LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
Affiliated to JNTUK, Kakinada & Approved by AICTE New Delhi,
Accredited by NAAC , An ISO 9001:2015 Certified Institution
L.B.Reddy Nagar, Mylavaram – 521 230, Krishna District, Andhra Pradesh, INDIA
Department of Aerospace Engineering
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COURSE HANDOUT

PART-A

Name of Course Instructor : **S.Indrasena Reddy**
Course Name & Code : MOC & 20AE22
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., ASE., VII-Sem. A.Y : 2024-25

PRE-REQUISITE: Strength of materials

COURSE EDUCATIONAL OBJECTIVES (CEOs): To Learn the basic knowledge about composite materials at micro and macro level, lamina and laminates, basic design concepts of sandwich panels, functionally graded materials and the manufacturing process of composite materials.

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

CO 1	understand stress-strain relations of orthotropic materials [Understand L2]
CO 2	analyze properties of composite lamina at micro level and macro level [Analyze-L4]
CO 3	analyze characteristics of layered composites [Analyze-L4]
CO 4	understand the nomenclature of sandwich structures [Understand-L2]
CO 5	apply techniques of fabrication processes to manufacture composites

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 Calcote, LR., "The Analysis of laminated Composite Structures", Von – Noastrand Reinhold Company, New York 1998.
T2 Jones, R.M., "Mechanics of Composite Materials", 2nd Edition McGraw-Hill, KogakushaLtd.,Tokyo, 1998.
T3 Carlsson, L.A., Kardomateas, G.A., "Structural and Failure Mechanics of Sandwich", Solid Mechanics and its Applications, Vol 121, Springer Heidlberg, New York, 2011.

REFERENCE BOOKS:

R1 Agarwal, B.D., Broutman, L.J., "Analysis and Performance of Fibre Composites", John Wiley and sons. Inc., New York, 1995
R2 Lubin, G., "Handbook on Advanced Plastics and Fibre Glass", Von Nostrand Reinhold Co.,New York, 1989.Publishers,3rd edition 2010.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: STRESS STRAIN RELATION

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 Composite materials	1	24-06-24		TLM1	
2.	History of composites	1	25-06-24		TLM2	
3.	Role of reinforcement and Matrix	1	26-06-24		TLM1	
4.	Classification of composites	1	28-06-24		TLM1	
5.	Classification of composites based on Reinforcement	1	01-07-24		TLM1	
6.	Properties of Fibers	1	02-07-24		TLM1	
7.	Classification of composites based on Matrix Phase	1	03-07-24		TLM1	
8.	Types of matrix and their applications	1	05-07-24		TLM1	
9.	Advantages and applications	1	08-07-24		TLM1	
10.	Aerospace Applications	1	09-07-24		TLM2	
11.	Other Applications	1	10-07-24		TLM2	
12.	Generalized Hooke's Law	1	12-07-24		TLM1	
13.	Stress strain relations for non-isotropic materials	1	15-07-24		TLM1	
14.	Stress strain relations for orthotropic materials	1	16-07-24		TLM1	
No. of classes required to complete UNIT-I: 14				No. of classes taken:		

UNIT-II: METHODS OF ANALYSIS

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 macro mechanics	1	19-07-24		TLM1	
2.	Stress-strain relations	1	22-07-24		TLM1	
3.	Stress-strain relation of orthotropic Lamina on-axis	1	23-07-24		TLM1	
4.	Stress-strain relation of orthotropic Lamina Arbitory orientation	1	24-07-24		TLM2	
5.	Material properties of Lamina	1	26-07-24		TLM1	
6.	Experimental characterization	1	29-07-24		TLM1	
7.	Problems on lamina properties	1	30-07-24		TLM3	
8.	Introduction to micro mechanics	1	31-07-24		TLM1	
9.	Mechanics of materials approach	1	02-08-24		TLM1	
10.	Determine Four Elastic constants	1	05-08-24		TLM1	
11.	Problems on Lamina Elastic Constants	1	06-08-24		TLM3	
12.	Elasticity approach to materials	1	07-08-24		TLM1	
13.	Bonding Techniques	1	09-08-24		TLM2	
14.	Upper and Lower bound of Lamina	1	12-08-24		TLM1	
No. of classes required to complete UNIT-II:14				No. of classes taken:		

UNIT-III: MULTI DIRCTIONAL COMPOSITES

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 laminate	1	13-08-24		TLM1	
2.	Macromechanics of Laminate	1	14-08-24		TLM1	
3.	Types of Laminates and Notations	1	16-08-24		TLM2	
4.	Equilibrium equations for laminate	1	19-08-24		TLM1	
5.	Stress strain variation in Laminate	1	20-08-24		TLM1	
6.	Classical Laminate Theory	1	21-08-24		TLM1	
7.	A,B,D matrices	1	23-08-24		TLM1	
8.	Symmetric Laminate Problems	1	27-08-24		TLM3	
9.	Anti-Symmetric Laminate	1	28-08-24		TLM1	
10.	Analysis of Symmetric laminate	1	30-28-24		TLM2	
11.	Cross ply laminates	1	09-09-24		TLM1	
12.	A,B, D matrices Cross ply laminates	1	10-09-24		TLM1	
13.	angle ply laminates	1	11-09-24		TLM1	
14.	A,B, D matrices angle ply laminates	1	13-09-24		TLM3	
15.	Failure criteria of laminates	1	17-09-24		TLM1	
16.	Failure theories (T-Sai. T-sai-Wu etc)	1	18-09-24		TLM1	
No. of classes required to complete UNIT-III:16				No. of classes taken:		

UNIT-IV: SANDWICH CONSTRUCTIONS

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 sandwich construction	1	20-09-24		TLM1	
2.	Design concepts of sandwich panels	1	23-09-24		TLM1	
3.	Facing/Skin Materials	1	24-09-24		TLM1	
4.	Core Materials	1	25-09-24		TLM2	
5.	Flexural rigidity of sandwich with same face thickness	1	27-09-24		TLM1	
6.	Deflection of sandwich beams	1	30-09-24		TLM1	
7.	Problems on sandwich beams	1	01-10-24		TLM3	
8.	Problems on sandwich panels	1	04-10-24		TLM1	
9.	Applications of Sandwich panels	1	07-10-24		TLM1	
10.	Failure modes of sandwich panels	1	08-10-24		TLM2	
11.	Failure modes of sandwich panels	1	09-10-24		TLM2	
No. of classes required to complete UNIT-IV:11				No. of classes taken:		

UNIT-V: FABRICATION PROCESSES & FUNCTIONALLY GRADED MATERIALS

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 fabrication process	1	14-10-24		TLM1	
2.	Fabrication of Carbon Fiber	1	15-10-24		TLM1	
3.	Fabrication of Boron,Glass Fiber	1	16-10-24		TLM1	
4.	Open mould fabrication processes	1	18-10-24		TLM1	
5.	Closed mould Fabrication processes	1	21-10-24		TLM1	
6.	Hand Layup, Spray Layup process	1	22-10-24		TLM1	
7.	Vacuum bagging, infusion Process	1	23-10-24		TLM1	
8.	Pressure bagging Process	1	25-10-24		TLM1	
9.	Pultrusion Process	1	28-10-24		TLM1	
10.	Resin Transfer Moulding Process	1	29-10-24		TLM1	
11.	Auto Clave Process	1	30-10-24		TLM1	
12.	Filament Winding Process	1	01-11-24		TLM1	
13.	Introduction to FGM	1	04-11-24		TLM1	
14.	Functionally Graded Materials	1	05-11-24		TLM1	
No. of classes required to complete UNIT-V:14				No. of classes taken:		

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.	Materials used in Aerospace	1	06-11-24		TLM1	
2.	Advanced Fabrication Techniques	1	08-11-24		TLM1	

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

PART-C

EVALUATION PROCESS (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 problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

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

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DEPARTMENT OF AEROSPACE ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. A. Revanth Reddy
Course Name & Code : SVP & 20AE24
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., ASE., VII-Sem. A.Y : 2024-25

PRE-REQUISITE: Air-breathing Propulsion

COURSE EDUCATIONAL OBJECTIVES (CEOs): To learn the engineering concepts of ramjet and scram jet, the basic aspects of rocket propulsion, working principle of liquid, and solid propellant rocket systems, and advance propulsion techniques.

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

CO 1	To understand the working of ramjet and scram jet engines [Understand L2]
CO 2	To evaluate the preliminary parameters of rocket propulsion. [Apply-L3]
CO 3	To understand the working of liquid and solid propellant rocket systems [Understand-L2]
CO 4	To apply the advanced rocket propulsion techniques for a mission [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

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 Sutton. G.P and Oscar Biblarz "Rocket Propulsion Elements", Wiley-Interscience,7th Edition., 2000.

T2 Mattingly. J. D, Elements of Propulsion: Gas Turbines and Rockets, AIAA Educational Series, 2017.

REFERENCE BOOKS:

R1 Gorden, C.O, Aero Thermodynamics of Gas Turbine and Rocket Propulsion, AIAA Education Series, New York, 1997.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: RAMJET 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.	Introduction to ramjet propulsion	1	24-06-24		TLM1	
2.	Operating principle of ramjets	1	25-06-24		TLM1	
3.	Critical mode of operation	1	27-06-24		TLM1	
4.	Sub-critical and Super-critical mode of operation	1	28-06-24		TLM1	
5.	Combustion process in ramjet engines	1	01-07-24		TLM1	
6.	Performance of Ramjets	1	02-07-24		TLM1	
7.	Performance of Ramjets and its current limitations	1	04-07-24		TLM1	
8.	Need for Supersonic combustion	1	05-07-24		TLM1	
9.	Components and working principle of a Supersonic Ramjet Engine	1	08-07-24		TLM1	
10.	Components and working principle of a Supersonic Ramjet Engine	1	09-07-24		TLM1	
11.	Isolators for SCRAMJET Engine	1	11-07-24		TLM1	
12.	Types of combustion chambers for Scramjet Engine	1	12-07-24		TLM1	
13.	Working principle behind the design of various combustion chambers	1	15-07-24		TLM1	
14.	Mixing process in SCRAMJET Combustion	1	16-07-24		TLM1	
No. of classes required to complete UNIT-I: 14				No. of classes taken: 14		

UNIT-II: ROCKET 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
15.	Introduction to Rocket propulsion	1	18-07-24		TLM1	
16.	Operating principles of different rockets	1	19-07-24		TLM1	
17.	Derivation of Effective exhaust velocity	1	22-07-24		TLM1	
18.	Derivation of Thrust equation	1	23-07-24		TLM1	
19.	Determination of Specific Impulse of a propellant combination	1	25-07-24		TLM1	
20.	Problems based on various performance parameters of rockets	1	26-07-24		TLM1	
21.	Problems based on various performance parameters of rockets	1	29-07-24		TLM1	
22.	Rocket Propulsion Requirements	1	30-07-24		TLM3	
23.	Derivation of equations of motion for an accelerating rocket	1	01-08-24		TLM1	
24.	Derivation of equations of motion for an accelerating rocket (Cont)	1	02-08-24		TLM1	

25.	Multistage Rockets	1	05-08-24		TLM1	
26.	Problems based on Multistaging of rockets	1	06-08-24		TLM1	
No. of classes required to complete UNIT-II:12				No. of classes taken: 12		

UNIT-III: LIQUID PROPELLANT ROCKET

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 Liquid rockets	1	08-08-24		TLM1	
28.	Classification of Liquid propellant	1	09-08-24		TLM1	
29.	Types of fuels used and their properties	1	12-08-24		TLM1	
30.	Types of oxidizers used and their properties	1	13-08-24		TLM1	
31.	Design of the propellant tanks and their arrangements in the launch vehicles	1	16-08-24		TLM2	
32.	Need to pressurize the tanks for propellant delivery	1	19-08-24		TLM1	
33.	Introduction to the different types of feed systems	1	20-08-24		TLM2	
34.	Introduction to turbopump feed systems and engine cycles	1	22-08-24		TLM1	
35.	Open and closed engine cycles	1	23-08-24		TLM2	
36.	Introduction to Gas pressure feed systems	1	27-08-24		TLM1	
37.	Design of various gas pressure feed systems	1	29-08-24		TLM2	
38.	Introduction to injectors and their types	1	30-08-24		TLM1	
39.	Designs of various spray type injectors	1	09-09-24		TLM1	
40.	Designs of Jet type injectors	1	10-09-24		TLM2	
41.	Combustion process in a liquid rocket engine	1	12-09-24		TLM2	
42.	Introduction to combustion instabilities	1	13-09-24		TLM2	
43.	Methods to mitigate or eliminate the combustion instability	1	17-09-24		TLM1	
No. of classes required to complete UNIT-III:17				No. of classes taken:		

UNIT-IV: SOLID PROPELLANT ROCKET

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 Solid Propellant Rockets	1	19-09-24		TLM1	
45.	Classification of Solid propellants	1	20-09-24		TLM1	
46.	Composition of double base propellants.	1	23-09-24		TLM1	
47.	Composition of Composite propellants	1	24-09-24		TLM1	
48.	Selection criteria of solid propellants	1	26-09-24		TLM1	
49.	Combustion process of Solid propellants	1	27-09-24		TLM3	
50.	Propellant burning rate	1	30-09-24		TLM1	
51.	Problems based on Burning rate of	1	01-10-24		TLM1	

	solid propellants					
52.	Propellant grains and its configurations	1	03-10-24		TLM1	
53.	Regression phenomenon of various grain designs	1	04-10-24		TLM1	
54.	Thrust profile of various grain designs	1	07-10-24		TLM1	
55.	Igniters used in Solid Rockets	1	08-10-24		TLM1	
56.	Ignition delay, action time and burning time	1	14-10-24		TLM1	
57.	Propellant grain stress and strain	1	15-10-24		TLM1	
58.	Hybrid rocket design and its performance	1	17-10-24		TLM1	
No. of classes required to complete UNIT-IV:15				No. of classes taken:		

UNIT-V: ADVANCED PROPULSION TECHNIQUES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
59.	Introduction to Advanced propulsion techniques	1	18-10-24		TLM1	
60.	Electro thermal Rocket design and working principle	1	21-10-24		TLM1	
61.	Working principle of Electrostatic engines	1	22-10-24		TLM1	
62.	Ion Propulsion techniques	1	24-10-24		TLM1	
63.	Working principle of Electro-magnetic thrusters	1	25-10-24		TLM1	
64.	Pulsed plasma thrusters and MPD thrusters	1	28-10-24		TLM1	
65.	Magneto Plasma Dynamic Thrusters	1	29-10-24		TLM1	
66.	Solar Sails	1	01-11-24		TLM1	
67.	Nozzleless propulsion	1	04-11-24		TLM1	
68.	Introduction to nuclear propulsion and its need	1	05-11-24		TLM1	
69.	Types of nuclear engine designs proposed	1	07-11-24		TLM1	
70.	Usage of Nuclear power in Inter planetary missions (MTGs)	1	08-11-24		TLM1	
No. of classes required to complete UNIT-V:12				No. of classes taken:		

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.	Recent advances in Electric propulsion	1	09-11-24		TLM2	
2.	Recent developments in 3D printed rocket engines	1	09-11-24		TLM2	

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

PART-C

EVALUATION PROCESS (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 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)

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 NAAC with 'A' grade, An ISO 9001:2015 Certified Institution
DEPARTMENT OF AEROSPACE ENGINEERING
Website: https://www.lbrce.ac.in/ase/index.php Email: hodaero@lbrce.ac.in Phone:08659-222933 Ext:624/623

COURSE HANDOUT

PROGRAM	:	B.Tech, VII Sem, Aerospace Engineering
ACADEMIC YEAR	:	2024-2025
COURSE NAME AND CODE	:	20AE28-SPACE MECHANICS 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 basic aspects of space and solar system, Satellite injection and its orbit perturbations, an interplanetary trajectory issues, ballistic missile trajectories and material used of spacecraft

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

CO1	Understand the basic aspects of space [Understand-L2]
CO2	Evaluate trajectory details of ballistic missiles [Analyze-L4]
CO3	Apply N-body aspects in space exploration issues [Apply-L3]
CO4	Know the general aspects of satellite injection and orbit perturbations [Understand-L2]
CO5	Evaluate interplanetary trajectories of spacecraft [Analyze-L4]

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

BOS APPROVED TEXT BOOKS

T1 W.E. Wiesel, "Spaceflight Dynamics", McGraw-Hill, 1997
T2 Comelisse, Schoyer HFR, Wakker KF, "Rocket Propulsion and Space Flight Dynamics", Pitman publications, 1984
T3 Van de Kamp, P., "Elements of Astro-mechanics", Pitman, 1979.
T4 Parker E.R., "Materials for Missiles and Spacecraft", McGraw-Hill Book Co. Inc., 1982. Series, Published by AIAA, 2002
T5 Vladimir A. Chobotov, "Orbital Mechanics", AIAA Education Series, AIAA Education Series, AIAA Education Series, Published by AIAA, 2002

COURSE DELIVERY PLAN (LESSON PLAN)

UNIT - I BASIC CONCEPTS

s. No	Topics to be Covered	No of classes required	Tentative date of completion	Act Date of completion	TLM method	Learning Outcomes	Textbook Followed	HoD Sign
1	References Frames and Coordinate Systems	1	01-07-2024		2	CO1	T1&T2	
2	The celestial sphere,	2	03,4-07-24		2	CO1	T1&T2	
3	The ecliptic, Motion of Vernal Equinox:	1	05-07-2024		2	CO1	T1&T2	
4	Time and calendar Sidereal Time	2	06-07-2024		2	CO1	T1&T2	
5	Solar Time, Standard time	1	08-07-2024		2	CO1	T1&T2	
6	The Earth's atmosphere	2	10,11-07-2024		2	CO1	T1&T2	
7	The space environment	1	12-07-2024		2	CO1	T1&T2	
Total No of classes required to complete Unit-1		10	No of Classes Taken :					

UNIT - II BALLISTIC MISSILE TRAJECTORIES

s. No	Topics to be Covered	No of classes required	Tentative date of completion	Act Date of completion	TLM method	Learning Outcomes	Textbook Followed	HoD Sign
1	The Boost Phase: The Ballistic Phase	3	13,15,18/07/24		2	CO2	T1&T2	
2	Trajectory Geometry, Optimal Flights	3	19,20,22/07/24		2	CO2	T1&T2	
3	Time of Flight: The re-entry phase	3	24,25,26/07/24		2	CO2	T1&T2	
4	The position of the impact point	4	27,29,30,31/7/24		2	CO2	T1&T2	
5	Spherical earth, Oblate Earth, Influence Coefficients	4	1,2,3,5/08/24		2	CO2	T1&T2	
Total No of classes required to complete Unit-II		17	No of Classes Taken:					

UNIT - III THE MANY- BODY PROBLEM

s. No	Topics to be Covered	No of classes required	Tentative date of completion	Act Date of completion	TLM method	Learning Outcomes	Text Book Followed	HoD Sign
1	General N-body problem:	1	07-08-2024		2	CO3	T1&T2	
2	The Circular Restricted Three Body Problem	2	8,9/08/2024		2	CO3	T1&T2	
3	Jocob's integral, Libration Points	4	10,14,16,17/8/24		2	CO3	T1&T2	
4	Applications to space flight:	3	19,21,22/8/24		2	CO3	T1&T2	
5	Relative Motion in the N-body Problem	3	23,24,28/08/24		2	CO3	T1&T2	
6	Satellite orbit perturbations	3	29,30,31/08/24		2	CO3	T1&T2	

02-09-2024 to 09-09-2024 MID-1 Examination

s. No	Topics to be Covered	No of classes required	Tentative date of completion	Act Date of completion	TLM method	Learning Outcomes	Textbook Followed	HoD Sign
7	Two-Body Problem circular, elliptic	2	11,12-09-2024		2	CO3	T1&T2	
8	parabolic and hyperbolic orbits: Orbital Elements	2	13,14/09/2024		2	CO3	T1&T2	
Total No of classes required to complete Unit-III		20	No of Classes Taken :		2	CO3	T1&T2	

UNIT - IV SATELLITE LAUNCHING AND ORBIT PERTURBATIONS

s. No	Topics to be Covered	No of classes required	Tentative date of completion	Act Date of completion	TLM method	Learning Outcomes	Textbook Followed	HoD Sign
1	Launch vehicle ascent trajectories:	1	17-09-2024		2	CO4	T1&T2	
2	Satellite Injection-General Aspects:	2	18,19/09/2024		2	CO4	T1&T2	
3	Launch vehicle performances: Orbit deviations:	2	20,21/09/2024		2	CO4	T1&T2	
4	Special and General Perturbations	2	23,25/09/2024		2	CO4	T1&T2	
5	cowell's method, encke's method	2	26,27/09/2024		2	CO4	T1&T2	
6	method of variation of orbital elements	2	28,30/09/2024		2	CO4	T1&T2	
7	General Perturbations Approach	1	03-10-2024		2	CO4	T1&T2	
Total No of classes required to complete Unit-IV		12	No of Classes Taken :		2	CO4	T1&T2	

UNIT - V INTERPLANETARY TRAJECTORIES

s. No	Topics to be Covered	No of classes required	Tentative date of completion	Act Date of completion	TLM method	Learning Outcomes	Text Book Followed	HoD Sign
1	Two Dimensional Interplanetary trajectories	1	04-10-2024		2	CO5	T1&T2	
2	Hohmann trajectories, Fast Interplanetary Trajectories	2	5,7/10/2024		2	CO5	T1&T2	
3	Launch opportunities:	2	14,16/10/2024		2	CO5	T1&T2	
4	Three Dimensional	2	17,18/10/2024		2	CO5	T1&T2	
5	Interplanetary Trajectories	3	19,21,23/10/24		2	CO5	T1&T2	
6	Launch if interplanetary Spacecraft:	2	24,25/10/24		2	CO5	T1&T2	
7	Trajectory about the Target Planet.	3	26,28,30/10/24		2	CO5	T1&T2	
Total No of classes required to complete Unit-V		15	No of Clasess Taken :		2	CO5	T1&T2	

11-11-2024 to 16-11-2024 MID-2 Examination
18-11-2024 to 23-11-2024 Preparation and Practical Examinations
13-10-2023 to 25-11-2023 Sem end examination

Teaching Learning Method	
TLM2	PPT and Chalk and Talk

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

DEPARTMENT OF AEROSPACE ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. P. Venkateswara Rao, Sr. Asst.Professor
Course Name & Code : Systems and signal Processing-20EC85 **Regulation**: R20
L-T-P Structure : 3-0-0 **Credits:** 03
Program/Sem/Sec : B. Tech. VII-Sem., Aerospace Engineering **A.Y.:** 2024-25

PRE-REQUISITE: Differentiation and Integration

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course provides basic knowledge on signals, operations, representation of signals in frequency domain using Fourier series, Fourier transform and Z transform. This course introduces underlying concepts of sampling & reconstruction, types of systems and filter design.

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

CO1	Discuss the classification of signals and systems along with their properties and the Concepts of sampling. **(Understand – L2)**
CO2	Apply the concepts of Fourier series, Fourier Transform and Z Transform on signals. **(Apply – L3)**
CO3	Describe the systems and observe the response of Linear Systems. **(Understand – L2)**
CO4	Design IIR Digital Filters by applying Approximation Procedures and FIR Digital Filters through Window Techniques. **(Apply – L3)**

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

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

TEXTBOOKS:

T1	A V Oppenheim, A S Wilsky and IT Young, "Signals and Systems", PHI/Pearson publishers, 2nd Edition.
T2	John G. Proakis, "Digital Signal Processing, Principles, Algorithms & Applications", Pearson education, Fourth edition, 2007

REFERENCE BOOKS:

R1	A.Anand Kumar, "Signals and Systems", 2nd Edition, PHI, 2012.
R2	B P Lathi, "Signals, Systems and Communications", BSP, 2003, 3rd Edition.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Signal Analysis, Operations of Signals

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, Course Outcomes, Introduction to UNIT-I	1	24-06-2024			
2.	**Signal analysis:** Concept of signal	1	25-06-2024			
3.	Classification of Signals	2	28-06-2024 29-06-2024			
4.	Representation of elementary signals	1	01-07-2024			
5.	**Operations of signals**: Time shifting and Time reversal operations	1	02-07-2024			
6.	Time scaling and Amplitude scaling operations	1	05-07-2024			
7.	Problems on operations on signals	1	06-07-2024			
8.	**Properties of signals**: Even and Odd, Causal and Non causal signals	1	08-07-2024			
9.	Bounded and unbounded signals, Periodic and aperiodic signals	1	09-07-2024			
10.	Energy and power, Deterministic and random signals	1	12-07-2024			
11.	Problems on Properties of signals	1	15-07-2024			
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Fourier series, Fourier Transform, Sampling Theorem

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
12.	**Fourier Series:** Concept of Fourier Series	1	16-07-2024			
13.	Trigonometric Fourier Series	1	19-07-2024			
14.	Exponential Fourier Series	1	20-07-2024			
15.	Problems on Trigonometric Fourier Series (TFS)	1	22-07-2024			
16.	Problems on Exponential Fourier Series (EFS)	1	23-07-2024			
17.	Relationship between TFS and EFS	1	26-07-2024			
18.	**Fourier Transform:** Existence of Fourier Transform	1	27-07-2024			
19.	Properties of Fourier Transform	2	29-07-2024 30-07-2024			
20.	Problems on Fourier Transform	1	02-08-2024			

21.	**Sampling Theorem:** Sampling Theorem for band limited signals	2	03-08-2024 05-08-2024			
22.	Reconstruction of original signal from sampled signal	1	06-08-2024			
23.	Types of Samplings	1	09-08-2024			
24.	Effects of Under Sampling-Aliasing	1	12-08-2024			
25.	Problems on sampling Theorem	1	13-08-2024			
No. of classes required to complete UNIT-II: 16				**No. of classes taken:**		

UNIT-III: Signal Transmission through linear systems, Z-Transform

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.	**Signal Transmission through linear systems:** Definition of system	1	16-08-2024			
27.	Linear and Nonlinear systems	1	17-08-2024			
28.	Time invariant and Time variant systems	1	19-08-2024			
29.	Causal and Non causal systems, stable and unstable systems	1	20-08-2024			
30.	Problems on types of systems	2	23-08-2024 24-08-2024			
31.	Response of Linear systems-convolution in Continuous time domain	2	27-08-2024 30-08-2024			
32.	Response of Linear systems-convolution in Discrete time domain	1	31-08-2024			
33.	**Z-Transform** : Z-Transform Definition, Region of convergence Definition	1	09-09-2024			
34.	ROC Properties	1	10-09-2024			
35.	Properties of Z-Transform	2	13-09-2024 17-09-2024			
36.	Inverse Z-Transform through Partial fractions	1	20-09-2024			
37.	Problems on Z-Transform	1	21-09-2024			
No. of classes required to complete UNIT-III: 15				**No. of classes taken:**		

UNIT-IV: Discrete Fourier Transform, Fast Fourier Transform

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.	**Discrete Fourier Transform(DFT)**:Introduction to DFT, Concept of DFT	2	23-09-2024 24-09-2024			
39.	Properties of DFT	2	27-09-2024 28-09-2024			
40.	Circular convolution, Problems	2	30-09-2024 01-10-2024			
41.	Problems on DFT	1	04-10-2024			
42.	**Fast Fourier Transform:** Need of FFT	1	05-10-2024			
43.	Radix-2 Decimation in Time and Decimation in Frequency FFT Algorithm	2	07-10-2024 08-10-2024			
44.	Inverse FFT	1	14-10-2024			
45.	Problems on FFT	1	15-10-2024			
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: Filters, IIR Filter Design, FIR Filter Design

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.	**Filters**: Concept of Filter, Characteristics of Filters-LPF, HPF,BPF,BSF	1	18-10-2024 19-10-2024			
47.	**IIR Filter Design:** Specifications of IIR Filters	1	21-10-2024			
48.	Analog Butterworth IIR filter design using Impulse Invariant and Bilinear Transformation	2	22-10-2024 25-10-2024			
49.	Problems on IIR filter design	1	26-10-2024			
50.	**FIR Filter Design:** Design using Fourier series Method	2	28-10-2024 29-10-2024			
51.	Rectangular window, Hanning window	2	01-11-2024 02-11-2024			
52.	Hamming window	1	04-11-2024			
53.	Problems on FIR Filter design	1	05-11-2024			
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
54.	Applications of signal Processing	1	08-11-2024		TLM1	

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

PART-C

EVALUATION PROCESS (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

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education
PEO 2	To Function professionally in the rapidly changing world with advances in technology
PEO 3	To Contribute to the needs of the society in solving technical problems using Electronics & Communication Engineering principles, tools and practices
PEO 4	To Exercise leadership qualities, at levels appropriate to their experience, which addresses issues in a responsive, ethical, and innovative manner?

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
PSO 2	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	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Date: 24-06-2024

Title	**Course Instructor**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr.P. Venkateswara Rao**	**Dr. GLN Murthy**	**Dr. G.Srinivasulu**
Signature			

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.R.Anjaneyulu Naik
Course Name & Code **:** LINEAR CONTROL SYSTEMS –20EE81
L-T-P Structure **: 2-1-0** **Credits:** 3
Program/Sem/Sec :AERO SPACE B.Tech/VII SEM **A.Y.:** 2024-25

PREREQUISITE: Electrical circuit Analysis and Applied Physics

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to introduce to the students the principles and applications of control systems in everyday life. The basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems and also deals with the different aspects of stability analysis of systems in frequency domain and time domain.

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

CO1	Develop mathematical models of Linear Time Invariant system**(Apply-L3)**
CO2	Realize transfer function representation of system from conventional and state space approach **(Apply-L3)**
CO3	Analyze linear time invariant systems in Time domain **(Apply-L3)**
CO4	Analyze time invariant systems in Frequency domain**(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	2	2	2										2	1
CO2	2	2	2										2	1
CO3	2	2	2										2	1
CO4	2	2	2										2	1

TEXTBOOKS:

T1	B. C. Kuo , "Automatic Control Systems" John Wiley and Sons ,9th edition,2014.
T2	I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International (P) Limited Publishers,6th edition,2018.

REFERENCE BOOKS:

R1	Katsuhiko Ogata , "Modern Control Engineering", Prentice Hall of India Pvt. Ltd., 5th edition,2009
R2	Norman S. Nise, Control Systems Engineering, 8thEdition, John Wiley, New Delhi,
R3	Richard C Dorf, Robert H Bishop, Modern control systems , 12thedition, Prentice Hall (Pearson education, Inc.), New Delhi 2010.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: MATHEMATICAL MODELLING OF CONTROL 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 of Control Systems- Open Loop and Closed Loop control systems.	1	25-06-2024		TLM2	
2.	Mathematical modeling: Differential equations, Impulse Response	1	26-06-2024		TLM2	
3.	Modeling of Translational mechanical Systems and Transfer function	1	27-06-2024		TLM1	
4.	Modeling of Rotational mechanical systems and Transfer function	1	29-06-2024		TLM1	
5.	Block diagram representation of systems	1	02-07-2024		TLM1	
6.	Block diagram algebra	1	03-07-2024		TLM2	
7.	Signal flow graph – reduction using Mason's gain	1	04-07-2024		TLM1	
8.	PROBLEMS	1	05-07-2024		TLM1	
No. of classes required to complete UNIT-I: 7				**No. of classes taken:**		

UNIT-II: TIME RESPONSE ANALYSIS-I

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
9.	Standard test signals, Step response of first order systems	1	06-07-2024		TLM1	
10.	Step response of second order systems	1	09-07-2024		TLM1	
11.	Time response specifications	1	10-07-2024		TLM1	
12.	Time response specifications of second order systems	1	11-07-2024		TLM2	
13.	steady state errors and error constants	1	12-07-2024		TLM1	
14.	problems	1	16-07-2024		TLM1	
15.	problems	1	1707-2024		TLM2	
No. of classes required to complete UNIT-II: 07				**No. of classes taken:**		

UNIT-III: TIME RESPONSE ANALYSIS-II

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
16.	Concepts of stability	1	30-07-2024		TLM1	
17.	R-H stability criterion	1	31-07-2024		TLM1	
18.	The root locus concept	1	01-08-2024		TLM1	
19.	construction of root loci	1	02-08-2024		TLM1	
20.	Relative stability analysis	1	03-08-2024		TLM1	
21.	problems	1	06-08-2024		TLM1	
22.	problems	1	13-08-2024		TLM1	
23.	problems	1	17-08-2024		TLM1	
No. of classes required to complete UNIT-III: 08				**No. of classes taken:**		

UNIT-IV: FREQUENCY RESPONSE ANALYSIS

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	1	10-09-2024		TLM1	
25.	Frequency domain specifications		11-09-2024		TLM2	
26.	determination of frequency domain	1	12-09-2024		TLM1	

	specifications					
27.	Bode Plot - phase margin and gain margin	1	17-09-2024		TLM1	
28.	Polar plot- phase margin and gain margin	1	18-09-2024		TLM1	
29.	Nyquist Stability criteria	1	19-09-2024		TLM1	
30.	Nyquist Plot- phase margin and gain margin	1	21-09-2024		TLM2	
31.	problems	1	24-09-2024		TLM1	
No. of classes required to complete UNIT-IV: 08				**No. of classes taken:**		

UNIT-V: STATE SPACE ANALYSIS OF CONTINUOUS 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
32.	Concept of state, state variables and State models	1	01-10-2024		TLM1	
33.	Canonical state space models	1	03-10-2024		TLM1	
34.	solving the Time invariant state Equations	1	08-10-2024		TLM1	
35.	State Transition Matrix and it's Properties	1	09-10-2024		TLM1	
36.	Concepts of controllability and observability.	1	10-10-2024		TLM2	
37.	problems	1	15-10-2024		TLM1	
38.	problems	1	16-10-2024		TLM2	
39.	**BEYOND THE SYLLABUS:** DISCRETE CONTROL SYSTEM	1	22-10-2024		TLM2	
No. of classes required to complete UNIT-V: 08				**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	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. R.A.NAIK**	**Mr. R.A.NAIK**	**Dr. K.R.L.Prasad**	**Dr.J. Sivavara Prasad**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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DEPARTMENT OF AEROSPACE ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: A. Dhanunjay Kumar

Course Name & Code	**:** MANAGEMENT SCIENCE FOR ENGINEERS & 20HS02	**Regulation**: R20
L-T-P Structure	**: 3-0-0**	**Credits:** 03
Program/Sem/Sec	: B.Tech VII Sem (A)	**A.Y.:** 2024-2025

PREREQUISITE: Professional ethics and human values

COURSE EDUCATIONAL OBJECTIVES (CEOs):

1. To make students understand management, its principles, contribution to management, organization, and its basic issues and types.
2. To make students understand the concept of plant location and its factors and plant layout and types, method of production and work study importance.
3. To understand the purpose and function of statistical quality control. And understand thematerial management techniques.

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

CO1	Understand management principles to practical situations based on the organization structures. (L2)
CO2	Design Effective plant Layouts by using work study methods. (L2)
CO3	Apply quality control techniques for improvement of quality and materials management. (L3)
CO4	Develop best practices of HRM in corporate Business to raise employee productivity. (L2)
CO5	Identify critical path and project completion time by using CPM and PERT techniques. (L3)

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

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

TEXTBOOKS:

T1 Dr. A.R.Aryasri, Management Science, TMH, 10th edition, 2012

REFERENCE BOOKS:

R1 Koontz & weihrich – Essentials of management, TMH, 10th edition, 2015
R2 Stoner, Freeman, Gilbert, Management, 6th edition Pearson education, New Delhi, 2004
R3 O.P. Khana, Industrial engineering and Management L.S.Srinath, PERT & CPM

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section - A

UNIT-I: INTRODUCTION

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 Outcomes, Introduction to Subject	1	24-06-2024		**TLM1/TLM2**	
2.	Management-Nature and Importance	1	27-06-2024		**TLM1/TLM2**	
3.	Management functions	1	28-06-2024		**TLM1/TLM2**	
4.	Contributions of Taylor	1	29-06-2024		**TLM1/TLM2**	
5.	Fayal's Principles of management	1	01-07-2024		**TLM1/TLM2**	
6.	Contribution of Elton Mayo	1	04-07-2024		**TLM1/TLM2**	
7.	Maslow's & Herzberg's Two Factor Theory	1	05-07-2024		**TLM1/TLM2**	
8.	Douglas McGregor	1	06-07-2024		**TLM1/TLM2**	
9.	Basic Concepts of Organization-Authority		06-07-2024		**TLM1/TLM2**	
10.	Responsibility Delegation of Authority	1	07-07-2024		**TLM1/TLM2**	
11.	Departmentation and Decentralization		07-07-2024		**TLM1/TLM2**	
12.	Span of Control	1	08-07-2024		**TLM1/TLM2**	
13.	Line, Line and Staff organizations		08-07-2024		**TLM1/TLM2**	
14.	Functional, Committee	1	11-07-2024		**TLM1/TLM2**	
15.	Matrix Organizations		11-07-2024		**TLM1/TLM2**	
No. of classes required to complete UNIT-I: 11				**No. of classes taken:**		

UNIT-II: OPERATIONS MANAGEMENT

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
17.	Plant location	1	12-07-2024		**TLM1/TLM2**	
18.	Factors influencing location	1	13-07-2024		**TLM1/TLM2**	
19.	Principles	2	15-07-2024		**TLM1/TLM2**	
20.	Types of plant layouts		18-07-2024			
21.	Methods of production (job, batchproduction)	1	19-07-2024		**TLM1/TLM2**	
22.	Mass production	1	20-07-2024		**TLM1/TLM2**	
23.	Work study - Basic procedure involved in method study	2	22-07-2024 25-07-2024		**TLM1/TLM2**	
24.	Work study - Basic procedure involved in Work measurement	2	26-07-2024 27-07-2024		**TLM1/TLM2**	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT-III: STATISTICAL QUALITY CONTROL, MATERIALS MANAGEMENT

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Statistical quality control Introduction	1	29-07-2024		TLM1/TLM2	
27.	Concept of Quality & Quality Control		29-07-2024		TLM1/TLM2	
28.	Functions, Meaning of SQC	1	01-08-2024		TLM1/TLM2	
29.	Variables and attributes		01-08-2024		TLM1/TLM2	
30.	X chart	1	02-08-2024		TLM1/TLM2	
31.	R Chart		02-08-2024		TLM1/TLM2	
32.	C Chart	1	03-08-2024		TLM1/TLM2	
33.	P Chart		03-08-2024		TLM1/TLM2	
34.	Simple Problems	2	08-08-2024		TLM1/TLM2	
35.	Acceptance sampling	2	09-08-2024		TLM1/TLM2	
36.	Sampling plans		10-08-2024		TLM1/TLM2	
37.	Deming's contribution to quality	1	12-08-2024		TLM1/TLM2	
38.	Materials management	1	16-08-2024		TLM1/TLM2	
39.	Meaning and objectives		16-08-2024		TLM1/TLM2	
40.	Inventory control	2	17-08-2024		TLM1/TLM2	
41.	Need for inventory control		22-08-2024		TLM1/TLM2	
42.	Purchase procedure	1	23-08-2024		TLM1/TLM2	
43.	Store records					
44.	EOQ, ABC analysis	1	24-08-2024		TLM1/TLM2	
45.	Stock levels		24-08-2024		TLM1/TLM2	
No. of classes required to complete UNIT-III: 14				**No. of classes taken:**		

UNIT-IV: HUMAN RESOURCE MANAGEMENT (HRM)

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
47.	Concepts of HRM	1	29-08-2024		TLM1/TLM2	
48.	Basic functions of HR manager	1	30-08-2024		TLM1/TLM2	
49.	Manpower planning	1	31-08-2024		TLM1/TLM2	
50.	Recruitment	1	12-09-2024		TLM1/TLM2	
51.	Selection	1	13-09-2024		TLM1/TLM2	
52.	Training and development	1	19-09-2024		TLM1/TLM2	
53.	Placement	1	20-09-2024		TLM1/TLM2	
54.	Wage and salary administration	1	21-09-2024		TLM1/TLM2	
55.	Wage and salary administration	1	23-09-2024		TLM1/TLM2	
56.	Promotion	1	26-09-2024		TLM1/TLM2	
57.	Transfers Separation	1	27-09-2024		TLM1/TLM2	
58.	Performance appraisal					

59.	Job evaluation and merit rating	1	28-09-2024		**TLM1/TLM2**	
No. of classes required to complete UNIT-IV: 14				**No. of classes taken:**		

UNIT-V: PROJECT MANAGEMENT

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
61.	Introduction	1	30-09-2024		**TLM1/TLM2**	
62.	Early techniques in project management	1	03-10-2024		**TLM1/TLM2**	
63.	Network analysis	1	04-10-2024		**TLM1/TLM2**	
64.	Programme Evaluation and Review Technique (PERT)	1	05-10-2024		**TLM1/TLM2**	
65.	Problems	3	18-10-2024		**TLM1/TLM2**	
66.	Critical path method (CPM)	1	19-10-2024		**TLM1/TLM2**	
67.	Identifying critical path	1	21-10-2024		**TLM1/TLM2**	
68.	Problems	2	25-10-2024		**TLM1/TLM2**	
70.	Probability of completing project within given time	1	26-10-2024		**TLM1/TLM2**	
71.	Project cost analysis	1	28-10-2024		**TLM1/TLM2**	
72.	Problems	2	01-11-2024		**TLM1/TLM2**	
73.	project crashing	1	02-11-2024		**TLM1/TLM2**	
74.	Simple problems	2	07-11-2024		**TLM1/TLM2**	
No. of classes required to complete UNIT-V: 18				**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	**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 EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education.
PEO 2	To Function professionally in the rapidly changing world with advances in technology
PEO 3	To Contribute to the needs of the society in solving technical problems usingElectronics & Communication Engineering principles, tools and practices.
PEO 4	To Exercise leadership qualities, at levels appropriate to their experience, whichaddresses issues in a responsive, ethical, and innovative manner.

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solutionof complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusionsusing first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineeringproblems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, andthe cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-basedknowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide validconclusions.
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 theconsequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solution in societal and environmental contexts, anddemonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics andresponsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as amember or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activitieswith 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 contextof technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Design and develop modern communication technologies for building the interdisciplinary skills to meet current and future needs of industry.
PSO 2	Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systemsusing relevant tools.
PSO 3	Apply the Signal processing techniques to synthesize and realize the issuesrelated to real time applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	A.Dhanunjay Kumar	Mr. A.Nageswara Rao	J.Subba Reddy	Dr.M.B.S.Sreekara Reddy
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
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COURSE HANDOUT

PROGRAM	:	B.Tech, VII Sem, Aerospace Engineering
ACADEMIC YEAR	:	2024-2025
COURSE NAME AND CODE	:	20AES3-FLUID FLOW ANLYSIS USING ANSYS FLUENT
L-T-P STRUCUTRE	:	1-0-2
COURSE CREDITS	:	2
COURSE INSTRUCTOR	:	Dr. Sreenadh Chevula
COURSE COORDINAOTR	:	Dr. Sreenadh Chevula

PRE-REQISITE

Course educational objectives	:	To learn the finite element package ANSYS Fluent to analyze the incompressible and compressible flow field characteristics
COURSE OUTCOMES(Co's)	:	At the end of the course students are able to

CO1	To demonstrate the various modules of Ansys Fluent [Apply-L3]
CO2	To solve and analyze the characteristics of flow over aerodynamic objects and flow through ducts [Analyze-L4]

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

BOOKS APPROVED TEXT BOOKS

T1 ANSYS Fluent Tutorial Guide 18.1 BY ANSYS, Inc. Release 18.0, Southpointe January 2017 ,2600 ANSYS Drive, Canonsburg, PA 15317

COURSE DELIVERY PLAN (LESSON PLAN)

Module - I Introduction

S. No	Topics to be Covered	No of classes required	Tentative date of completion	Actual Date of completion	TLM method	Learning Outcomes	Text book	HoD Sign
1	Introduction to ANSYS Fluent,		26-06-2024		2	CO1	T1	
2	Basic Steps for CFD Analysis using ANSYS Fluent,	18	26-06-2024		2	CO1	T1	
3	Guide to a Successful Simulation Using ANSYS Fluent,		03-07-2024		2	CO1	T1	
4	Starting and Executing ANSYS Fluent		10-07-2024		2	CO1	T1	
5	Introduction, Viewing, 2D Sketching,		24-07-2024		22	CO1	T1	
6	Selection, Planes and Sketches, Geometry		31-07-2024		2	CO1	T1	
7	Representations, 3D Modelling		07-08-2024		2	CO1	T1	
Total No of classes required to complete Module I		18	No of Classes Taken:					

Module II (Meshing)

S. No	Topics to be Covered	No of classes required	Tentative date of completion	Actual Date of completion	TLM method	Learning Outcomes	Text Book	HoD Sign
1	Introduction to Meshing Mode in Fluent,	9	14-08-2024		2	CO1	T1	
2	Starting Fluent in Meshing Mode, Graphical User Interface,		21-08-2024		2	CO1	T1	
3	Size Functions and Scoped Sizing,		28-08-2024		2	CO1	T1	

02-09-2024 to 07-09-2024 MID-1 Examination

S. No	Topics to be Covered	No of classes required	Tentative date of completion	Actual Date of completion	TLM method	Learning Outcomes	Text Book	HoD Sign
4	Mesh, Determining Mesh Statistics and Quality	6	11-09-2024		2	CO1	T1	
5	Object Based Meshing - Surface, Volume, Creating		18-09-2024		2	CO1	T1	
Total No of classes required to complete Module II		15	No of Classes Taken :					

Module III (Solver Settings and Solution)

S. No	Topics to be Covered	No of classes required	Tentative date of completion	Actual Date of completion	TLM method	Learning Outcomes	Text Book	HoD Sign
1	Introduction, Solution Procedure Overview	12	25-09-2024	13-09-2023	2	CO1	T1	
2	Available Solvers, Choosing a Solver, Discretisation, Initialization,		09-10-2024	20-09-2023	2	CO1	T1	
3	Case Check, Convergence, Solution Accuracy,		16-10-2024	27-09-2023	2	CO1	T1	
4	Grid-Independent Solutions, Mesh Adaption,		23-10-2024	27-09-2023	2	CO1	T1	
	Total No of classes required to complete Module III	12	No of Classes Taken :	12				

Module IV (post-processing)

S. No	Topics to be Covered	No of classes required	Tentative date of completion	Actual Date of completion	TLM method	Learning Outcomes	Text book	HoD Sign
1	Overview, GUI Layout, Case Comparison,	12	30-10-2024		2	CO1	T1	
2	Creating Locations-types, Colour, Render and View,		06-11-2024		2	CO1	T1	
3	Files Other Graphics Objects, Generating Tables,		13-11-2024		2	CO1	T1	
4	Charts and Reports, Animation,		20-11-2024		2			
	Total No of classes required to complete Module IV	12	No of Classes Taken:					

11-11-2024 to 16-11-2024 MID-2 Examination

Module V (Tutorials)

S. No	Topics to be Covered	No of classes required	Tentative date of completion	Actual Date of completion	TLM method	Learning Outcomes	Text Book	HoD Sign
1	Fluid Flow and Heat Transfer in a Mixing Elbow,	12	30-10-2024	18-10-2023	2	**CO2**	T1	
2	Flow over Cylinder, Compressible Flow over Airfoil,		06-11-2024	25-10-2023	2	**CO2**	T1	
3	Flow through convergent nozzle, Flow through convergent-divergent Nozzle,		13-11-2024	01-11-2023	2	**CO2**	T1	
	Total No of classes required to complete Module V	12	No of Clasess Taken :					

25-11-2024 to 07-12-2024 Sem end examination.

Teaching Learning Method	
TLM2	PPT and Chalk, Talk and System demo