1	
17	Transformation of Circle to Cambered Aerofoil	2	11-04-2022 13-04-2022		TLM1	
18	Tutorial	1	16-04-2022		TLM3	
No. of classes required to complete UNIT-II		**9**		**No. of classes taken:**		

I Mid Examination (25-04-2022 to 29-04-2022)

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
12.	Introduction to Aerofoil Theory	1	18-04-2022		TLM1	
13.	Airfoil Characteristics	1	20-04-2022		TLM1	
14.	Vortex Sheet	1	22-04-2022		TLM1	
15.	Kutta Condition, Kelvin's Circulation Theorem, Starting Vortex	1	23-04-2022		TLM1	
16.	Thin Aerofoil Theory and its applications	1	30-04-2022		TLM1	
17.	Application of thin aerofoil theory- Analysis of flow over symmetric airfoil	2	2-05-2022 4-05-2022		TLM1	
18.	Application of thin aerofoil theory- Analysis	2	6-05-2022 7-05-2022		TLM1	

	of flow over cambered airfoil					
19.	Tutorial	1	9-05-2022		TLM3	
No. of classes required to complete UNIT-III		10		**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
20.	Finite Wing Theory-Introduction	1	11-05-2022		TLM1	
21.	Down wash and Induced drag, Trailing vortex	1	13-05-2022		TLM1	
22.	Vortex filament	1	14-05-2022		TLM1	
23.	Biot-Savart's law, Infinite and semi-infinite vortex filament	2	16-05-2022 18-05-2022		TLM1	
24.	Helmholtz theorems	1	20-05-2022		TLM1	
25.	Horseshoe Vortex, Prandtl's Classical Lifting Line Theory	2	20-05-2022 23-05-2022		TLM1	
26.	Elliptic Lift Distribution	2	25-05-2022 27-05-2022		TLM1	
27.	General Lift Distribution	1	28-05-2022		TLM1	
28.	Tutorial	1	30-05-2022		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
29.	Introduction, Boundary Layer Development	1	1-06-2022		TLM1	
30.	Boundary layer Thickness, Boundary layer Displacement Thickness	2	3-06-2022 4-06-2022		TLM1	
31.	Momentum Thickness, Energy Thickness	1	6-06-2022		TLM1	
32.	Types of Boundary layer, Momentum Integral Estimates	1	8-06-2022		TLM1	
33.	Karman Analysis of Flat plate	1	10-06-2022		TLM1	
34.	Navier Stokes Equations-Boundary Layer Equations-2D	2	11-06-2022 13-06-2022		TLM1	

35.	Boundary layer growth on a Flat Plate, Blasius Solution	1	15-06-2022		TLM1	
36.	Boundary Layer with Pressure Gradient	1	17-06-2022		TLM1	
37.	Tutorial	1	18-06-2022		TLM3	
No. of classes required to complete UNIT-V		**11**		**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 (R20 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 Educational Objectives (PEO)

PEO1: To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve engineering problems

PEO2: To train students with good scientific and engineering breadth so as to comprehend, analyze, design, and create novel products and solutions for the real life problems

PEO3: To prepare students to excel in competitive examinations, postgraduate programs, advanced education or to succeed in industry/technical profession

PEO4: To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context

PEO5: To provide student with an academic environment with awareness of excellence, leadership, and the life-long learning needed for a successful professional career

PROGRAM OUTCOMES (POs)

PO1: To apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO2: To identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO3: To 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: To 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: To 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 limitations.

PO6: To 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: To understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

PO8: To apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

PO9: To function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: To communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: To 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: To 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 the defense and space research programs

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

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DEPARTMENT OF AEROSPACE ENGINERRING

COURSE HANDOUT

PART-A

Name of Course Instructor: S.Indrasena Reddy
Course Name & Code **:** Aircraft Structures-I-AE07
L-T-P Structure **:2-1-0** **Credits:** 3
Program/Sem/Sec : B.Tech./ IV-Sem **A.Y.:** 2021-22

PREREQUISITE: **Engineering Mechanics**

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

CO1	Solve problems related to elastic members by applying stress-strain relations
CO2	Analyze the behavior of beams, frames and trusses under various loading conditions (Analyze-L4)
CO3	Analyze the statically indeterminate structures under various loading conditions (Analyze-L4)
CO4	Evaluate the strain energy stored in the structural members (Apply-L3)
CO5	Analyze the buckling of columns and compressive member under various loading conditions (Analyze-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	3	3	3								2	3	3
CO2	3	3	3	3								2	3	3
CO3	3	3	3	3								2	3	3
CO4	3	3	3	3								2	3	3
CO5	3	3	3	3								2	3	3
1 - Low			**2 –**Medium					**3 -** High						

TEXTBOOKS:

T1 Timoshenko, S., "Strength of Materials", Vol. I and II, Princeton D. Vonostrand Co, 1990.

T2 Bruhn.E.F."Analysis and design of flight vehicle structures" Tri set of offset Company, USA, 1973.

REFERENCE BOOKS:

R1 Donaldson, B.K., "Analysis of Aircraft Structures – An Introduction", McGraw-Hill

R2 B.C.Punmia, "Theory of Structures", Laxmi Publication

R3 S.Ramamrutham, R.Narayanan, "Theory of Structures" – Dhanpat Rai Publishing Co, 2003

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Basic Elasticity

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 Basic Elasticity	1	07-03-22		TLM1	
2.	Equations of equilibrium	1	08-03-22		TLM1	
3.	Determination of normal and tangential stresses	1	10-03-22		TLM1	
4.	Normal and tangential and resultant stresses	1	14-03-22		TLM1	
5.	Graphical methods to determine stresses	1	15-03-22		TLM1	
6.	Mohr's circle-uni axial, Bi-axial	1	17-03-22		TLM1	
7.	Concept of principal planes, stresses and strains	1	19-.3-22		TLM1	
8.	plane stress problems	1	21-03-22		TLM3	
9.	compatibility equations	1	22-03-22		TLM1	
10.	stress - strain relations	1	24-03-22		TLM1	
No. of classes required to complete UNIT-I: 10				**No. of classes taken:**		

UNIT-II: Statically Determinate Structures

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 statically determinate structures	1	26-03-22		TLM1	
12.	Determinacy and Stability	1	28-03-22		TLM1	
13.	Principle of Superposition	1	29-03-22		TLM1	
14.	Reactions of supports of a frame	1	31-03-22		TLM1	
15.	Analysis of plane truss-types of frame	1	04-04-22		TLM1	
16.	Method of joints for simple frames	1	07-04-22		TLM1	
17.	Method of joints for complex frames	1	09-04-22		TLM3	
18.	Method of sections for simple frames	1	11-04-22		TLM1	
19.	Method of sections for complex frames	1	12-04-22		TLM1	
No. of classes required to complete UNIT-II: 09				**No. of classes taken:**		

UNIT-III: Statically Indeterminate Structures

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.	statically Indeterminate structures	1	16-04-22		TLM1	
21.	Propped cantilever- prop reaction	1	18-04-22		TLM1	
22.	Propped cantilever with point load and UDL	1	19-04-22		TLM1	
23.	Fixed beams	1	21-04-22		TLM1	
24.	Fixed-Fixed beams	1	23-04-22		TLM1	
25.	SFD BMD of Fixed Beams	1	30-04-22		TLM3	
26.	Continuous beams	1	02-05-22		TLM1	
27.	Clapeyron's three moment equation	1	03-05-22		TLM1	
28.	SFD and BMD of continuous beams	1	05-05-22		TLM1	
29.	Continuous beam problems	1	07-05-22		TLM3	
30.	Moment distribution Method	1	09-05-22		TLM1	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT-IV: Energy Methods

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.	Introduction to energy methods	1	10-05-22		TLM1	

32.	Strain Energy due to axial, bending loading	1	12-05-22		TLM1	
33.	Strain Energy due to Torsion	1	14-05-22		TLM1	
34.	Deflection of beams using strain energy	1	16-05-22		TLM3	
35.	Castigliano's first theorem	1	17-05-22		TLM1	
36.	Deflection of beams using Castigliano's theorem	1	19-05-22		TLM1	
37.	Castigliano's second theorem	1	21-05-22		TLM1	
38.	Deflection of beams	1	23-05-22		TLM3	
39.	Maxwell's Reciprocal theorem	1	24-05-22		TLM1	
40.	Unit load method	1	26-05-22		TLM1	
41.	Deflection of frames by using unit load method	1	28-05-22		TLM1	
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V: Columns

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.	Introduction to columns	1	30-05-22		TLM1	
43.	Axially loaded compression members	1	31-05-22		TLM1	
44.	Crushing load- Buckling load	1	02-06-22		TLM1	
45.	Euler's theory-Effective length	1	04-06-22		TLM1	
46.	Expressions for buckling load	1	06-06-22		TLM1	
47.	buckling load with different end conditions	1	07-06-22		TLM3	
48.	Limitations-Euler's formula	1	09-06-22		TLM1	
49.	Euler's crushing load	1	11-06-22		TLM1	
50.	Rankine's formula	1	13-06-22		TLM1	
51.	Column with initial curvature	1	14-06-22		TLM1	
52.	Columns subjected to eccentric loading	1	16-06-22		TLM1	
53.	Euler's method- Rankine's method	1	18-06-22		TLM1	
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	**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	Course Coordinator	Module Coordinator	HOD
(S.Indrasena Reddy)	(S.Indrasena Reddy)	(Dr.Prabhu.L)	(Dr.P.Lovaraju)

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DEPARTMENT OF AEROSPACE ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. G V SURYA NARAYANA
Course Name & Code : Manufacturing Technology Lab-20AE53 **Regulation**: R20
L-T-P Structure : **0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/IV-SEM **A.Y.:** 2021-22

PRE-REQUISITES: Engineering workshop

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objectives of the course are to provide hands-on laboratory experience to acquire basic knowledge in the area of casting, welding and its equipment, lathe machine and special machine operations.

COURSE OUTCOMES (COs): After completion of the course students are able to:

CO1	Design and develop a product 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).

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	1	1	1	-	-	-	-	-	-	-	1	2	3
CO2	3	1	1	1	-	-	-	-	-	-	-	1	2	3
CO3	3	1	1	1	-	-	-	-	-	-	-	1	2	3
1 - Low						**2** –Medium						**3** - High		

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
			BATCH-I		**BATCH-II**			
1.	Introduction	03	08-03-22		11-03-22		TLM4	
2.	Mould making and Sand Casting	03	15-03-22		18-03-22		TLM4	
3.	Pattern Design and making	03	22-03-22		25-03-22		TLM4	
4.	ARC Welding Butt Joint and Lap joint	03	29-03-22		01-04-22		TLM4	
5.	Spot Welding (chain), Spot Welding (Zigzag)	03	12-04-22		08-04-22		TLM4	
6.	Injection Moulding	03	19-04-22		22-04-22		TLM4	
7.	Lathe Operations: step turning, Tapper turning	03	10-05-22		06-05-22		TLM4	
8.	Lathe Operations: knurling	03	17-05-22		13-05-22		TLM4	
9.	Special Machines: Shaping	03	24-05-22		20-05-22		TLM4	
10.	Special Machines: Milling	03	31-05-22		27-05-22		TLM4	
11.	Special Machines: Drilling, Surface Grinding	03	07-06-22		03-06-22		TLM4	
12.	Repetition	03	14-06-22		10-06-22		TLM4	
13.	Lab internal Exam	03	17-06-22		17-06-22		TLM4	
No. of classes required to complete: 13						**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 (R20 Regulation):

Evaluation Task	**Expt. no's**	**Marks**
Day to Day work = **A**	1,2,3,4,5,6,7,8…	A=05
Record = **B**	1,2,3,4,5,6,7,8	B=05
Internal Test = **C**	1,2,3,4,5,6,7,8	C = 05
Cumulative Internal Examination : A + B + C = 15	1,2,3,4,5,6,7,8	**15**
Semester End Examinations = D	1,2,3,4,5,6,7,8	**D = 35**
Total Marks: A + B + C + D = 50	1,2,3,4,5,6,7,8	**50**

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve engineering problems.
PEO 2	To train students with good scientific and engineering breadth so as to analyze, design, and create novel products and solutions for the real-life problems
PEO 3	To prepare students to excel in competitive examinations, postgraduate programs, advanced education or to succeed in industry/technical profession
PEO4	To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context
PEO5	To provide student with an academic environment with awareness of excellence, leadership, and the life-long learning needed for a successful professional career

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.
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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	To apply the knowledge of Aerodynamics, Propulsion, Aircraft structures, and Flight Dynamics in Aerospace vehicle design.
PSO 2	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

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' grade& NBA (Under Tier - I), ISO 9001:2015 Certified Institution
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF AEROSPACE ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.I.Dakshina Murthy
Course Name & Code **:** Thermal Engineering Lab-20AE54 **Regulation**: R20
L-T-P Structure **: 0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/IV-SEM **A.Y.:** 2021-22

PRE-REQUISITES: ICGT & Thermal Engineering

COURSE OBJECTIVE: The objective is to familiarize the principle and its evaluation of various performance parameters of mechanical systems and its impact on global environment

COURSE OUTCOMES (CO): After completion of course, students will be able to
CO1: Estimate various fuel characteristics through experimental testing
CO2: Analyse the performance of IC Engines
CO3: Evaluate the performance parameters of refrigeration and air conditioning systems

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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	1	-	-	3	-	-	3	3	3	2	1	3
CO2	1	-	3	-	-	3	-	-	2	-	1	3	-	3
CO3	2	-	3	-	-	-	-	-	3	-	2	3	1	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):

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
			BATCH-I		**BATCH-II**			
1.	Introduction	03	11-03-22		08-03-22		TLM4	
2.	Exp No1.	03	18-03-22		15-03-22		TLM4	
3.	Exp No 2	03	25-03-22		22-03-22		TLM4	
4.	Exp No 3	03	01-04-22		29-03-22		TLM4	
5.	Exp No 4	03	08-04-22		12-04-22		TLM4	
6.	Exp No 5	03	22-04-22		19-04-22		TLM4	
7.	Exp No 6	03	06-05-22		10-05-22		TLM4	
8.	Exp No 7	03	13-05-22		17-05-22		TLM4	
9.	Exp No 8	03	20-05-22		24-05-22		TLM4	
10.	Exp No 9	03	27-05-22		31-05-22		TLM4	
11.	Exp No 10	03	03-06-22		07-06-22		TLM4	
12.	Repetition	03	10-06-22		14-06-22		TLM4	
13.	Lab internal Exam	03	17-06-22		17-06-22		TLM4	
No. of classes required to complete: 13						**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 (R20 Regulation):

Evaluation Task	**Expt. no's**	**Marks**
Day to Day work = **A**	1,2,3,4,5,6,7,8…	A=05
Record = **B**	1,2,3,4,5,6,7,8	B=05
Internal Test = **C**	1,2,3,4,5,6,7,8	C = 05
Cumulative Internal Examination : A + B + C = 15	1,2,3,4,5,6,7,8	**15**
Semester End Examinations = D	1,2,3,4,5,6,7,8	**D = 35**
Total Marks: A + B + C + D = 50	1,2,3,4,5,6,7,8	**50**

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve engineering problems.

PEO 2	To train students with good scientific and engineering breadth so as to analyze, design, and create novel products and solutions for the real-life problems
PEO 3	To prepare students to excel in competitive examinations, postgraduate programs, advanced education or to succeed in industry/technical profession
PEO4	To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context
PEO5	To provide student with an academic environment with awareness of excellence, leadership, and the life-long learning needed for a successful professional career

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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PROGRAMME SPECIFIC OUTCOMES (PSOs):

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PSO 2	To prepare the students to work effectively in the defense and space research programs.

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