



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

Accredited by NAAC&NBA(Under Tier-I), ISO9001:2015 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
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FRESHMAN ENGINEERING DEPARTMENT

COURSE HANDOUT

PART-A

PROGRAM	: II B. Tech., IV-Sem., ASE
ACADEMIC YEAR	: 2022-23
COURSE NAME & CODE	: PROBABILITY AND STATISTICS
L-T-P STRUCTURE	: 3-0-0
COURSE CREDITS	: 3
COURSE INSTRUCTOR	: K. N. V. Lakshmi
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 - L3

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	-	-	-	-	-	-	-	2	-	-	-
CO2	3	2	2	3	-	-	-	-	-	-	-	2	-	-	-
CO3	3	2	2	2	-	-	-	-	-	-	-	2	-	-	-
CO4	3	3	3	3	-	-	-	-	-	-	-	2	-	-	-
CO5	3	2	2	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	31-01-23		TLM1	
2.	Basic concepts of probability	1	02-02-23		TLM1	
3.	problems on basic probability	1	03-02-23		TLM1	
4.	Addition theorem, problems	1	06-02-23		TLM1	
5.	Problems on Addition theorem	1	07-02-23		TLM1	
6.	Multiplication theorem, examples	1	09-02-23		TLM1&2	
7.	Independent events, theorems	1	10-02-23		TLM1	
8.	Problems	1	13-02-23		TLM1	
9.	Baye's theorem, Examples	1	14-02-23		TLM1&2	
10.	Problems on Baye's theorem	1	16-02-23		TLM1	
11.	Random variables, Expectations	1	17-02-23		TLM1	
12.	Problems on PMF	1	20-02-23		TLM1	
13.	Problems on PMF	1	21-02-23		TLM1	
14.	Problems on PDF	1	23-02-23		TLM1	
15.	Problems on PDF	1	24-02-23		TLM1	
No. of classes required to complete UNIT-I: 15				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	27-02-23		TLM1&2	
2.	Problems on Binomial distribution	1	28-02-23		TLM1	
3.	Applications of Binomial	1	02-03-23		TLM1	
4.	Fitting of binomial distribution	1	03-03-23		TLM1	
5.	Poisson distribution, mean and variance	1	06-03-23		TLM1&2	
6.	Problems on Poisson distribution	1	07-03-23		TLM1	
7.	Fitting of Poisson distribution	1	09-03-23		TLM1	
8.	Normal distribution: mean & variance	1	10-03-23		TLM1&2	
9.	Problems on Normal Distribution	1	13-03-23		TLM1	
10.	Problems on Normal Distribution	1	14-03-23		TLM1	
11.	Applications	1	16-03-23		TLM1	
12.	Exponential distribution:	1	17-03-23		TLM1	
No. of classes required to complete UNIT-II: 12				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	20-03-23		TLM1&2	
2.	Sampling distribution of mean, variance	1	21-03-23		TLM1	
3.	Central limit theorem, Examples	1	23-03-23		TLM1	
4.	Problems on Central Limit Theorem	1	24-03-23		TLM1	
5.	Mid-I examinations		27-03-23 to 01-04-23			
6.	Estimation –Point and Interval	1	03-04-23		TLM1	
7.	Confidence interval of Mean	1	04-04-23		TLM1&2	
8.	Confidence Interval of mean	1	06-04-23		TLM1	
9.	Confidence Interval of proportion	1	10-04-23		TLM1	
10.	Confidence Interval of proportion	1	11-04-23		TLM1	
11.	Confidence Interval of mean (n<30)	1	13-04-23		TLM1	
12.	problems	1	17-04-23		TLM1	
No. of classes required to complete UNIT-III: 11				No. of classes taken:		

UNIT-IV: 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
1.	Testing of Hypothesis , definitions	1	18-04-23		TLM 1 & 2	
2.	Z-test for single mean	1	20-04-23		TLM 1	
3.	Z-test for difference of means	1	21-04-23		TLM 1	
4.	Applications on mean tests	1	24-04-23		TLM 1	
5.	Z-test for single Proportion	1	25-04-23		TLM 1	
6.	Z-test for difference of Proportions	1	27-04-23		TLM 1	
7.	t-test for single mean	1	28-04-23		TLM 1	
8.	t-test for difference of means	1	01-05-23		TLM 1	
9.	Paired t-test	1	02-05-23		TLM 1	
10.	Applications on t-tests	1	04-05-23		TLM 1	
11.	F-test for variances	1	05-05-23		TLM 1	
12.	χ^2 -test for goodness of fit	1	08-05-23		TLM 1	
13.	χ^2 -test for independence of attributes	1	09-05-23		TLM 1	
No. of classes required to complete UNIT-IV: 11				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	11-05-23		TLM 1 & 2	
2.	Problems on Pearson's Correlation	1	12-05-23		TLM 1	
3.	Regression lines	1	15-05-23		TLM 1	
4.	Problems on Regression lines	1	16-05-23		TLM 1	
5.	Properties of Regression coefficients	1	18-05-23		TLM 1 & 2	
6.	Problems on Regression coefficients	1	19-05-23		TLM 1	
7.	Problems on rank Correlation	1	22-05-23		TLM 1	
8.	Problems on repeated ranks	1	23-05-23		TLM 1	
9.	Practice problems	1	25-05-23		TLM 1	
10.	Revision	1	26-05-23		TLM 1	
No. of classes required to complete UNIT-V: 10				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 (R20 Regulations):**

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):

PO1 - Engineering Knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2 - Problem Analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3 - Design / Development of Solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4 - Conduct Investigations of Complex Problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, 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 prediction 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 ring 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.

Course Instructor
(K. N. V. Lakshmi)

Course Coordinator
(M. Rami Reddy)

Module Coordinator
(Dr. A. Rami Reddy)

HOD
(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 : 20AE05-AEROSPACE MATERIALS AND MANUFACTURING
L-T-P Structure : 0-0-3 **Credits:** 3
Program/Sem/Sec : B.Tech-IV SEM **A.Y.:** 2022-23

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-	01	30-01-2023		TLM1, TLM2	
2.	Body centered cubic,	01	01-02-2023		TLM1, TLM2	
3.	Face cantered cubic, closed packed	01	02-02-2023		TLM1, TLM2	
4.	hexagonal,	01	06-02-2023		TLM1, TLM2	
5.	Mechanism of grain and grain boundaries,	01	07-02-2023		TLM1, TLM2	
6.	Effect of grain boundaries on the properties of metal / alloys,	01	08-02-2023		TLM1	
7.	Determination of grain size.	01	08-02-2023		TLM1	
8.	Solid solutions- Interstitial Solid Solution and	01	09-02-2023		TLM1, TLM2	
9.	Substitution Solid Solution,	01	13-02-2023		TLM1	
10.	Hume Rothery rules. Assignment-1	01	14-02-2023		TLM1, TLM2	
No. of classes required to complete UNIT-I: 10				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
11.	EQUILIBRIUM DIAGRAMS AND TRANSFORMATIONS: Classification of equilibrium diagrams-	01	15-02-2023		TLM1	
12.	isomorphous, eutectic equilibrium diagrams.	01	16-02-2023		TLM1, TLM2	

13.	partial eutectic equilibrium diagrams. Lever rule	01	20-02-2023		TLM1	
14.	Study of Cu-Ni equilibrium diagram	01	21-02-2023		TLM1, TLM2	
15.	Iron-Iron carbide equilibrium diagram	01	22-02-2023		TLM1	
16.	STEEL: Classification of steels, structure,	01	22-02-2023		TLM1, TLM2	
17.	properties and applications of plain carbon steel	01	23-02-2023		TLM1, TLM2	
18.	low carbon steel	01	27-02-2023		TLM1, TLM2	
19.	medium carbon steel		28-02-2023		TLM1, TLM2	
20.	high carbon steel.	01	01-03-2023		TLM1, TLM2	
21.	CAST IRONS: structure, properties and applications of white cast iron,	01	02-03-2023		TLM1, TLM2	
22.	malleable cast iron, grey cast iron,	01	06-03-2023		TLM1, TLM2	
23.	spheroidal graphite cast iron	01	07-03-2023		TLM1, TLM2	
24.	NON-FERROUS METALS AND ALLOYS: structure,	01	09-03-2023		TLM1, TLM2	
25.	properties and applications of copper and its alloys,	01	13-03-2023		TLM1, TLM2	
26.	Aluminium and its alloys. Assignment-I	01	14-03-2023		TLM1	
No. of classes required to complete UNIT-II: 16				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
27.	INTRODUCTION TO MANUFACTURING AND CASTING: Classification of manufacturing processes	01	15-03-2023		TLM1	
28.	Engineering materials, Steps involved in making a casting	01	16-03-2023		TLM1	
29.	Advantages of castings and its applications	01	20-03-2023		TLM1	
30.	Types of patterns,	01	21-03-2023		TLM1	
31.	pattern allowances.	01	23-03-2023		TLM1	
MID EXAM						

32.	principles of Gating ratio, types of raisers	01	03-04-2023		TLM1	
33.	Special casting processes: Centrifugal casting	01	04-04-2023		TLM1, TLM2	
34.	Die casting	01	06-04-2023		TLM1, TLM2	
35.	Investment casting, Assignment-II	01	10-04-2023		TLM1, TLM2	
No. of classes required to complete UNIT-III: 09				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
36.	WELDING: Classification of Welding Process-	01	11-04-2023		TLM1, TLM2	
37.	Types of Welds- Welded Joints,	01	12-04-2023		TLM1	
38.	Principle and Applications- Gas Welding	01	13-04-2023		TLM1	
39.	Arc Welding	01	17-04-2023		TLM1, TLM2	
40.	Friction Welding,	01	18-04-2023		TLM1, TLM2	
41.	Soldering and Brazing.	01	19-04-2023		TLM1, TLM2	
42.	METAL FORMING PROCESSES: Types of Rolling Mills and Products;	01	20-04-2023		TLM1	
43.	Principles of Forging	01	24-04-2023		TLM1	
44.	Types of Forging-Smith Forging,	01	25-04-2023		TLM1, TLM2	
45.	Drop Forging	01	26-04-2023		TLM1, TLM2	
46.	EXTRUSION OF METALS: Hot Extrusion	01	27-04-2023		TLM1, TLM2	
47.	Cold Extrusion	01	01-05-2023		TLM1, TLM2	
48.	Forward Extrusion	01	02-05-2023		TLM1, TLM2	
49.	Backward Extrusion	01	03-05-2023		TLM1, TLM2	
50.	Impact Extrusion, Hydrostatic Extrusion. Assignment-II	01	04-05-2023		TLM1, TLM2	
No. of classes required to complete UNIT-IV: 14				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
51.	MACHINING PROCESSES: Tool Geometry	01	08-05-2023		TLM1	
52.	Cutting Tool & Tool Wear	01	09-05-2023		TLM1	
53.	Cutting Materials;	01	10-05-2023		TLM1	
54.	Cutting Fluids;	01	11-05-2023		TLM1	
55.	Introduction and Working Principle of Lathe and Operations	01	15-05-2023		TLM1, TLM2	
56.	Principles of Working, Principal Parts, Specifications, Classification, Comparison and Operations Performed: SHAPING	01	16-05-2023		TLM1, TLM2	
57.	PLANNING, MILLING	01	17-05-2023		TLM1, TLM2	
58.	DRILLING MACHINES	01	18-05-2023		TLM1, TLM2	
59.	INTRODUCTION TO UNCONVENTIONAL MACHINING PROCESSES: Classification of Unconventional Machining Processes. Abrasive Jet Machining	01	22-05-2023		TLM1, TLM2	
60.	Ultrasonic Machining	01	23-05-2023		TLM1, TLM2	
61.	Laser Beam Machining, Assignment-II	01	24-05-2023		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), (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	Ethics: 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	Module Coordinator	Head of the Department
Signature			
Name of the Faculty	MR. G V SURYA NARAYANA	MR. I DAKSHINA MURTHY	DR. P. LOVARAJU

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF AEROSPACE ENGINEERING
(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,
NAAC Accredited, Certified by ISO 9001:2015
L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT
PART-A

PROGRAM : B.Tech., IV-Sem., ASE
ACADEMIC YEAR : 2022-23
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)

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	30-01-2023		TLM1	
2.	Review of Fluid Mechanics and Introduction to the Potential flow	1	31-01-2023		TLM1	
3.	Basic Flows-Uniform parallel flow, Source and Sink Flows	2	1-02-2023 3-02-2023		TLM1	
4.	Source and Sink Pair-Doublet, Simple vortex	1	4-02-2023		TLM1	
5.	Tutorial	1	6-02-2023		TLM3	
6.	Combination of uniform flow and Source-Flow past half body	1	8-02-2023		TLM1	
7.	Rankine oval	1	10-2-2023		TLM1	
8.	Flow over circular Cylinder without circulation	1	13-02-2023		TLM1	
9.	Flow over circular Cylinder with circulation	1	15-02-2023		TLM1	
10.	Kutta-Joukowski Theorem	1	17-02-2023		TLM1	
11.	Tutorial	1	20-02-2023		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	22-02-2023		TLM1	
13	Examples of Simple Transformation	1	24-02-2023		TLM	
14	Kutta-Joukowski Transformation	1	25-02-2023		TLM1	
15	Transformation of Circle to Straight Line, Transformation of Circle to Ellipse	2	27-02-2023 1-03-2023		TLM1	
16	Transformation of Circle to Symmetrical Aerofoil	2	3-03-2023 4-03-2023		TLM1	
17	Transformation of Circle to Cambered Aerofoil	2	6-03-2023 10-03-2023		TLM1	
18	Tutorial	1	13-03-2023		TLM3	
No. of classes required to complete UNIT-II		10		No. of classes taken:		

I Mid Examination (27-03-2023 to 01-04-2023)**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	15-03-2023		TLM1	
13.	Airfoil Characteristics	1	17-03-2023		TLM1	
14.	Vortex Sheet	1	18-03-2023		TLM1	
15.	Kutta Condition, Kelvin's Circulation Theorem, Starting Vortex	2	20-03-2023 24-03-2023		TLM1	
16.	Thin Aerofoil Theory and its applications	2	25-03-2023 27-03-2023		TLM1	
17.	Application of thin aerofoil theory- Analysis of flow over symmetric airfoil	2	29-03-2023 31-03-2023		TLM1	
18.	Application of thin aerofoil theory- Analysis of flow over cambered airfoil	1	1-04-2023		TLM1	

19.	Tutorial	1	3-04-2023		TLM3	
No. of classes required to complete UNIT-III		11		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	10-04-2023		TLM1	
21.	Down wash and Induced drag, Trailing vortex	1	12-04-2023		TLM1	
22.	Vortex filament	1	15-04-2023		TLM1	
23.	Biot-Savart's law, Infinite and semi-infinite vortex filament	2	17-04-2023 19-04-2023		TLM1	
24.	Helmholtz theorems	1	21-04-2023		TLM1	
25.	Horseshoe Vortex, Prandtl's Classical Lifting Line Theory	2	24-04-2023 26-04-2023		TLM1	
26.	Elliptic Lift Distribution	2	28-04-2023 29-04-2023		TLM1	
27.	General Lift Distribution	1	1-05-2023		TLM1	
28.	Tutorial	1	3-05-2023		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	5-05-2023		TLM1	
30.	Boundary layer Thickness, Boundary layer Displacement Thickness	2	6-05-2023 8-05-2023		TLM1	
31.	Momentum Thickness, Energy Thickness	2	10-05-2023 12-05-2023		TLM1	
32.	Types of Boundary layer, Momentum Integral Estimates	2	15-05-2023 17-05-2023		TLM1	
33.	Karman Analysis of Flat plate	1	19-05-2023		TLM1	
34.	Navier Stokes Equations-Boundary Layer Equations-2D	2	20-05-2023 22-05-2023		TLM1	

35.	Boundary layer growth on a Flat Plate, Blasius Solution	1	24-05-2023		TLM1
36.	Boundary Layer with Pressure Gradient	1	26-05-2023		TLM1
37.	Tutorial	1	27-05-2023		TLM3
No. of classes required to complete UNIT-V		13	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 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

COURSE HANDOUT

PART-A

Name of Course Instructor: S.Indrasena Reddy

Course Name & Code : Aircraft Structures-I & 20AE07

L-T-P Structure :2-1-0

Program/Sem/Sec : B.Tech./ IV-Sem

Credits: 3

A.Y.: 2022-23

PREREQUISITE: Engineering Mechanics

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

C01	Solve problems related to elastic members by applying stress-strain relations
C02	Analyze the behavior of beams, frames and trusses under various loading conditions (Analyze-L4)
C03	Analyze the statically indeterminate structures under various loading conditions (Analyze-L4)
C04	Evaluate the strain energy stored in the structural members (Apply-L3)
C05	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
C01	3	3	3	3								2	3	3
C02	3	3	3	3								2	3	3
C03	3	3	3	3								2	3	3
C04	3	3	3	3								2	3	3
C05	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	30-01-23		TLM1	
2.	Equations of equilibrium	1	31-01-23		TLM1	
3.	Determination of normal and tangential stresses	1	01-02-23		TLM1	
4.	Normal and tangential and resultant stresses	1	04-02-23		TLM1	
5.	Graphical methods to determine stresses	1	06-02-23		TLM1	
6.	Mohr's circle-uni axial, Bi-axial	1	07-02-23		TLM1	
7.	Concept of principal planes, stresses and strains	1	08-02-23		TLM1	
8.	plane stress problems	1	13-02-23		TLM1	
9.	compatibility equations	1	14-02-23		TLM3	
10.	stress - strain relations	1	15-02-23		TLM1	
11.	Two-Dimensional problems-Stress function	1	20-02-23		TLM1	
12.	Airy's Stress function	1	21-02-23		TLM1	
No. of classes required to complete UNIT-I: 12				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
13.	Introduction to statically determinate structures	1	22-02-23		TLM1	
14.	Determinacy and Stability	1	25-02-23		TLM1	
15.	Degree of Redundancy	1	27-02-23		TLM1	
16.	Principle of Superposition	1	28-02-23		TLM1	
17.	Reactions of supports of a frame	1	01-03-23		TLM1	
18.	Analysis of plane truss-types of frame	1	04-03-23		TLM3	
19.	Method of joints for simple frames	1	06-03-23		TLM1	
20.	Method of joints for complex frames	1	07-03-23		TLM1	
21.	Method of sections for simple frames	1	13-03-23		TLM1	
22.	Method of sections for complex frames	1	14-03-23		TLM1	
No. of classes required to complete UNIT-II: 10				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
23.	statically Indeterminate structures	1	15-03-23		TLM1	
24.	Propped cantilever- prop reaction	1	18-03-23		TLM1	
25.	Propped cantilever with point load and UDL	1	20-03-23		TLM1	
26.	Fixed beams	1	21-03-23		TLM1	
27.	Fixed-Fixed beams	1	25-03-23		TLM3	
28.	SFD BMD of Fixed Beams	1	03-04-23		TLM1	
29.	Continuous beams	1	04-04-23		TLM1	
30.	Clapeyron's three moment equation	1	10-04-23		TLM1	
31.	SFD and BMD of continuous beams	1	11-04-23		TLM1	
32.	Continuous beam problems	1	12-04-23		TLM1	
33.	Moment distribution Method	1	15-04-23		TLM3	
No. of classes required to complete UNIT-III: 11				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
34.	Introduction to energy methods	1	17-04-23		TLM1	
35.	Strain Energy due to axial, bending loading	1	18-04-23		TLM1	
36.	Strain Energy due to Torsion	1	19-04-23		TLM1	
37.	Deflection of beams using strain energy	1	24-04-23		TLM1	
38.	Castigliano's first theorem	1	25-04-23		TLM1	
39.	Deflection of beams using Castigliano's theorem	1	26-04-23		TLM1	
40.	Castigliano's second theorem	1	29-04-23		TLM3	
41.	Maxwell's Reciprocal theorem	1	01-05-23		TLM1	
42.	Unit load method	1	02-05-23		TLM1	
43.	Deflection of frames by using unit load method	1	03-05-23		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
44.	Introduction to columns	1	06-05-23		TLM1	
45.	Axially loaded compression members	1	08-05-23		TLM1	
46.	Crushing load- Buckling load	1	09-05-23		TLM1	
47.	Euler's theory-Effective length	1	10-05-23		TLM1	
48.	Expressions for buckling load	1	15-05-23		TLM1	
49.	buckling load with different end conditions	1	16-05-23		TLM1	
50.	Limitations-Euler's formula	1	17-05-23		TLM1	
51.	Euler's crushing load	1	20-05-23		TLM3	
52.	Rankine's formula	1	22-05-23		TLM1	
53.	Column with initial curvature	1	23-05-23		TLM1	
54.	Columns subjected to eccentric loading	1	24-05-23		TLM1	
55.	Euler's method- Rankine's method	1	27-05-23		TLM1	
No. of classes required to complete UNIT-V: 12				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 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)	(Dr.Prabhu.L)	(Dr.P.Lovaraju)



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DEPARTMENT OF AEROSPACE ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: **L. PRABHU**

Course Name & Code : Universal Human Values 2: Understanding Harmony (20HS01)

L-T-P Structure : 3-0-0

Credits : 3

Program/Sem/Sec : B.Tech IV Semester - **ASE**

A.Y. : 2022-23

PREREQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): To become more aware of themselves and their surroundings (family, society, nature); they would become more responsible in life and in handling problems with sustainable solutions while keeping human relationships and human nature in mind.

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

C01	Apply the value inputs in life and profession
C02	Distinguish between values and skills, happiness and accumulation of physical facilities, the self and the Body
C03	Understand the role of a human being in ensuring harmony in society
C04	Understand the role of a human being in ensuring harmony in the nature and existence
C05	Distinguish between ethical and unethical practices

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01						3	2	2				1			
C02						2	2					1			
C03						3	2					1			
C04						3	3	2				1			
C05						2	2	3				2			

TEXTBOOKS:

T1 R R Gaur, r singal, G P Bagaria, "Human values and Professional Ethics", Excel Books, New Delhi,2010

REFERENCE BOOKS:

R1 Jeevan vidya: Ek Parichaya, A.Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999

R2 Human values, A N Tripathi, New Age Publishers, New Delhi, 2004

R3 The story of my experiments with Truth, Mohandas Karamchand Gandhi

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Need, Basic Guide lines, content and Process for value Education

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, COs	1	30-01-2023		TLM2	
2.	Process for self exploration: Natural Acceptance	1	01-02-2023		TLM.2	
3.	Experiential validation	1	02-02-2023		TLM2	
4.	Continuous Happiness and prosperity	1	03-02-2023		TLM2	
5.	A look at basic human aspirations: Right understanding	1	06-02-2023		TLM2	
6.	Relationship	1	08-02-2023		TLM2	
7.	Physical facility	1	09-02-2023		TLM2	
8.	Understanding Happiness and prosperity	1	10-02-2023		TLM2	
9.	Understanding Happiness and prosperity	1	13-02-2023		TLM2	
No. of classes required to complete UNIT-I: 9				No. of classes taken:		

UNIT-II: Understanding Harmony in the Human Being-Harmony in myself

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
10.	Understanding Human being as a co-existence of sentient 'I' and the material 'Body'	1	15-02-2023		TLM2	
11.	Understanding the needs of self ('I') and 'Body'- Happiness and Physical facility	1	16-02-2023		TLM2	
12.	Understanding the Body as an instrument of 'I'	1	17-02-2023		TLM2	
13.	Understanding the characteristics and activities of 'I' and harmony in 'I'	1	20-02-2023		TLM2	
14.	Understanding the harmony of I with the Body	1	22-02-2023		TLM2	
15.	Sanyam and Health	1	23-02-2023		TLM2	
16.	Correct appraisal of Physical needs	1	24-02-2023		TLM2	
17.	Meaning of prosperity in detail	1	27-02-2023		TLM1	
No. of classes required to complete UNIT-II: 8				No. of classes taken:		

UNIT-III: Understanding Harmony in the Family and society-Harmony in Human- Human Relationship

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
18.	Understanding values in human-human relationship: meaning of justice	03	01, 02, 03 Mar 2023		TLM2	
19.	Program for fulfillment to ensure mutual happiness, Trust and Respect as the foundational values of relationship	03	06,09,10 Mar 2023		TLM2	
20.	Understanding Harmony in the society: Resolution	02	13, 15 Mar 2023		TLM2	
21.	Revision	06	16 to 24 Mar 2023			
22.	I-Mid examinations		27-03-2023 to 01-04-2023			
23.	Prosperity, fearlessness and co-existence as comprehensive human goals	2	03-04-2023 06-04-2023		TLM2	
24.	Visualizing a universal harmonious order in the society- undivided society	1	10-04-2022		TLM2	
25.	Universal order-from family to world family	1	12-04-2022		TLM2	
26.	Gratitude as a universal value in relationships	1	13-04-2022		TLM2	
No. of classes required to complete UNIT-III: 13				No. of classes taken:		

UNIT-IV: Understanding Harmony in the Nature and Existence- Whole existence as Coexistence

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.	Understanding Harmony in the Nature	02	13, 17 Apr 2023		TLM2	
28.	Interconnectedness and mutual fulfillment among four orders of nature	02	19, 20 Apr 2023		TLM2	
29.	Recyclability and self regulation in nature	02	21, 24 Apr 2023		TLM2	
30.	Understanding Existence as co-existence of mutually interacting units in all pervasive space	02	26, 27 Apr 2023		TLM2	
31.	Understanding Existence as co-existence of mutually interacting units in all pervasive space	1	28-04-2023		TLM2	
32.	Holistic perception of harmony at all levels of existence	02	01, 03 May 2023		TLM2	
No. of classes required to complete UNIT-IV: 11				No. of classes taken:		

UNIT-V: Implications of the above Holistic understanding of Harmony on professional ethics

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
33.	Natural acceptance of human values	02	04, 05, May 2023		TLM2	

34.	Definitiveness of ethical human conduct	1	08-05-2023		TLM2	
35.	Basis for humanistic education	1	10-05-2023		TLM2	
36.	Humanistic constitution and humanistic universal order	1	11-05-2023		TLM2	
37.	Competence in professional ethics	1	12-05-2023		TLM2	
38.	Strategy for transition from the present state to universal human order	1	15-05-2023		TLM2	
39.	Revision	2	17, 18, 19 May 2023		TLM2	
No. of classes required to complete UNIT-V: 10				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 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 organization.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	L. Prabhu			Dr. P. Lovaraju
Signature				

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	01-02-23		04-02-23		TLM4	
2.	Mould making and Sand Casting	03	08-02-23		11-02-23		TLM4	
3.	Pattern Design and making	03	15-02-23		25-02-23		TLM4	
4.	ARC Welding Butt Joint and Lap joint	03	22-02-23		04-03-23		TLM4	
5.	Spot Welding (chain), Spot Welding (Zigzag)	03	01-03-23		11-03-23		TLM4	
6.	Injection Moulding	03	01-03-23		18-03-23		TLM4	
7.	Repetition	03	15-03-23		25-03-23			
8.	Lathe Operations: step turning, Tapper turning	03	12-04-23		08-04-23		TLM4	
9.	Lathe Operations: knurling	03	19-04-23		15-04-23		TLM4	
10.	Special Machines: Shaping	03	26-04-23		29-04-23		TLM4	
11.	Special Machines: Milling	03	03-05-23		06-05-23		TLM4	
12.	Special Machines: Drilling, Surface Grinding	03	10-05-23		13-05-23		TLM4	
13.	Repetition	03	17-05-23		20-05-23		TLM4	
14.	Lab internal Exam	03	24-05-23		27-05-23		TLM4	
No. of classes required to complete 14						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

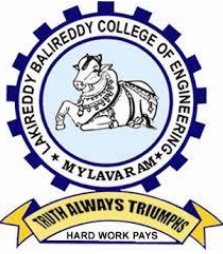
PROGRAMME OUTCOMES (POs):

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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



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/Mr.D.Mallikarjuna Rao
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.:** 2022-23

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(Apply-L3)
CO2	Analyze the performance characteristics of Internal Combustion Engines (Analyze-L4)
CO3	Evaluate the performance parameters of refrigeration and air conditioning systems(Apply-L3)

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	2	3	1	-	-	-	-	-	-	-	1	2	1
CO2	3	2	3	1	-	-	-	-	-	-	-	1	2	1
CO3	3	2	3	1	-	-	-	-	-	-	-	1	2	1

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	----		01-02-23		TLM4	
2.	Exp No1.	03	04-02-23		08-02-23		TLM4	
3.	Exp No 2	03	25-02-23		15-02-23		TLM4	
4.	Exp No 3	03	11-03-23		22-02-23		TLM4	
5.	Exp No 4	03	18-03-23		01-03-23		TLM4	
6.	Exp No 5	03	25-03-23		12-03-23		TLM4	
7.	Exp No 6	03	15-04-23		29-03-23		TLM4	
8.	Exp No 7	03	29-04-23		12-04-23		TLM4	
9.	Exp No 8	03	06-05-23		19-04-23		TLM4	
10.	Exp No 9	03	20-05-23		26-04-23		TLM4	
11.	Exp No 10	03	27-05-23		03-05-23		TLM4	
12.	Repetition	03	----		10-05-23		TLM4	
13.	Lab internal Exam	03	----		17-05-23		TLM4	
No. of classes required to complete:						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 sound mathematical, engineering, and multidisciplinary knowledge to solve Aerospace and Allied Engineering problems
PEO 2	To prepare students to excel in higher education programs and to succeed in industry/academia profession.
PEO 3	To inculcate ethical attitude, leadership qualities, problem solving abilities and life-long learning 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.
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PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the knowledge of Aerodynamics, Propulsion, Aircraft structures and Flight Dynamics in the Aerospace vehicle design
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Title	Course Instructor	Module Coordinator	Head of the Department
Signature			
Name of the Faculty	Mr. I Dakshina Murthy	Mr. I Dakshina Murthy	Dr. P. Lovaraju