



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(Autonomous)

Approved by AICTE, New Delhi and Permanently Affiliated to JNTUK, Kakinada
Accredited by NAAC and NBA (CSE, IT, ECE, EEE & ME) under Tier - I



DEPARTMENT OF AEROSPACE ENGINEERING **COURSE HANDOUT**

Part-A

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

ACADEMIC YEAR : 2024-25

COURSE NAME & CODE : ELEMENTS OF HEAT TRANSFER-20AE14

L-T-P STRUCTURE : 4-0-0

COURSE CREDITS : 3

COURSE INSTRUCTOR : K. Lakshmi Prasad

COURSE COORDINATOR : K. Lakshmi Prasad

PRE-REQUISITES: Engineering Fluid Mechanics, Engineering Thermodynamics.

COURSE EDUCATIONAL OBJECTIVES (CEOs): To learn the basic differential equations of heat transfer in conduction, convection, radiation and to understand the LMTD concepts used in heat exchangers.

COURSE OUTCOMES (COs)

After completion of the course, the student will be able to

CO1: To formulate heat conduction phenomenon through plane, cylindrical surfaces (Apply L3)

CO2: To analyze steady state heat conduction in planes walls and cylindrical shells (Analyze-L4)

CO3: To analyze the convective heat transfer phenomenon in both external and internal flows (Analyze-L4)

CO4: To understand the thermal radiation concepts (Understand-L2)

CO5: To apply the heat transfer principles on the working of heat exchangers and electronic equipment (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	2	2	2	-	-	-	-	-	-	-	2	3	3
CO2	3	2	3	2	-	-	-	-	-	-	-	2	3	3
CO3	3	3	2	3	-	-	-	-	-	-	-	2	3	3
CO4	3	1	2	2	-	-	-	-	-	-	-	2	3	3
CO5	3	3	3	3	-	-	-	-	-	-	-	2	3	3

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

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

BOS APPROVED TEXT BOOKS:

T1 Sachdeva. R.C, Fundamentals of Engineering Heat and Mass Transfer, Fifth Edition, New Age Intl. Publishers, 2015.

BOS APPROVED REFERENCE BOOKS:

- R1** Rathakrishnan. E, Elements of Heat transfer CRC press, New York, 2012.
- R2** Yunus A. Cengel, Afshin J. Ghajar, Heat and Mass Transfer: Fundamentals and Applications McGraw-Hill, 2020.
- R3** Holman. J.P, Heat transfer, McGraw-Hill Higher Education, 2010.
- R4** Ghoshdastidar. P.S, Heat Transfer, Oxford University Press, 2012.

Part-B**COURSE DELIVERY PLAN (LESSON PLAN): Section-A****UNIT-I: CONDUCTIVE HEAT TRANSFER:**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Course Outcomes & Blooms Taxonomy Levels	1	03.12.24		TLM1/ TLM2			
2.	Introduction	2	04.12.24 06.12.24		TLM1/ TLM2	CO1	T1	
3.	Heat Conduction- Fourier Law of Heat Conduction, Thermal Conductivity.	2	07.12.24 10.12.24		TLM1/ TLM2	CO1	T1	
4.	General Heat Conduction Equation in Cartesian Co-ordinates.	1	11.12.24		TLM1/ TLM2	CO1	T1	
5.	General Heat Conduction Equation in Cylindrical Co-ordinates.	1	13.12.24		TLM1/ TLM2	CO1	T1	
6.	Problems	4	17.12.24 18.12.24 20.12.24 21.12.24		TLM1	CO1	T1	
7.	Quiz/Assignment							
No. of classes required to complete UNIT-I		11	No. of classes taken:					

UNIT-II: ONE-DIMENSIONAL STEADY STATE CONDUCTION:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
8.	Heat Conduction in Plane Wall with Constant Thermal Conductivity	1	24.12.24		TLM1/ TLM2	CO2	T1	
9.	Heat Flow Through Composite Wall	1	27.12.24		TLM1/ TLM2	CO2	T1	
10.	Electrical Analogy	1	28.12.24		TLM1/ TLM2	CO2	T1	

11.	Thermal Resistance				TLM1/ TLM2	CO2	T1	
12.	Heat Conduction in Cylindrical shell with Constant Thermal Conductivity	1	31.12.24		TLM1/ TLM2	CO2	T1	
13.	Heat Flow Through Cylinder.	1	03.01.25		TLM1/ TLM2	CO2	T1	
14.	Critical thickness of Insulation	1	04.01.25		TLM1/ TLM2	CO2	T1	
15.	Uniform Internal Heat Generation in Slab	1	07.01.25		TLM1/ TLM2	CO2	T1	
16.	Extended Surfaces	2	08.01.25 10.01.25		TLM1/ TLM2	CO2	T1	
17.	Problems	3	17.01.25 18.01.25 21.01.25		TLM1	CO2	T1	
18.	Quiz/Assignment					CO2		
No. of classes required to complete UNIT-II		12			No. of classes taken:			

UNIT-III: CONVECTIVE HEAT TRANSFER:

S.N o.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
19.	Introduction-Types of Convection	1	22.01.25		TLM1/ TLM2	CO3	T1, R8	
20.	Convective Heat Transfer Coefficient	1	24.01.25		TLM1/ TLM2	CO3	T1	
21.	Significance of Non-Dimensional Numbers	2	25.01.25 28.01.25		TLM1/ TLM2	CO3	T1	
22.	Convective Boundary Layers	1	29.01.25		TLM1/ TLM2	CO3	T1	
23.	The Convection Heat Transfer Equations	1	31.01.25		TLM1/ TLM2	CO3	T1	
24.	Velocity Boundary Layer, Thermal Boundary Layer	1	01.02.25		TLM1/ TLM2	CO3	T1	
25.	Thermal Boundary Layer for Flow Past Heated Plate	1	11.02.25		TLM1/ TLM2	CO3	T1	
26.	Free Convection	2	12.02.25 14.02.25		TLM1/ TLM2	CO3	T1	

27.	Problems	3	15.02.25 18.02.25 19.02.25		TLM1/ TLM2	CO3	T1	
28.	Quiz/Assignment					CO3		
No. of classes required to complete UNIT-III		13			No. of classes taken:			

UNIT-IV: THERMAL RADIATION:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
29.	Introduction-Nature of Thermal Radiation	1	21.02.25		TLM1/ TLM2	CO4	T1	
30.	Concept of Black Body –Laws of Black Body Radiation-	2	22.02.25 25.02.25		TLM1/ TLM2	CO4	T1	
31.	Radiation Heat Exchange Between Two Black Isothermal Surfaces	1	28.02.25		TLM1/ TLM2	CO4	T1	
32.	View Factor	1	01.03.25		TLM1/ TLM2	CO4	T1	
33.	Heat Exchange Between Non-Black Infinite Parallel Plates	1	04.03.25		TLM1/ TLM2	CO4	T1	
34.	Radiation Shields	2	05.03.25 07.03.25		TLM1/ TLM2	CO4	T1	
35.	Simple Problems	2	11.03.25 12.03.25		TLM1	CO4	T1	
36.	Quiz/Assignment					CO4		
No. of classes required to complete UNIT-IV		10			No. of classes taken:			

UNIT-V: APPLICATIONS: HEAT EXCHANGERS & COOLING OF ELECTRONIC EQUIPMENT

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
37.	HEAT EXCHANGERS: Introduction- Classification of Heat Exchangers	1	15.03.25		TLM1/ TLM2	CO5	T1	
38.	Overall Heat Transfer Coefficient- Fouling Factor	1	18.03.25		TLM1/ TLM2	CO5	T1	
39.	LMTD Method of Heat Exchanger Analysis	2	19.03.25 21.03.25		TLM1/ TLM2	CO5	T1	

40.	Manufacturing of Electronic Equipment, Cooling Load of Electronic Equipment	1	22.03.25		TLM1/ TLM2	CO5	T1
41.	Thermal Environment	1	25.03.25		TLM1/ TLM2	CO5	R2
42.	Electronics Cooling in Different Applications,	1	26.03.25		TLM1/ TLM2	CO5	R2
43.	Conduction Cooling, Air Cooling:	1	28.03.25		TLM1/ TLM2	CO5	R2
44.	Forced Convection, Fan Selection	1	29.03.25		TLM1/ TLM2	CO5	R2
45.	Cooling Personal Computers, Liquid Cooling, Immersion Cooling	1	01.04.25		TLM1/ TLM2	CO5	R2
46.	, Problems	3	02.04.25 04.04.25 05.04.25		TLM1/ TLM2	CO5	R2
47.	Quiz/Assignment					CO5	
No. of classes required to complete UNIT-V		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

Academic Calender-A.Y-2023-24

Description	From	To	Weeks
B Tech VI Semester			
Commencement of class work	02.12.2024		
I phase of Instructions	02.12.24	01.02.25	9
I Mid Examination	03.02.25	08.02.25	1
II phase of Instructions	10.02.25	05.04.25	8
II Mid Examination	07.04.25	12.04.25	1
Preparation and Practical	14.04.25	19.04.25	1
Semester End Examination	21.04.25	03.05.24	2
Internship	05.05.24	28.06.25	8

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment 1	1	A1=5
Assignment 2	2	A2=5
I-Mid Examination	1,2,3	B1=15
Quiz – 1	1,2,3	Q1=10
Assignment 3	3	A3=5
Assignment 4	4	A4=5
Assignment 5	5	A5=5
II-Mid Examination	3,4,5	B2=15
Quiz – 2	3,4,5	Q2=10
Evaluation of Assignment: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=15
Evaluation of Quiz Marks: $Q=75\% \text{ of Max}(Q1,Q2)+25\% \text{ of Min}(Q1,Q2)$	1,2,3,4,5	Q=10
Cumulative Internal Examination: A+B+Q	1,2,3,4,5	CIE=30
Semester End Examinations	1,2,3,4,5	SEE=70
Total Marks: CIE+SEE	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

PEO2: To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

PEO3: To develop inquisitiveness towards good communication and lifelong learning.

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

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

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.

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.

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.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex

engineering activities with an understanding of the limitations.

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.

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.

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

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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.

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.

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.

PSOs

1. To apply the principles of thermal sciences to design and develop various thermal systems.

2. To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.

3. To apply the basic principles of mechanical engineering design or evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. K Lakshmi Prasad	Mr. K Lakshmi Prasad	Dr. P. Vijay Kumar	Dr. M B S Sreekara Reddy

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 Aircraft Performance and Design, J.D Anderson, McGrawhill Education, 2017

T2 Nelson, R.C. "Flight Stability and Automatic Control", McGraw-Hill Book Co., 2017.

REFERENCE BOOKS:

R1 Perkins, C.D., and Hage, R.E., "Airplane Performance stability and Control", John Wiley & Son:, Inc, NY, 1988.

R2 Etkin, B., "Dynamics of Flight Stability and Control", Edn. 2, John Wiley, NY, 1982.

R3 Babister, A.W., "Aircraft Dynamic Stability and Response", Pergamon Press, Oxford, 1980.

R4 Michael V. Cook, "Flight Dynamics Principles", Second Edition, Elsevier Aerospace Engineering Series, 2007.

R5 Mc Cornick B. W, "Aerodynamics, Aeronautics and Flight Mechanics", John Wiley, NY, 1995.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: STEADY FLIGHT PERFORMANCE

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 Course and discussion of course outcomes (Cos)	1	03-12-2024		TLM1	
2.	Introduction to Aircraft Performance, Equations of motion of Steady level flight	1	04-12-2024		TLM1	
3.	Drag Polar	1	05-12-2024		TLM1	
4.	Thrust Required for Level Flight	1	06-12-2024		TLM1	
5.	Thrust Available and Maximum Velocity	1	10-12-2024		TLM1	
6.	Power required for level flight, Power available and maximum velocity	1	11-12-2024		TLM1	
7.	Altitude effects	1	12-12-2024		TLM1	
8.	Effect of Drag Divergence	1	13-12-2024		TLM1	
9.	Tutorial	1	17-12-2024		TLM3	
10.	Assignment-1/Quiz-1				---	
No. of classes required to complete UNIT-I		9		No. of classes taken:		

UNIT-II: MANOEUVERING FLIGHT PERFORMANCE:

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.	Rate of climb and climb performance parameter	2	18-12-2024, 19-12-2024		TLM1, TLM2	
12.	Hodograph Diagram ,Absolute and service ceiling, Time to climb	1	20-12-2024		TLM1	
13.	Gliding Flight	1	24-12-2024		TLM1	
14.	Tutorial	1	26-12-2024		TLM3	
15.	Range for propeller driven and jet propelled	1	27-12-2024		TLM1,TLM2	
16.	Endurance, Endurance for propeller driven and jet propelled	2	31-12-2024, 01-01-2025		TLM1,TLM2	
17.	Pull-Up and Pull-Down Manoeuvres	1	02-01-2025		TLM1, TLM2	
18.	Turning Flight, Constraints on load factor	1	03-01-2025		TLM1	
19.	V-n diagram	1	07-01-2025		TLM1, TLM2	
20.	Take-off performance	1	08-01-2025		TLM1	
21.	Landing performance	1	09-01-2025		TLM1	
22.	Tutorial	1	10-01-2025		TLM3	
23.	Assignment/Quiz-2				----	
No. of classes required to complete UNIT-II		14		No. of classes taken:		

I Mid Examination (03-02-2025 to 10-02-2025)**UNIT-III: STATIC LONGITUDINAL STABILITY AND CONTROL::**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Introduction, Moments on the airplane, Absolute angle of attack	1	21-01-2025		TLM1, TLM4	
25.	Criteria for longitudinal Stability	1	22-01-2025		TLM1	
26.	Wing contribution for longitudinal static stability	2	23-01-2025 24-01-2025		TLM1	
27.	Tail contribution for longitudinal static stability	2	28-01-2025 29-01-2025		TLM1, TLM2	

28.	Total pitching moment, Neutral point, Static margin	1	30-01-2025		TLM3	
29.	Tutorial	1	31-01-2025		TLM1	
30.	Stick fixed stability, Stick free stability, Longitudinal control	1	11-02-2025		TLM1	
31.	Elevator angle to trim, Elevator hinge moment	1	12-02-2025		TLM1	
32.	Power effects	1	13-02-2025		TLM1	
33.	Tutorial	1	14-02-2025		TLM3	
34.	Assignment/Quiz-3					
No. of classes required to complete UNIT-III		12		No. of classes taken:		

UNIT-IV: STATIC LATERAL-DIRECTIONAL STABILITY AND CONTROL:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
35.	Lateral stability- Dihedral effect, criterion for lateral stability	2	18-02-2025, 19-02-2025		TLM1	
36.	Dihedral effect, Adverse yaw effects	1	20-02-2025		TLM1,TLM5	
37.	Contribution of wing, fuselage, tail, Lateral control - Coupling between rolling and yawing moments	1	21-02-2025		TLM1	
38.	Lateral control-strip theory estimation of aileron effectiveness, aileron reversal.	1	25-02-2025		TLM1	
39.	Directional stability- yaw and sideslip, Criterion of directional stability, Contribution wing, fuselage, tail	1	27-02-2025		TLM1	
40.	Tutorial	1	28-02-2025		TLM3	
41.	Directional control- rudder control effectiveness	1	04-03-2025		TLM1	
42.	Rudder requirements- adverse yaw, asymmetric power condition, spin recovery	1	05-03-2025		TLM1	
43.	Rudder lock and Dorsal fin	1	06-03-2025		TLM1	
44.	Tutorial	1	07-03-2025		TLM3	
45.	Assignment/Quiz-4					
No. of classes required to complete UNIT-IV		11		No. of classes taken:		

UNIT-V: DYNAMIC STABILITY AND CONTROL:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Introduction to dynamic longitudinal stability, Modes of stability	1	11-03-2025		TLM1,TLM5	
47.	Aircraft Equations of motion	2	12-03-2025, 13-03-2025		TLM1	
48.	Small disturbance theory	2	18-03-2025, 19-03-2025		TLM1,TLM5	
49.	Solving the stability quartic, Routh's Discriminant	2	20-03-2025, 21-03-2025		TLM1	
50.	Phugoid motion, Short period of oscillation	1	25-03-2025		TLM1	
51.	Brief description of lateral and directional dynamic stability	2	26-03-2025, 27-03-2025		TLM1	
52.	Spiral divergence, Dutch roll, auto rotation and spin	2	28-03-2025, 01-04-2025		TLM1	
53.	Tutorial	1	02-04-2025		TLM3	
54.	Assignment/Quiz-5					
55.	Revision	2	03-04-2025, 04-04-2025		TLM2	
No. of classes required to complete UNIT-V		15		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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(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

Name of Course Instructor : Dr. A. Revanth Reddy
Course Name & Code : ABP & 20AE16
L-T-P Structure : 3-0-0
Program/Sem/Sec : B.Tech., ASE., VI-Sem. Credits : 3
A.Y : 2024-25

PRE-REQUISITE: Engineering Thermodynamics, Elements of Aerospace Engineering

COURSE EDUCATIONAL OBJECTIVES (CEOs): To learn engineering concepts of jet engines, flow through subsonic and supersonic inlets of a jet engine, principle of operation of aircraft jet engines, fundamentals of combustion process.

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

CO 1	To determine the performance parameters of various jet engines (Apply-L3)
CO 2	To analyze flow thorough subsonic and supersonic inlets (Analyze-L4)
CO 3	To estimate the performance parameters of aircraft compressor (Apply-L3)
CO 4	To identify the parameters governing the working of combustion chambers (Understand-L2)
CO 5	To determine the performance parameters of turbines of jet engines (Apply-L3)

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

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

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

TEXT BOOKS:

- T1 Ganesan. V, Gas Turbines, Third Edition, Tata McGraw-Hill, New Delhi, 2017
- T2 Saravanamuttoo. H.I.H, Rogers. G. F. C, Cohen. H, Straznicky. P. V, Nix. A. C, Gas Turbine Theory, Seventh Edition, Pearson Education, 2019.

REFERENCE BOOKS:

- R1 Hill, P.G., Peterson, C.R. Mechanics & Thermodynamics of Propulsion, Addison –

Wesley. Longman INC, 1999

R2 Mattingly. J. D, Elements of propulsion: Gas Turbines and Rockets, AIAA Educational Series

R3 Rolls Royce Jet Engine, Third Edition, 1983

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: FUNDAMENTALS OF AIRBREATHING PROPULSION

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.	Working of Gas Turbine Engine	1	02-12-24		TLM1	
2.	Characteristics of Turboprop	1	05-12-24		TLM1	
3.	Characteristics of Turbofan	1	06-12-24		TLM1	
4.	Characteristics of Turbojet	1	07-12-24		TLM1	
5.	Cycle Analysis	1	09-12-24		TLM1	
6.	Performance Characteristics	1	12-12-24		TLM1	
7.	Performance Characteristics (Cont)	1	13-12-24		TLM1	
8.	Performance Characteristics (Cont)	1	14-12-24		TLM1	
9.	Thrust Equation.	1	16-12-24		TLM1	
10.	Thrust Equation (cont)	1	19-12-24		TLM1	
11.	Factors Affecting Thrust	1	20-12-24		TLM1	
12.	Methods of Thrust Augmentation	1	21-12-24		TLM1	
13.	Introduction to Ramjets and Working Principle.	1	23-12-24		TLM1	
14.	Introduction to SCRAMJETS and Working Principle.	1	26-12-24		TLM1	
No. of classes required to complete UNIT-I: 14				No. of classes taken: 14		

UNIT-II: SUBSONIC AND SUPERSONIC INLETS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Introduction to Subsonic and Supersonic inlets	1	27-12-24		TLM1	
16.	Subsonic Inlets	1	28-12-24		TLM1	
17.	Internal Flows	1	30-12-24		TLM1	
18.	External Flows	1	02-01-25		TLM1	
19.	Supersonic Inlets	1	03-01-25		TLM1	
20.	Starting problem on Supersonic Inlets	1	04-01-25		TLM1	
21.	Shock Swallowing	1	06-01-25		TLM1	
22.	Flow Stability Problem	1	09-01-25		TLM3	
23.	Revision of the Unit II	1	11-01-25		TLM1	
No. of classes required to complete UNIT-II: 9				No. of classes taken: 9		

UNIT-III: COMPRESSORS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Introduction to compressors	1	20-01-25		TLM1	
25.	Principle of Operation of Centrifugal Compressor	1	23-01-25		TLM1	
26.	Work Done and Pressure Rise	1	24-01-25		TLM1	
27.	Velocity diagrams	1	25-01-25		TLM1	
28.	Diffuser vane considerations	1	27-01-25		TLM2	
29.	Prewirl, Stall and Surge	1	30-01-25		TLM1	
30.	Elementary theory of Axial Flow Compressor	1	31-01-25		TLM2	
31.	Velocity Triangles	1	01-02-25		TLM1	
32.	Velocity Triangles (Cont..)	1	10-02-25		TLM2	
33.	Degree of reactions	1	13-02-25		TLM1	
34.	Centrifugal compressor Performance Characteristics	1	14-02-25		TLM2	
35.	Axial compressor Performance Characteristics	1	15-02-25		TLM1	
36.	Numericals	1	17-02-25		TLM1	
No. of classes required to complete UNIT-III:13				No. of classes taken: 13		

UNIT-IV: COMBUSTION CHAMBERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Classification of Combustion Chambers	1	20-02-25		TLM1	
38.	Combustion Process	1	21-02-25		TLM1	
39.	Combustion Process (cont..)	1	22-02-25		TLM1	
40.	Factors affecting CC design	1	24-02-25		TLM1	
41.	CC Performance	1	27-02-25		TLM1	
42.	CC Performance (cont..)	1	28-02-25		TLM3	
43.	Effect of Operating variables on Performance	1	01-03-25		TLM1	
44.	Effect of Operating variables on Performance	1	03-03-25		TLM1	
45.	Flame tube cooling	1	06-03-25		TLM1	
46.	Flame Stabilization	1	07-03-25		TLM1	
47.	Use of Flame Holders	1	08-03-25		TLM1	
48.	Fuel Injection Systems	1	10-03-25		TLM1	
49.	Revision of Unit IV	1	13-03-25		TLM1	
No. of classes required to complete UNIT-IV:15				No. of classes taken: 13		

UNIT-V: TURBINES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
50.	Elementary theory of Turbines	1	15-03-25		TLM1	

51.	Impulse Turbines	1	17-03-25		TLM1
52.	Reaction Turbines	1	20-03-25		TLM1
53.	Axial flow Turbines	1	21-03-25		TLM1
54.	Radial flow Turbines	1	22-03-25		TLM1
55.	Velocity triangles and Power output	1	24-03-25		TLM1
56.	Velocity triangles and Power output (Cont..)	1	27-03-25		TLM1
57.	Estimation of Stage Performance	1	28-03-25		TLM1
58.	Estimation of Stage Performance (Cont..)	1	29-03-25		TLM1
59.	Turbine Performance Characteristics	1	02-04-25		TLM1
60.	Turbine Performance Characteristics	1	03-04-25		TLM1
61.	Methods of Blade Cooling	1	04-04-25		TLM1
No. of classes required to complete UNIT-V:12				No. of classes taken: 12	

Advanced Topics/ beyond Syllabus in MOC

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.						
2.						

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 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

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
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	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
(Dr. A Revanth Reddy)	(Dr. A Revanth Reddy)	(Dr.P.Lovaraju)



COURSE HANDOUTS

PROGRAM : B. Tech, VI Sem, Aerospace Engineering
ACADEMIC YEAR : 2024-2025
COURSE NAME AND CODE : 20AE17- INTRODUCTION TO COMPUTATIONAL FLUID DYNAMICS
L-T-P STRUCUTRE : 3-0-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : Dr. Sreenadh Chevula
COURSE COORDINAOTR : Dr. Sreenadh Chevula

PRE-REQISITE

Course educational objectives

: To learn the basic governing equations of fluid dynamics, mathematical behaviour of partial differential equations, phenomena of various discretization techniques, techniques

COURSE

OUTCOMES(Co's)

At the end of the course students are able to

CO1	Formulate the governing equations of fluid dynamics (Apply-L3)
CO2	Apply the discretization techniques to governing equations of fluid dynamics (Apply-L3)
CO3	Understand various CFD techniques (Understand-L2)
CO4	Apply various CFD techniques to solve fluid dynamic problems (Apply-L3)

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

REFERENCES

- T1. Anderson.J.D, Computational Fluid Dynamics-Basics with Applications, Mc Graw Hill, 2017.
- T2. Anderson, D. A, Tannehill. J. C, Pletcher. R. H, Computational Fluid Mechanics and Heat Transfer, CRC Press, 2012.
- T3. Patankar. S. V, Numerical Heat Transfer and Fluid Flow, CRC Press, 1980.
- T4. Sengupta. T. K, Fundamentals of Computational Fluid Dynamics, University Press, 2004

COURSE DELIVERY PLAN (LESSON PLAN)

UNIT - I Introduction, Governing Equations of Fluid Dynamics, Mathematical Behavior of Partial Differential Equations

S.No	Topics to be Covered	No of classes required	Tentative date of completion	Actual Date of completion	Teaching Learning method	Learning Outcomes	Text Book Followed	HoD Sign Weekly
1	Computational Fluid Dynamics as a Research and Design Tool, Applications of Computational Fluid Dynamics.	2	2,5, Dec,2024		TLM2	CO1	T1	
Governing Equations of Fluid Dynamics:								
2	Introduction, Control Volume,	1	6 Dec,2024		TLM2	CO1	T1	
3	Substantial Derivative, Divergence of Velocity	1	07-Dec-24		TLM2	CO1	T1	
4	Continuity Equation	1	09-Dec-24		TLM2	CO1	T1	
5	Momentum Equation	2	12, 13-12-2024		TLM2	CO1	T1	
6	Energy Equation	2	14, 16-12-2024		TLM2	CO1	T1	
7	Conservation and non-conservation forms of governing flow equations	2	19, 20-12-2024		TLM2	CO1	T1	
Mathematical Behaviour of Partial Differential Equations:								
8	Introduction	2	21, 23-12-2024		TLM2	CO1	T1	
9	Classification of Quasi-Linear Partial Differential Equations	2	26, 27-12-2024		TLM2	CO1	T1	
10	Eigen Value Method,	2	28,30-12-2024		TLM2	CO1	T1	
11	Hyperbolic Equations	2	2,3-01-2025		TLM2	CO1	T1	
12	Parabolic Equations	1	04-Jan-25		TLM2	CO1	T1	
14	Elliptic Equations	1	6,8-01-2025		TLM2	CO1	T1	
Total No of classes required to complete Unit-1		19	No of Classes Taken :					

UNIT - 2 Basics Aspects of Discretization

S.No	Topics to be Covered	No of classes required	Tentative date of completion	Actual Date of completion	Teaching Learning method	Learning Outcomes	Text Book Followed	HoD Sign Weekly
1	Introduction,	1	09-01-2025		TLM2	CO2	T1	
2	Introduction of Finite Differences,	2	17,18-01-2025		TLM2	CO2	T1	
3	Difference Equations,	2	20,23-01-2025		TLM2	CO2	T1	
4	Explicit Approaches	2	24,25-01-2025		TLM2	CO2	T1	
5	Implicit Approaches	2	27,30-01-2025		TLM2	CO2	T1	
6	Errors and Stability Analysis	2	31/1/25,1-02-2025		TLM2	CO2	T1	

03-02-2025 to 08-2-2025 MID-1 Examination

		No of classes required	Tentative date of completion	Actual Date of completion	Teaching Learning method	Learning Outcomes	Text Book Followed	HoD Sign Weekly
7	Grid Generation	2	10, 13-02-2025		TLM2	CO2	T1	
	Total No of classes required to complete Unit-2	13	No of Classes Taken :					

UNIT - 3 Simple CFD Techniques

s.No	Topics to be Covered	No of classes	Tentative date	Actual Date of	Teaching	Learning	Text Book	HoD Sign
		required	of completion	completion	Learning method	Outcomes	Followed	Weekly
1	Introduction	1	13-02-2025		TLM2	CO3	T1	
2	The Lax–Wendroff method	2	14,15-02-2025		TLM2	CO3	T1	
3	Maccormack technique	2	17,20-02-2025		TLM2	CO3	T1	
4	Space Marching	1	21-02-2025		TLM2	CO3	T1	
5	Relaxation Technique and its use with low-speed inviscid Flow	2	22,24-02-2025		TLM2	CO3	T1	
6	Artificial Viscosity	2	27,28-02-2025		TLM2	CO3	T1	
	Total No of classes required to complete Unit-3	10	No of Classess Taken :					

UNIT - 4 Numerical Solutions of Quasi 1-D Nozzle Flows:

s.No	Topics to be Covered	No of classes	Tentative date	Actual Date of	Teaching	Learning	Text Book	HoD Sign
		required	of completion	completion	Learning method	Outcomes	Followed	Weekly
1	Introduction	1	01-Mar-25		TLM2	CO4	T1	
2	Supersonic Isentropic Nozzle	2	3,6-03-2025		TLM2	CO4	T1	
3	Maccormack technique	1	7,8-03-2025		TLM2	CO4	T1	
4	Governing Equations	2	10,13-03-2025		TLM2	CO4	T1	
5	Finite Difference Equations	2	14,15-03-2025		TLM2	CO4	T1	
6	CFD Solution of Purely Subsonic Isentropic Nozzle Flow	2	17,20-03-2025		TLM2	CO4	T1	
7	Shock Capturing	2	21,22-03-2025		TLM2	CO4	T1	
	Total No of classes required to complete Unit-4	12						

UNIT - 5 Incompressible Couette Flow:

s.No	Topics to be Covered	No of classes	Tentative date	Actual Date of	Teaching	Learning	Text Book	HoD Sign
		required	of completion	completion	Learning method	Outcomes	Followed	Weekly
1	Introduction,	1	24-03-2025		TLM2	CO5	T1, T2	
2	The Physical Problem and its exact Analytical Solution	3	27, 28,29-03-2025		TLM2	CO5	T1, T2	
3	Implicit Crank-Nicholson Technique	2	01, 4-04-2025		TLM2	CO5	T1, T2	
4	Pressure Correction Method	2	05, 06-04-2025		TLM2	CO5	T1, T2	
	Total No of classes required to complete Unit-5	8						

07-04-2025 to 12-4-2025 MID-II Examination

21-04-2025 to 03-05-2025 Semester end examination

Teaching Learning Method

TLM2

PPT and Chalk and Talk



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

L. B. Reddy Nagar, Mylavaram – 521 230, N.T.R. District, Andhra Pradesh, India
Affiliated to JNTUK, Kakinada & Approved by AICTE New Delhi
Accredited by NBA under Tier – I, Accredited by NAAC with 'A' grade,
An ISO 21001:2018, 500001:2018, 14001:2015 Certified Institution

DEPARTMENT OF AEROSPACE ENGINEERING

Estd.: 1998

Website: <https://www.lbrce.ac.in/ase/index.php> Email: hodaero@lbrce.ac.in Phone: 08659-222933 Ext: 624/623

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. Nazumuddin Shaik

Course Name & Code : AIRPORT DESIGN -20AE19

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

Program/Sem/Sec : B. Tech, VI- Sem

Credits: 3

A.Y.: 2024-25

PREREQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVE (CEO):

To study the procedure of the formation of aerodrome and its design, various maintenance activities for airport maintenance, air traffic control, procedure and air traffic service.

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

C01	To Acquire the concept of air traffic rules and clearance procedures for airline operation [Understand-L2]
C02	To Analyze the various air traffic data for air traffic services [Analyze-L4]
C03	To Analyze the influence of aerodrome design factors for service establishments [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	2	2	-	-	-	-	-	-	-	-	2	3	3
C02	3	3	2	-	-	-	-	-	-	-	-	3	3	3
C03	3	3	2	-	-	-	-	-	-	-	-	3	3	3
C04	3	2	2	-	-	-	-	-	-	-	-	2	3	3
C05	3	3	2	-	-	-	-	-	-	-	-	3	3	3
1 - Low				2 -Medium				3 - High						

REFERENCE BOOKS:

R1	Virendra kumar and Sathish Chandra, Airport Planning and Design, Galgotia publications Pvt Ltd, New Delhi, 2012.
R2	Aeronautical Information Publication (India) Vol. I & II, the English book store, 17-1, Connaught Circus, New Delhi, 2006.
R3	M.S Nolan, "Fundamentals Air Traffic Control", Latest Edition, YESDEE Publishers, 2010.
R4	Seth B. Young, Alexander T. Wells, "Airport Planning and Management" McGraw-Hill Education, New Delhi, 2011.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: BASIC CONCEPTS

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.	Airport Design Introduction, CEO & COs	1	02-12-2024		TLM1&2	
2.	Objectives of Air Traffic Services	1	05-12-2024		TLM1&2	
3.	Parts of Air Traffic Control (ATC) Service	1	06-12-2024		TLM1&2	
4.	Scope and Provision of ATCS	1	07-12-2024		TLM1&2	
5.	Classification of ATS air spaces	1	09-12-2024		TLM1&2	
6.	Classification of ATS air spaces	1	12-12-2024		TLM1&2	
7.	VFR (Visual Flight Rules) vs. IFR (Instrument Flight Rules)	1	13-12-2024		TLM1&2	
8.	Provides flight information and alerting services.	1	14-12-2024		TLM1&2	
9.	Designation and identification of units providing ATS	1	16-12-2024		TLM1&2	
10.	Varies kinds of separation	1	19-12-2024		TLM1&2	
11.	Altimeter setting procedures, establishment,	1	20-12-2024		TLM1&2	
12.	Designation and identification of units providing ATS	1	21-12-2024		TLM1&2	
13.	Division of responsibility of control.	1	23-12-2024		TLM1&2	
No. of classes required to complete UNIT-I: 13				No. of classes taken:		

UNIT-II: AIR TRAFFIC SERVICES

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Area control service	1	26-12-2024		TLM1&2	
15.	Assignment of cruising levels	1	27-12-2024		TLM1&2	
16.	Minimum flight altitude	1	28-12-2024		TLM1&2	
17.	ATS routes and significant Points	1	30-12-2024		TLM1&2	
18.	RNAV and RNP	1	02-01-2025		TLM1&2	
19.	Vertical, lateral and longitudinal separations based on time	1	03-01-2025		TLM1&2	
20.	Vertical, lateral and longitudinal separations based on distance	1	04-01-2025		TLM1&2	

21.	ATC Clearances	1	06-01-2025		TLM1&2	
22.	Flight plans	1	09-01-2025		TLM1&2	
23.	Flight position report	1	10-01-2025		TLM1&2	
24.	Comparison of various ATC services	1	11-01-2025		TLM1&2	
25.	Comparison of various ATC services	1	20-01-2025		TLM1&2	
No. of classes required to complete UNIT-II: 12				No. of classes taken:		

UNIT-III: FLIGHT INFORMATION

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Flight Information	1	23-01-2025		TLM1&2	
27.	Alerting Services, Coordination	1	24-01-2025		TLM1&2	
28.	Emergency Procedures	1	25-01-2025		TLM1&2	
29.	Rules of the Air Radar service	1	27-01-2025		TLM1&2	
30.	Basic radar terminology	1	30-01-2025		TLM1&2	
31.	Identification procedures using primary	1	31-01-2025		TLM1&2	
32.	Identification procedures using primary radar	1	01-02-2025		TLM1&2	
33.	Identification procedures using Secondary radar	1	10-02-2025		TLM1&2	
34.	Performance checks	1	13-02-2025		TLM1&2	
35.	Use of radar in area and approach control services	1	14-02-2025		TLM1&2	
36.	Assurance control and coordination of radar control	1	15-02-2025		TLM3	
37.	Assurance control and coordination of non-radar control	1	17-02-2025		TLM1	
No. of classes required to complete UNIT-III: 12				No. of classes taken:		

UNIT-IV: AERODROME DATA

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
38.	Aerodrome data - basic terminology	1	20-02-2025		TLM1&2	
39.	Aerodrome reference code	1	21-02-2025		TLM1&2	
40.	Aerodrome reference point	1	22-02-2025		TLM1&2	
41.	Aerodrome elevation	1	24-02-2025		TLM1&2	
42.	Aerodrome reference temperature	1	27-02-2025		TLM1&2	
43.	Instrument runway	1	28-02-2025		TLM1&2	
44.	Physical characteristics; length of primary runway	1	01-03-2025		TLM1&2	
45.	Secondary runway	1	03-03-2025		TLM1&2	
46.	Width of runways	1	06-03-2025		TLM1&2	

47.	Minimum distance between parallel runways	1	07-03-2025		TLM1&2	
48.	Obstacles restriction	1	08-03-2025		TLM1&2	
49.	Comparison between domestic and international airports	1	10-03-2025		TLM1&2	
No. of classes required to complete UNIT-IV: 12				No. of classes taken:		

UNIT-V: VISUAL AIDS FOR NAVIGATION

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
50.	Visual aids for navigation	1	13-03-2025		TLM1&2	
51.	Wind direction indicator	1	15-03-2025		TLM1&2	
52.	Landing direction indicator	1	17-03-2025		TLM1&2	
53.	Location and characteristics of signal area & markings	1	20-03-2025		TLM1&2	
54.	Location and characteristics of lights	1	21-03-2025		TLM1&2	
55.	Aerodrome beacon, identification beacon	1	22-03-2025		TLM1&2	
56.	Simple approach lighting system	1	24-03-2025		TLM1&2	
57.	Various lighting systems	1	27-03-2025		TLM1&2	
58.	VASI & PAPI	1	28-03-2025		TLM1&2	
59.	VASI & PAPI	1	31-03-2025		TLM1&2	
60.	Visual aids for denoting obstacles; object to be marked and lighter	1	03-04-2025		TLM1&2	
61.	Emergency and other services.	1	04-04-2025		TLM1&2	
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):

Engineering Graduates will be able to:

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 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.
PO 5	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.
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 the Aerospace vehicle design
PSO 2	To prepare the students to work effectively in Aerospace and Allied Engineering organizations

Title	Course Instructor	Module Coordinator	Head of the Department
Name of the Faculty	Mr. Nazumuddin Shaik	Dr. P. Lovaraju	Dr. P. Lovaraju
Signature			



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 ELECTRONICS AND COMMUNICATION

COURSE HANDOUT

PART-A

Name of Course Instructor : V.V.RAMA KRISHNA
Course Name & Code : ELEMENTS OF COMMUNICATION SYSTEMS - 20EC82
L-T-P Structure : 3-0-0 Credits: 3
Program/Sem/Sec : B.Tech., ASE., VI-Sem., A. Y: 2024-25
PRE-REQUISITE : Concept of signals and modulation theory.

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course provides the knowledge on fundamental properties of systems, radio transmitters, receivers, and noise present in the communication channel and transmission lines and antennas used in communication systems.

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

CO 1	Summarize the properties of systems and concepts of noise in communication systems. (Understand-L2).
CO 2	Outline the concepts of communication system, transmission lines, antennas, and response of linear systems (Understand-L2).
CO 3	Apply the knowledge of systems, transmission and reception concepts for communication systems in the presence of noise. (Apply-L3).
CO 4	Interpret the response of linear systems and performance of RF transmitters, receivers, transmission lines and antennas (Understand L2).

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	PS O1	PS O2	PS O3
CO1	3	-	1	-	-	-	-	-	-	-	-	2	3	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	3	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	2	3	-	-
CO4	3	1	-	2	-	-	-	-	-	-	-	2	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).

TEXT BOOKS:

1. Simon Haykin, Communication Systems, Second Edition, John Wiley & Sons Publications, Singapore, 1983.
2. Kennedy, Davis, Electronic Communication Systems, 4th edition, Tata McGraw-Hill Publications, 2009.

REFERENCE BOOKS:

1. Herbert Taub, Donald L. Schilling, "Principles of Communication Systems", Second Edition, Tata McGraw-Hill, New Delhi, 1991.
2. B.P.Lathi, "Modern Digital and Analog Communication Systems", Third Edition, Oxford University.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Systems:

UNIT-I: Introduction to Systems:						
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.	Course Objectives	1	02-12-24		TLM1	
2.	Brief introduction about the course and its importance.	1	03-12-24		TLM1	
3.	Introduction to Systems - Definition	1	04-12-24		TLM1	
4.	Classification of systems	1	07-12-24		TLM1	
5.	Properties of systems – Linear and Non - linear	1	09-12-24		TLM1	
6.	Time invariant and time variant	1	10-12-24		TLM1	
7.	Causal and Non-causal	1	11-12-24		TLM1	
8.	Stable and Unstable	1	14-12-24		TLM1	
9.	Signal and system bandwidth, Revision	1	16-12-24		TLM1	
10.	Problems based on properties	1	17-12-24		TLM1	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

UNIT-II: Response of linear systems:

UNIT-II: Response of linear systems.						
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	1	18-12-24		TLM1	
2.	Transfer function	1	21-12-24		TLM1	
3.	Impulse response	1	23-12-24		TLM1	
4.	Distortion less transmission through a system	1	24-12-24		TLM1	
5.	Transmission of a signal through LTI system	1	28-12-24		TLM1	
6.	Elements of communication system and its description	1	30-12-24		TLM1	
7.	Revision	1	31-12-24		TLM1	
No. of classes required to complete UNIT-II: 7				No. of classes taken:		

UNIT-III: Noise in Communication Systems:

UNIT-III: Noise in Communication Systems						
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.	Concepts	1	04-01-25		TLM1	
2.	External Noise	1	06-01-25		TLM1	
3.	Internal noise	1	07-01-25		TLM1	
4.	White Noise, Band limited white noise	1	08-01-25		TLM1	
5.	Colored noise	1	11-01-25		TLM1	
6.	Noise Calculations, noise figure	1	20-01-25		TLM1	
7.	Noise temperature, Noise equivalent bandwidth	2	21-01-25 22-01-25		TLM1	
8.	Narrow band noise and its mathematical representation	2	25-01-25 10-02-25		TLM1	
9.	Power spectral density of in phase and quadrature components of noise	2	11-02-25 12-02-25		TLM1	
10.	Revision	1	15-02-25		TLM1	
No. of classes required to complete UNIT-III: 13				No. of classes taken:		

UNIT-IV : Radio Transmitters and Receivers

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.	Radio Transmitters : AM Transmitter	2	17-02-25 18-02-25		TLM1	
2.	FM Transmitter – Direct method of FM Transmission	1	19-02-25		TLM2	
3.	Indirect method of FM transmission	1	22-02-25		TLM1	
4.	Radio Receivers : Types of Radio receivers	2	24-02-25 25-02-25		TLM1	
5.	TRF Receiver and its limitations	1	26-02-25		TLM1	
6.	Super heterodyne receiver	2	1-03-25 3-03-25		TLM2	
No. of classes required to complete UNIT-IV: 10				No. of classes taken:		

UNIT-V : Transmission lines and Antennas

UNIT V : Transmission lines and Antennas						
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.	Transmission lines : Fundamentals	1	4-03-25		TLM1	
2.	Characteristic Impedance	1	5-03-25		TLM1	
3.	Losses in transmission lines, Standing waves	2	8-03-25 10-03-25		TLM2	
4.	Quarter and half wavelength lines	2	11-03-25 12-03-25		TLM1	
5.	Reactance properties	2	15-03-25 17-03-25		TLM1	
6.	Antennas : Basics	1	18-03-25		TLM1	
7.	Directional high frequency Antennas : Dipole Arrays	2	19-03-25 22-03-25		TLM1	
8.	Folded Dipole and applications	2	24-03-25 25-03-25		TLM2	
9.	UHF and Microwave Antennas : Antennas with Parabolic reflectors	1	26-03-25		TLM2	
10.	Horn Antennas, Lens Antennas	2	29-03-25 31-03-25		TLM1	
11.	Revision	1	01-04-25		TLM1	
No. of classes required to complete UNIT-V: 17						

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 the Digital Communication Techniques	1	02-04-25			
2.	Introduction to the Advanced Communication systems	1	03-04-25			

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 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

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	Communication: Design and develop modern communication technologies for building the interdisciplinary skills to meet current and future needs of industry.
PSO 2	VLSI and Embedded Systems: Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
PSO 3	Signal Processing: Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. V.V.Rama Krishna	Mr. V.V.Rama Krishna	Dr. M. V. Sudhakar	Dr. G.Srinivasulu

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING

DEPARTMENT OF AEROSPACE ENGINEERING

Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,

NAAC Accredited with 'A' grade, Certified by ISO 9001:2015

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

COURSE HANDOUT

Part-A

PROGRAM : B.Tech.VI-Sem.,
ACADEMIC YEAR : 2024-25
COURSE NAME & CODE : Aircraft Design Lab-20AE58
L-T-P STRUCTURE : 1-0-2
COURSE CREDITS : 1.5
COURSE INSTRUCTORS : Mr. Ashutosh Shukla / Dr.Sreenadh Chevula
COURSE COORDINATOR : Mr. Ashutosh Shukla
PRE-REQUISITE: Aircraft performance

Course Educational Objectives: To learn the aircraft design methodologies.

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

CO1: To design an aircraft system, component, or process as per the requirement

CO2: To design an aircraft as per the assigned specifications

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	3	-	-	-	-	-	2	3	3
CO2	3	-	-	-	3	2	-	-	-	-	-	2	3	3

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

TIME TABLE

Name of Course Instructor: Ashutosh Shukla/Dr.Sreenadh Chevula

Course Name & Code : AIRCRAFT DESIGN Lab – 20AE58 **Regulation:** R20

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

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

DAY	1	2	3	4	LUNCH	5	6	7
	9.00	09.50	11.00	11.40		01.30	02.20	03.10
	to	to	to	to		to	to	to
09.50	10.40	11.40	12.30	02.20		03.10	04.00	
MON						AD LAB (Batch A)		
TUE								
WED								
THU						AD LAB(Batch B		
FRI								
SAT								

LAB IN-CHARGE

HOD

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Batch A

S.No	Tentative Date of Completion	Actual Date of Completion	Topics to be covered / List of Experiments		Learning Outcome COs
1	02-12-24		Exp-1	Aircraft conceptual sketch	CO1
2	09-12-24		Exp-2	Preliminary weight estimation	CO1
3	16-12-24		Exp-3	Jet fighter, twin turboprop	CO1
4	23-12-24		Exp-4	Sailed powered, Jet tainer	CO1
5	30-12-24		Exp-5	Estimate the Critical Mach number for an Airfoil	CO2
6	6-1-25		Exp-6	Static Performance: Thrust required curve	CO2
7	20-2-25		Exp-7	Static Performance: Power curve	CO2
	27-2-25			Revision	
8	10-2-25		Exp-8	Induced Drag estimation	CO2
9	17-2-25		Exp-9	Preliminary design of aircraft	CO2
10	24-2-25		Exp-10	Trade off study on range	CO2
15	03-3-25		Exp-11	Trade off study on payload	CO2
16	10-3-25		Exp-12	Drawing all 3 view of a aircraft	CO2
	17-3-25			Revision	
17	31-4-25			Internal exam	

COURSE DELIVERY PLAN (LESSON PLAN): Batch B

S.No	Tentative Date of Completion	Actual Date of Completion	Topics to be covered / List of Experiments		Learning Outcome COs
1	5-12-24		Exp-1	Aircraft conceptual sketch	CO1
2	12-12-24		Exp-2	Preliminary weight estimation	CO1
3	19-12-24		Exp-3	Jet fighter, twin turboprop	CO1
4	26-12-24		Exp-4	Sailed powered, Jet tainer	CO1
5	2-01-25		Exp-5	Estimate the Critical Mach number for an Airfoil	CO2
6	09-1-25		Exp-6	Static Performance: Thrust required curve	CO2

7	23-01-25		Exp-7	Static Performance: Power curve	CO2
8	30-01-25			revision	
9	06-02-25		Exp-8	Induced Drag estimation	CO2
10	13-02-25		Exp-9	Preliminary design of aircraft	CO2
15	20-02-25		Exp-10	Trade off study on range	CO2
16	27-02-25		Exp-11	Trade off study on payload	CO2
17	06-03-25		Exp-12	Drawing all 3 view of a aircraft	CO2
18	13-03-25			Revision	
19	20-03-25			Internal exam	

Part - C

EVALUATION PROCESS:

Parameter		Marks
Day – to – Day Work	Observation	A1 = 10 Marks
	Record	A2 = 10 Marks
Internal Test		B =10 Marks
Attendance		C = 05 Marks
Viva – Voce During Regular Lab Sessions		D = 05 Marks
Cumulative Internal Examination		A1+ A2 + B+C+D = 40 Marks
Semester End Examinations		E = 60 Marks
Total Marks: A1+ A2 + B + C + D + E		100 Marks

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)

Engineering Graduated 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 the defense and space research programs.

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Ashutosh shukla	Dr. P.Lovaraju
Course Instructor	HOD



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF AEROSPACE ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. A. Revanth Reddy/Mr. I. Dakshina Murthy

Course Name & Code : Propulsion Lab-20AE59

Regulation: R20

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

Credits: 1.5

Program/Sem/Sec : B.Tech/VI-SEM

A.Y.: 2024-25

Course Educational Objectives:

To learn the various basic experiments related to components of jet engines and piston engines.

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

CO1	Estimate the performance parameters of various jet engine components [Apply-L3]
CO2	Characterize the wall and free jet [Apply-L3]
CO3	Prepare various solid propellant grains [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	3	2	3	-	-	-	-	-	-	-	3	3	3
CO2	3	3	2	3	-	-	-	-	-	-	-	3	3	3
CO3	3	3	2	3	--	--	--	--	--	--	--	3	3	3

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

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-A		BATCH-B			
1.	Introduction	03	02-12-24		05-12-24		TLM4	
2.	Exp No1.	03	09-12-24		12-12-24		TLM4	
3.	Exp No 2	03	16-12-24		19-12-24		TLM4	
4.	Exp No 3	03	23-12-24		26-12-24		TLM4	
5.	Exp No 4	03	06-01-25		09-01-25		TLM4	

6.	Exp No 5	03	27-01-25		30-01-25		TLM4	
7.	Exp No 6	03	10-02-25		13-02-25		TLM4	
8.	Exp No 7	03	17-02-25		20-02-25		TLM4	
9.	Exp No 8	03	24-02-25		27-02-25		TLM4	
10.	Exp No 9	03	03-03-25		06-03-25		TLM4	
11.	Exp No 10	03	10-03-25		13-03-25		TLM4	
12.	Repetition of experiments	03	17-03-25		20-03-25		TLM4	
13.	Lab internal Exam	03	24-03-25		27-03-25		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 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.
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

Title	Course Instructor	Module Coordinator	Head of the Department
Signature			
Name of the Faculty	Mr. I Dakshina Murthy	Dr. A. Revanth Reddy	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. Nazumuddin Shaik/Mr. G.V. Surya Narayana/
Mr. Ashutosh Shukla

Course Name & Code: Aircraft Component Modeling &
Analysis Lab - 20AE60

Regulation: R20

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

Credits: 1.5

Program/Sem/Sec : B.Tech VI-SEM

A.Y.: 2024-25

PRE-REQUISITES: Engineering workshop

COURSE EDUCATIONAL OBJECTIVES (CEOs):

To learn modeling package (CATIA) to draw 3D parts and Assembly of various aircraft components, and finite element package (ANSYS) to analyze the behavior of simple structural elements under static loading system.

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

CO1	Draw aircraft components 3D geometric modeling. (Apply-L2)
CO2	Solve and analyze the structural components of aircraft for deformations and stresses using a numerical tool. (Analyze-L4)

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	2	3	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	3	-	-	-	-	-	-	3	3	3

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered. (Experiment Name)	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	ACMA Introduction-CATIA Introduction	03-12-2024		TLM4	
2.	Aircraft Component Modeling-I Landing gear- Hydraulic Cover	10-12-2024		TLM4	
3.	Aircraft Component Modeling -II Landing gear-Axle	17-12-2024		TLM4	
4.	Assembly of landing gear Components	24-12-2024		TLM4	
5.	Aircraft Component Modeling -III Wing structural elements	31-12-2024		TLM4	
6.	Assembly of Wing Components	07-01-2025		TLM4	
7.	Aircraft Component Modeling-IV Fuselage	14-01-2025		TLM4	
8.	Modeling of Aircraft Components	21-01-2025		TLM4	
9.	Assembly of conventional aircraft	28-01-2025		TLM4	
10.	Ansys Introduction	11-02-2025		TLM4	
11.	Static analysis of cantilever beam	18-02-2025		TLM4	
12.	Eigenvalue Buckling analysis of oleo strut	25-02-2025		TLM4	
13.	Model analysis on Wing	04-03-2025		TLM4	
14.	Thermal analysis	11-03-2025		TLM4	
15.	Static analysis of composite laminate	18-03-2025		TLM4	
16.	Repetition	25-03-2025		TLM4	
17.	Lab internal Exam	01-04-2025		TLM4	

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):

Engineering Graduates will be able to:

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 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.
PO 5	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.
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.

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PO 12	Life-long Learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the knowledge of Aerodynamics, Propulsion, Aircraft structures and Flight Dynamics in the Aerospace vehicle design
PSO 2	To prepare the students to work effectively in Aerospace and Allied Engineering organizations

Title	Course Instructor	Module Coordinator	Head of the Department
Signature			
Name of the Faculty	Mr. Nazumuddin Shaik	Mr. S. Indrasena Reddy	Dr. P. Lovaraju

COURSE HANDOUT

PART-A

Name of Course Instructor: ANURADHA M

Course Name & Code : Soft Skills & 20HSS1

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

Credits: 02

Program/Sem/Sec : B. Tech- VI SEM ASE

Academic Year : 2024-25

PREREQUISITE: NIL

Course Educational Objectives:

The Soft Skills Laboratory course equips students with required behavioral, interpersonal & Intrapersonal skills, communication skills, leadership skills etc. It aims at training undergraduate students on soft skills leading to enhanced self-confidence, esteem, and acceptability in professional circles.

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

CO1	To Develop self-awareness and personality traits for professional growth.	L2
CO2	Work effectively in multi-disciplinary and heterogeneous teams through knowledge of teamwork, Inter-personal relationships, conflict management and leadership quality.	L3
CO3	Communicate through verbal/oral communication with good listening skills and empathy.	L3
CO4	Apply skills required to qualify in recruitment tests, Interviews & other professional assignments.	L3

COURSE ARTICULATION MATRIX

(Correlation between COs & POs)

Course Outcomes PO's →	Programme Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
	CO1.				2			3	3	3		2
	CO2.		2		2			3	3	3		3
	CO3.				2			3	3	3		3
CO4.					2			3	3	3		
1 = Slight (Low)			2= Moderate (Medium)						3 = Substantial (High)			

List of Activities:

1. Personality Development Skills

Role of language in Personality – How language reflects, impacts Personality – Using gender- neutral language in MNCs – being Culturally-Sensitive-Personality Traits - Grooming & Dress code

Activities: Group Discussion/Role play/Presentations (authentic materials: Newspapers, pamphlets and News Clippings)

2. Impactful Communication

Activities: Extempore / Story Telling/ Group Discussion (Case studies/Current affairs etc.)/ Elocution on Interpretation of given quotes/ Critical Appreciation and Textual Analysis/ Writing reviews on short story/videos/book/Social Media profiling/ Pronunciation Practice

3. Professional Skills:

Career Planning- job vs. career- goal setting- SWOT Analysis-Time management – self-management – stress-management.

Activities: SWOT analysis of the self/Goal Setting-Presentation/Writing Report/Listening exercises/Effective Resume-Writing and presentation/ Interview Skills: Mock interviews/Video samples.

REFERENCES:

1. Edward Holffman, “Ace the Corporate Personality”, McGraw Hill, 2001
2. Adrian Furnham, Personality and Intelligence at Work, Psyc 2. hology Press, 2008.
3. M.Ashraf Rizvi, “Effective Technical Communication”, 1 st edition, Tata cGrawHill, 2005.
4. Ace of Soft skills Gopalaswamy Ramesh, Pearson Education India, 2018
5. Soft Skills for the Workplace, Good heart - Willcox Publisher · 2020.
6. How to Win Friends and Influence People, Dale Carnegie · 2020

Software: Walden InfoTech

COURSE DELIVERY PLAN (LESSON PLAN)

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	Activity-1: Role of language in Personality- How language reflects, impacts Personality – Using gender	1+2	04/12/2024		
2.	neutral language in MNCs – being Culturally-Sensitive-Personality Traits - Grooming & Dress code& Role-play	1+2	11/12/2024		
3.	Group Discussion	1+2	18/12/2024		

4.	Presentations	1+2	08/01/2025		
5.	Activity-2: Impactful Communication Extempore - Story Telling	1+2	22/01/2025		
6.	Extempore -Group Discussion	1+2	29/01/2025		
7.	Elocution on Interpretation of given quotes/ Critical Appreciation and Textual Analysis/ Writing	1+2	12/02/2025		
8.	Reviews on short story /videos /book/Social Media profiling/ Pronunciation Practice	1+2	19/02/2025		
9.	Activity-3: Professional Skills: Career Planning- job vs. career- goal setting	1+2	26/02/2025		
10.	SWOT Analysis	1+2	5/03/2025		
11.	Time management – Self- management – stress-management.	1+2	12/03/2025		
12.	Presentation/Writing Report/Listening exercises	1+2	19/03/2025		
13.	Effective Resume-Writing and presentation	1+2	26/03/2025		
14.	Interview Skills: Mock interviews/Video samples.	1+2	02/04/2025		
No. of classes required to complete Syllabus:42					

Signature of Faculty

Signature of HoD