SEMESTER III

SNo	Category	Course Code	Course Title	L	T	P	C
THEORY							
1	BS	MA23301	Transform Techniques and Partial Differential Equations	3	1	0	4
2	PC	AE23301	Solid Mechanics	3	0	0	3
3	PC	AE23302	Fluid Mechanics and Machinery	3	0	0	3
4	PC	AE23303	Basics of Aeronautical Engineering	3	0	0	3
5	MC	MC23302	Human Values and Gender Equality	2	0	0	0
THEORY WITH LAB COMPONENT							
6	ES	AE23304	Aero Engineering Thermodynamics	3	0	2	4
PRACTICAL							
7	PC	AE23305	Strength of Materials Laboratory	0	0	4	2
8	PC	AE23306	Fluid Mechanics Laboratory	0	0	4	2
9	EE	GE23301	Professional Development I	0	0	2	1
			TOTAL	**17**	**1**	**12**	**22**

SEMESTER IV

SNo	Category	Course Code	Course Title	L	T	P	C
THEORY							
1	BS	MA23401	Numerical Methods	3	1	0	4
2	PC	AE23401	Gas Turbine Propulsion	3	0	0	3
3	PC	AE23402	Low Speed Aerodynamics	3	0	0	3
4	PC	AE23403	Aircraft Systems and Instruments	3	0	0	3
5	MC	MC23401	Environmental Sciences and Sustainability	2	0	0	0
THEORY WITH LAB COMPONENT							
6	PC	AE23404	Aircraft Structural Mechanics	3	0	2	4
PRACTICAL							
7	PC	AE23405	Propulsion Laboratory	0	0	4	2
8	PC	AE23406	Aerodynamics Laboratory	0	0	4	2
9	EE	GE23401	Professional Development II	0	0	2	1
			TOTAL	**17**	**1**	**12**	**22**

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MA23301	TRANSFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS	3	1	0	4

(Common to Aero, Agri, BME, Biotech, Civil, Chemical, EEE, Food, Pharma, Mech, MCT, R&A)

COURSE OBJECTIVES

To enable the students to

1.	develop the knowledge of periodic and non-periodic functions and their representations using fourier series.
2.	acquaint the student with Fourier transform techniques used in wide variety of situations.
3.	introduce the basic concepts of PDE for solving standard partial differential equations.
4.	acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
5.	develop Z transform techniques for discrete time systems.

UNIT I	FOURIER SERIES	12

Dirichlet's conditions; General Fourier series; Odd and even functions; Half range series; Statement of Complex form of Fourier Series; Parseval's identity; Harmonic Analysis.

UNIT II	FOURIER TRANSFORMS	12

Fourier integral theorem (without proof); Fourier transform pair; Sine and Cosine transform - Properties; Transforms of elementary functions; Convolution theorem; Parseval's identity.

UNIT III	PARTIAL DIFFERENTIAL EQUATIONS	12

Formation of partial differential equations; Lagrange's linear equation; Solutions of four standard types of first order partial differential equations; Linear partial differential equations of second order with constant coefficients.

UNIT IV	FOURIER SERIES SOLUTION TO PARTIAL DIFFERENTIAL EQUATIONS	12

Solutions of One-dimensional wave and heat equation; Steady state two-dimensional heat equation.

UNIT V	Z -TRANSFORMS AND DIFFERENCE EQUATIONS	12

Z-transforms - Elementary properties; Inverse Z-transform; Method of partial fraction Residue method; Convolution theorem; Solution of difference equations by Z-transform.

	TOTAL PERIODS	60

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	classify the properties of periodic and non-periodic vibrations with the help of fourier series.	Applying (K3)
CO2	apply the fourier transform to convert the function from frequency domain	Applying (K3)

	to time domain.	
CO3	demonstrate partial differential equations that occur in many engineering applications.	Applying (K3)
CO4	apply Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.	Applying (K3)
CO5	apply knowledge of Z transform to analyse linear time invariant systems.	Applying (K3)

TEXT BOOKS

1. Veerarajan T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint, 2012.
2. Grewal. B.S, "Higher Engineering Mathematics", 44th Edition, Khanna Publications, New Delhi, (2018).

REFERENCES

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley Publications, New Delhi, India, 2016.
2. Ramana. B.V., "Higher Engineering Mathematics", Tata Mc-Graw Hill Publishing Company limited, New Delhi (2010).
3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education (2007).
4. Wylie. R.C. and Barrett. L.C., "Advanced Engineering Mathematics", Tata Mc-Graw Hill Publishing Company limited, 6th Edition, New Delhi, 2012.

CO PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes
(3/2/1 indicates strength of correlation) 3- Strong, 2-Medium, 1-Weak

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

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BOARD OF STUDIES
Mathematics

AE23301	SOLID MECHANICS	3	0	0	3

COURSE OBJECTIVES

To enable the students to

1	analyze the behavior of simple and composite bars under various loads.
2	construct shear force and bending moment diagrams for beams including cantilevers, simply supported beams, and overhanging beams.
3	calculate the deflection of beams using appropriate methods.
4	analyze stresses and deflection in helical springs by relating the concept of shear stress to torsion.
5	determine the principal stresses in a member subjected to biaxial stress using mohr's circle.

UNIT I	SIMPLE STRESSES AND STRAINS	9

Introduction – Stress-Strain Relation –Poisson's ratio – Elastic constants - Deformation of simple and compound bars – Thermal stresses – Composite bars -Volumetric strains.

UNIT II	STRESSES IN BEAMS	9

Types Beams- Transverse loading on beams – Shear force and Bending moment in beams –Cantilever, simply supported and over hanging beams.

UNIT III	DEFLECTION OF BEAMS	9

Double integration method – Macaulay's method – moment area method – conjugate beam method

UNIT IV	TORSION – SPRINGS	9

Torsion of solid and hollow circular shafts – shear stress variation – open and closed-coiled helical springs – stresses in helical springs- deflection of helical springs.

UNIT V	BIAXIAL STRESSES	9

Stresses in thin-walled pressure vessels – combined loading of circular shaft with bending, torsion and axial loadings – Mohr's circle and its construction – determination of principal stresses.

	TOTAL PERIODS	45

COURSE OUTCOMES

	At the end of this course, students will be able to	BT Mapped (Highest Level)
CO1	apply the concepts of stress, strain, and elasticity to simple and composite bars	Apply (K3)
CO2	interpret shear force and bending moment diagrams for various beam configurations	Apply (K3)
CO3	explain the concept of deflection in beams and calculate deflections in beams	Apply (K3)
CO4	calculate stresses and deflection in helical springs subjected to torsion.	Apply (K3)
CO5	utilize Mohr's circle to determine the principal stresses in a member under biaxial stress	Analyze (K4)

TEXT BOOKS

1. R.K Bhansal, "A text book of Strength of Materials", Laxmi Publications., New Delhi, 2017.
2. Rattan S.S., "Strength of Materials", Tata McGraw Hill Education Pvt .Ltd, New Delhi, 2017.

REFERENCES

1. Singh. D.K., "Strength of Materials", Ane Books Pvt Ltd., New Delhi, 2021.
2. Rattan S.S., "Strength of Materials", Tata Mc Graw Hill Education Pvt .Ltd., New Delhi, 2017.
3. Beer. F.P. & Johnston. E.R. "Mechanics of Materials", Tata McGraw Hill, 8th Edition, New Delhi 2019.
4. Timoshenko,S. and Young, D.H., "Elements of Strength of Materials", 5th edition T.Van No strand Co. Inc., Princeton., 1990.

CO-PO MAPPING :

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	2	-	-	-	-	1	-	-	2	2	2
CO2	3	2	2	2	-	-	-	-	1	-	-	2	2	2
CO3	3	2	2	2	-	-	-	-	1	-	-	2	2	2
CO4	3	2	2	2	-	-	-	-	1	-	-	2	2	2
CO5	3	2	2	2	-	-	-	-	1	-	-	2	2	2

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AE23302	FLUID MECHANICS AND MACHINERY	3	0	0	3

COURSE OBJECTIVES

To enable the students to

1	identify the properties of fluids and flow characteristics.
2	expose the applications of the conservation laws to a) flow measurements ,and b) flow through pipes (both laminar and turbulent).
3	emphasize the boundary layer concepts and importance of dimensional analysis.
4	analyze the efficiency of turbines.
5	comprehend the functioning and characteristic curves of pumps.

UNIT I — FLUID PROPERTIES AND FLOW CHARACTERISTICS — 9

Properties of fluids – Fluid statics - Pressure Measurements - Buoyancy and floatation - Flow characteristics - Eulerian and Lagrangian approach - Concept of control volume and system - Reynold's transportation theorem - Continuity equation, energy equation and momentum equation - Applications.

UNIT II — FLOW THROUGH PIPES — 9

Reynold's Experiment - Laminar flow through circular conduits - Darcy Weisbach equation - friction factor- Moody diagram - Major and minor losses - Hydraulic and energy gradient lines - Pipes in series and parallel.

UNIT III — DIMENSIONAL ANALYSIS AND MODEL STUDIES — 9

Fundamental dimensions - Dimensional homogeneity - Rayleigh's method and Buckingham Pi theorem-Dimensionless parameters - Similitude and model studies - Distorted and undistorted models.

UNIT IV — HYDRAULIC TURBINES — 9

Impact of jets - Velocity triangles - Theory of roto dynamic machines - Classification of turbines - Working principles - Pelton wheel - Modern Francis turbine - Kaplan turbine - Work done - Efficiencies - Draft tube-Specific speed - Performance curves for turbines - Governing of turbines.

UNIT V — HYDRAULIC PUMPS — 9

Classification of pumps - Centrifugal pumps - Working principle - Heads and efficiencies– Velocity triangles - Work done by the impeller - Performance curves - Reciprocating pump working principle - Indicator diagram and it's variations - Work saved by fitting air vessels - Rotary pumps.

TOTAL PERIODS: 45

COURSE OUTCOMES

At the end of this course, students will be able to		**BT Mapped (Highest Level)**
CO1	compute the conservation laws applicable to fluids and its application through fluid kinematics and dynamic.	Understanding (K2)
CO2	contrast the losses in pipe lines for both laminar and turbulent conditions, and analysis of pipes connected in series and parallel.	Analyzing (K4)

CO3	determine the relationship among the parameters involved in the given fluid phenomenon and predict the performances of prototype by model studies	Applying (K3)
CO4	investigate the working principles of various turbines and design the different types of turbines.	Analyzing (K4)
CO5	detect the performance aspects of fluid machinery for centrifugal pump.	Analyzing (K4)

TEXT BOOKS

1. Bansal.R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt. Ltd., New Delhi, 2018.
2. Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 22nd edition (2019).

REFERENCES

1. Fox W.R. and Mc Donald A.T., "Introduction to Fluid Mechanics" John-Wiley and Sons, Singapore, 2011.
2. Pani B S, "Fluid Mechanics: A Concise Introduction", Prentice Hall of India Private Ltd, 2016.
3. Cengel Y A and Cimbala J M, "Fluid Mechanics", Mc Graw Hill Education Pvt. Ltd., 2014.
4. S K Som; Gautam Biswas and S Chakraborty, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill Education Pvt. Ltd., 2012.

CO-PO MAPPING :

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	-	-	-	-	1	-	-	2	2	2
CO2	3	3	2	2	-	-	-	-	1	-	-	2	2	2
CO3	3	3	2	2	-	-	-	-	1	-	-	2	2	2
CO4	3	3	2	2	-	-	-	-	1	-	-	2	2	2
CO5	3	3	2	2	-	-	-	-	1	-	-	2	2	2

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AE23303	BASICS OF AERONAUTICAL ENGINEERING	3	0	0	3

COURSE OBJECTIVES

To enable the students to

1	identify the different types of flight and their basic components.
2	learn about the aircraft control surfaces and basic aerodynamics.
3	gain the knowledge on aircraft structural component.
4	learn the concepts of aircraft and rocket engines.
5	acquire knowledge on space mechanics.

UNIT I — AIRCRAFT CONFIGURATIONS — 9

History of flight-different types of flight vehicles, classification, components and functions of typical transport aircraft, three view diagram, helicopter and UAV parts and functions. Physical properties and structure of the atmosphere, ISA, temperature, pressure and altitude relationships,

UNIT II — BASICS OF AERODYNAMICS — 9

Newton's law of motions applied to aeronautics - aerofoil and wing geometry, NACA series airfoils, generation of lift, Mach number and ranges, aerodynamic center, pressure coefficients, aspect ratio, types of drag- induced drag, lift and drag curves, sweepback on wing, basics of pitot tube.

UNIT III — AIRPLANE STRUCTURES AND MATERIALS — 9

General types of construction, monocoque and semi-monocoque, typical wing and fuselage structure. metallic and non-metallic materials, use of aluminium alloy, magnesium alloy, titanium, stainless steel, plastics, composite materials and smart structures, applications.

UNIT IV — BASICS OF PROPULSION — 9

Classification of propulsive engines -basics about piston, turbojet, turboprop and turbofan - use of propeller and jets for thrust production -equations, principles of operation of rocket, types of rockets and typical applications.

UNIT V — BASICS OF SPACE MECHANICS — 9

Keplar laws-Newton law of gravitation- two body problem-fundamentals of orbital mechanics, orbital elements. Orbital transfers, space environment-atmosphere, radiation and magnetic field, space debris-Space exploration by different country-ISRO

TOTAL PERIODS: 45

COURSE OUTCOMES

At the end of this course, students will be able to		**BT Mapped (Highest Level)**
CO1	illustrate the history of aircraft & developments over the years	Understanding (K2)
CO2	explain the concept of lift generation through airfoil	Apply (K3)
CO3	identify the types of fuselage and wing constructions	Understanding (K2)
CO4	distinguish the types of Engines and explain the principles of Rocket	Apply (K3)
CO5	explore the space and its mechanism.	Apply (K3)

TEXT BOOKS

1. Anderson, J.D., Introduction to Flight, McGraw-Hill; 9th edition, 2022
2. E Rathakrishnan, "Introduction to Aerospace Engineering: Basic Principles of Flight", John Wiley, NJ, 2021

REFERENCES

1. A.C. Kermode, "Flight without formulae", Pearson education, 5th edition, 2021.
2. Stephen.A. Brandt, Introduction to aeronautics: A design perspective, 2nd edition, AIAA Education Series, 2020
3. Sadhu Singh, "Internal Combustion Engines and Gas Turbine", SS Kataraia & Sons, 2021
4. Kermode, "Flight without Formulae", Pitman; 4th revised edition 2020

CO-PO MAPPING :

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	-	-	-	-	-	-	-	-	-	-	2	1	1
CO2	3	2	2	-	-	-	-	-	-	-	-	2	1	1
CO3	3	2	2	-	-	-	-	-	-	-	-	2	1	1
CO4	3	2	2	-	-	-	-	-	-	-	-	2	1	1
CO5	3	-	-	-	-	-	-	-	-	-	-	2	1	1

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NAMAKKAL

MC23302	HUMAN VALUES AND GENDER EQUALITY	2	0	0	0

COURSE OBJECTIVES

To enable the students to

1	define different types of human values and their impact on individual behaviour and societal norms.
2	apply principles of personal development such as self-confidence, self-discipline, and resilience to navigate modern challenges effectively.
3	evaluate the role of values in shaping professional ethics, civic sense and global citizenship.
4	examine the socio-economic factors influencing gender inequality and explore avenues for empowerment and advocacy.
5	critically analyze prevalent issues and challenges faced by women, including gender-based violence, discrimination, and cultural biases, and propose measures for their eradication.

UNIT I HUMAN VALUES — 6

Value Education - Definition, Types of values; Human values - Acceptance, Consideration. Appreciation, Listening. Empathy, Sympathy, Honesty, Integrity, Wisdom, Decision making, Self-actualization, Character formation towards positive personality, Contentment; - Religious Values - Humility, Compassion, Gratitude. Peace, Justice, Freedom, Equality.

UNIT II PERSONALITY DEVELOPMENT — 6

Personal Development - Introspection, Self-confidence, Self-discipline; Flexibility -Peer pressure - Sensitization towards Gender Equality; Reliability; Unity; Modern Challenges of Adolescent Emotions and behavior - Comparison and Competition, Positive and Negative attitudes; Family values; Self- improvement - Physical exercises, Meditation ,Yoga.

UNIT III VALUE EDUCATION TOWARDS NATIONAL AND GLOBAL DEVELOPMENT — 6

Professional Values -. Integrity, Responsibility, Punctuality, Dedication - Perseverance - Competence; Civic sense and Responsibility; Global Values - Computer Ethics, Moral Leadership, Code of Conduct; Corporate Social Responsibility; Aesthetic values; National Integration and International understanding of Religious Values – Spirituality, thought process.

UNIT IV GENDER EQUALITY — 6

Gender Equality - Definition, Empowerment, Economic Equality; Condition of Women in India-Education, Healthcare, Political Representation, Gender-based Violence; Challenging Stereotypes: Parental and Care giving Responsibilities; Legal and Policy Reform; Cultural Shifts; Global Perspective; Male Chauvinism; Sustainable Development..

UNIT V WOMEN ISSUES AND CHALLENGES — 6

Women Issues and Challenges - female feticide, violence against women; Domestic violence- dowry related abuse and deaths, Physical violence, Emotional abuse; Sexual assault; Honour killing; Eve-teasing- Stalking, e-stalking (cyber-crime).

TOTAL PERIODS	**30**

COURSE OUTCOMES		
At the end of this course, students will be able to		**BT Mapped (Highest Level)**
CO1	discuss the concept of human values and their significance in personal and societal development.	Understanding (K2)
CO2	demonstrate introspective skills to enhance personal growth and self-awareness.	Applying (K3)
CO3	recognize the importance of gender equality in promoting a just and equitable society.	Understanding (K2)
CO4	cultivate a sense of social responsibility and ethical conduct towards achieving national and global development.	Analyzing(K4)
CO5	analyse the challenges faced by women in various spheres and identify strategies for addressing them.	Analyzing(K4)

TEXT BOOKS

1. A Foundation Course in Human Values and Professional Ethics: Presenting a Universal Approach to Value Education - Through Self-exploration. New Delhi, 2016.
2. Aurther, John. Personality Development. Lotus Press, 2018.

REFERENCES

1. Joshi, Dhananjay. Value Education in Global Perspective. Lotus Press, 2014.
2. Mahrotra, Mamta. Gender Inequality in India: Challenging Social Norms. Prabhat Books, 2015.

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	1	-	1	1	1	2	3	2	1	1	3	1	1
CO2	-	1	-	1	1	1	3	3	2	2	1	1	2	2
CO3	-	1	-	1	1	1	2	3	1	1	1	3	1	1
CO4	-	1	-	1	1	1	2	3	2	2	1	2	1	2
CO5	-	1	-	1	1	1	1	3	2	2	1	3	1	1

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English
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AE23304	AERO ENGINEERING THERMODYNAMICS	3	0	2	4

COURSE OBJECTIVES

To enable the students to

1	introduce the foundational concepts of thermodynamics relevant to aerospace applications.
2	deepen the understanding of thermodynamic principles by exploring the concept of entropy and the second law.
3	equip students with the ability to analyze and compare the performance of ideal air standard cycles used in aerospace propulsion..
4	introduce the principles of vapor power cycles used in various applications like refrigeration and air conditioning.
5	apply the principles of thermodynamics to analyze aircraft propulsion systems and explore heat transfer mechanisms.

UNIT I	SYSTEMS AND LAWS OF AERO THERMODYNAMICS	9

Thermodynamic systems – closed, open and isolated. Property, state, path and process, quasi-static process, work, internal energy, enthalpy, specific heat capacities and heat transfer, SFEE, application of SFEE to jet engine components, First law of thermodynamics, relation between pressure, volume and temperature for various processes, Zeroth law of thermodynamics.

UNIT II	SECOND LAW AND ENTROPY	9

Second law of thermodynamics – Kelvin Planck and Clausius statements of second law. Reversibility and Irreversibility, Thermal reservoir, Carnot theorem. Carnot cycle, Reversed Carnot cycle, efficiency, COP, Thermodynamic temperature scale - Clausius inequality, Concept of entropy, Entropy changes for various processes.

UNIT III	AIR STANDARD CYCLES	9

Otto, Diesel, Dual and Brayton cycles - P-V and T-S diagrams; Air standard efficiency - mean effective pressure; numerical problems.

UNIT IV	FUNDAMENTALS OF VAPOUR POWER CYCLES	9

Properties of pure substances – solid, liquid and vapour phases, Principles of refrigeration; Air conditioning – Vapour compression, Vapour absorption types; Air cycle machine; Humidity control; Coefficient of performance; Properties of refrigerants.

UNIT V	AIRCRAFT PROPULSION SYSTEMS AND HEAT TRANSFER	9

Classification of jet engines - basic jet propulsion arrangement; Simple jet propulsion system; Thrust rocket motor; Specific impulse; Thrust equation – Specific thrust, SFC, TSFC, specific impulse, isentropic efficiencies of jet engine components, polytropic efficiency; Conduction in parallel, radial and composite wall; Basics of convective andradiation heat transfer.

	TOTAL PERIODS	45

LIST OF EXPERIMENTS

1. Performance test on a 4-stroke engine
2. Valve timing of a 4 – stroke engine.
3. Port timing of a 4 – stroke engine.

4. Coefficient of Performance test on a vapour compression refrigeration test rig.
5. Coefficient of Performance test on a vapour compression air-conditioning test rig.
6. Determination of effectiveness of a parallel flow heat exchanger.
7. Determination of effectiveness of a counter flow heat exchanger.

TOTAL PERIODS: 75

COURSE OUTCOMES

At the end of this course, students will be able to		BT Mapped (Highest Level)
CO1	classify thermodynamic systems, analyze basic processes using the first law (SFEE), and explain the zeroth law of thermodynamics.	Understanding (K2)
CO2	demonstrate the significance of the second law and apply the concept of entropy to various thermodynamic processes.	Applying (K3)
CO3	illustrate and analyze air standard cycles (Otto, Diesel, Dual, Brayton) using P-V and T-S diagrams.	Analyzing (K4)
CO4	classify vapor cycles, and understand the concept COP for these systems.	Understanding (K2)
CO5	outline basic jet propulsion systems, explain key performance parameters and apply basic principles of heat in aerospace applications.	Analyzing (K4)

TEXT BOOKS

1. Nag, P. K., "Engineering Thermodynamics", 6th edition. Tata McGraw-Hill 2017.
2. E.Radhakrishnan, "Fundamentals of Engineering Thermodynamics", Prentice, Hall, India, 2006.

REFERENCES

1. Yunus A. Cengel and Michael A. Boles, "Thermodynamics: An Engineering Approach" McGraw-HillScience/Engineering/Math; 9th edition 2019.
2. Merala C, Pother, Craig W, Somerton, "Thermodynamics for Engineers", Schaum Outline Series, Tata Mc Graw-Hill, New Delhi, 2004.
3. Holman.J.P., "Thermodynamics", 3rd Edition, McGraw-Hill, 2007.
4. Rayner Joel, "Basic Engineering Thermodynamics", 5th Edition, Addison Wesley, New York, 2016.

CO-PO MAPPING :

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	1	2	-	-	-	-	1	-	-	2	2	2
CO2	3	2	1	2	-	-	-	-	1	-	-	2	2	2
CO3	3	2	1	2	-	-	-	-	1	-	-	2	2	2
CO4	3	2	2	2	-	-	-	-	1	-	-	2	2	2
CO5	3	2	2	2	-	-	-	-	1	-	-	2	2	2

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AE23305	STRENGTH OF MATERIALS LABORATORY	0	0	4	2

COURSE OBJECTIVES

To enable the students to

1	understand the basic operations of UTM Machine..
2	calculate the hardness of materials.
3	perform Compression Test for various Materials.
4	determine the young's modulus for mild steel rod using a torsion test.

LIST OF EXPERIMENTS

1. Measure the Brinell Hardness Number (BHN) using the Brinell hardness test.
2. Measure the Rockwell Hardness Number (RHN) using the Rockwell hardness test.
3. Assess the shear modulus of a mild steel rod using a tension test .
4. Evaluate the Young's modulus of a mild steel rod using a torsion test.
5. Calculate the impact strength value using the Izod impact test.
6. Calculate the impact strength value using the Charpy impact test .
7. Conduct the reverse plate bending fatigue test.
8. Conduct the rotating beam fatigue test.
9. Test the springs for performance and characteristics.
10. Perform the block compression test on various materials.

TOTAL PERIODS :60

COURSE OUTCOMES At the end of the course, the students will be able to		BT MAPPED (Highest level)
CO1	inspect the behavior of various materials under tension, compression, shear and torsion.	Apply (K3)
CO2	analyze the Impact strength and hardness strength of the material.	Analyze (K4)
CO3	investigate strength of materials under stiffness and strain.	Analyze (K4)
CO4	analyze the fatigue problem of a materials.	Apply (K3)

CO - PO Mapping

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	-	2	2	2
CO2	3	3	2	2	-	-	-	-	-	-	-	2	2	2
CO3	3	3	2	2	-	-	-	-	-	-	-	2	2	2
CO4	3	3	2	2	-	-	-	-	-	-	-	2	2	2

ENGINEERING COLLEGE
Approved
BOARD OF STUDIES
Aeronautical Engineering
03/05/24
AUTONOMOUS

AE23306	FLUID MECHANICS LABORATORY	0	0	4	2

COURSE OBJECTIVES

To enable the students to

1	compute Coefficient of discharge of given venturi meter.
2	calculate the rate of flow using friction factor for a given set of pipes.
3	find out efficiency of reciprocating and gear pump.
4	select a suitable type of turbine for the given situation.

LIST OF EXPERIMENTS

1. Determination of the Coefficient of discharge of given Venturimeter.
2. Determination of the pressure measurement with pitot static tube.
3. Determination of pipe flow losses.
4. Verification of Bernoulli's theorem.
5. Determination of friction factor for a given set of pipes.
6. Conducting experiments and drawing the characteristic curves of centrifugal pump.
7. Conducting experiments and drawing the characteristic curves of reciprocating pump.
8. Conducting experiments and drawing the characteristic curves of Pelton wheel.
9. Conducting experiments and drawing the characteristics curves of Francis turbine.
10. Conducting experiments and drawing the characteristic curves of Kaplan turbine.

TOTAL PERIODS :60

COURSE OUTCOMES At the end of the course, the students will be able to		BT MAPPED (Highest level)
CO1	determine the coefficient of discharge of given orifice meter.	Analyzing (K4)
CO2	analyse the friction factor for a given set of pipes.	Analyzing (K4)
CO3	choose an appropriate pump for a specific application.	Applying (K3)
CO4	test the performance of turbines.	Analyzing (K4)

CO - PO Mapping

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	-	2	2	2
CO2	3	3	2	2	-	-	-	-	-	-	-	2	2	2
CO3	3	3	2	2	-	-	-	-	-	-	-	2	2	2
CO4	3	3	2	2	-	-	-	-	-	-	-	2	2	2

PAAVAI ENGINEERING COLLEGE
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BOARD OF STUDIES
Aeronautical Engineering
03/05/24
AUTONOMOUS

GE23301	PROFESSIONAL DEVELOPMENT I	0	0	2	1

COURSE OBJECTIVES

To enable the students to

1	enhance and evaluate the student's professional skills and introduce the function of corporate world.
2	enhance and develop the students behavioral, speaking and listening skills to face the interview.
3	solve advance level verbal aptitude tests to get placed in Tier I companies.
4	improve their reasoning skills to get placed in reputed companies.

UNIT I	SELF - UNDERSTANDING AND PERSONALITY ENHANCEMENT SKILLS	7

Introduction self-exploration; SWOT analysis - Types and barriers; Effective communication in workplace; Leadership skills; Decision making - Problem solving; Goal setting - Critical, strategic and lateral thinking; JAM level- I; Basic resume building level- I.

UNIT II	BEHAVIOURAL SKILLS, LISTENING AND SPEAKING SKILLS	7

Behavioral skills; Time management; Emotional intelligence; Analytical thinking- Listening; Listening and hearing; Self-introduction; Group discussion - Types and importance, evaluation criteria, do's and don'ts of GD; GD Level-1.

UNIT III	QUANTITATIVE APTITUDE	8

Number System; LCM and HCF; Simple interest and compound interest; Average; Pipes and cisterns; Area; Profit and loss.

UNIT IV	LOGICAL REASONING	8

Logical sequence; Analogy; Classification; Causes and effect; Making judgment; Directions.

	TOTAL PERIODS	30

COURSE OUTCOMES

At the end of this course, students will be able to		BT Mapped (Highest Level)
CO1	define and analyze soft skills to improve the leadership skills.	Analyzing (K4)
CO2	demonstrate the behavioral skills through various activities.	Applying (K3)
CO3	develop the problem solving skills through quantitative aptitude.	Applying (K3)
CO4	illustrate the logical reasoning Skills to solve real world problems.	Analyzing (K4)

TEXT BOOKS

1. Agarwal, R.S. "Objective General English", S. Chand & Co.2021.
2. Agarwal, R.S. "Quantitative Aptitude", S. Chand & Co.2021.

REFERENCES

1. Abhijit Guha, "Quantitative Aptitude ", Tata-Mc graw Hill, 2023.
2. Agarwal, R.S." a modern approach to Verbal & Non Verbal Reasoning", S.Chand & Co Ltd, New Delhi.2021.
3. Word Power Made Easy By Norman Lewis, Wr.Goyal Publications, 2021.

CO-PO MAPPING :

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	-	-	-	-	-	3	3	2	3	-	3	1	1
CO2	-	-	-	-	-	-	2	3	2	3	-	3	1	1
CO3	3	2	2	2	-	1	-	-	-	-	2	-	2	2
CO4	2	1	3	2	-	3	3	1	-	1	2	-	2	2

PAAVAI ENGINEERING COLLEGE, NAMAKKAL
Approved
BOARD OF STUDIES
English
25/5/24
AUTONOMOUS

MA23401	NUMERICAL METHODS	3	1	0	4
(Common to AERO & EEE)					

COURSE OBJECTIVES

To enable the students to

1.	apply various numerical techniques for solving algebraic/transcendental equations and system linear equations.
2.	analyse the knowledge of interpolation using numerical data.
3.	develop the knowledge of numerical differentiation and numerical integration techniques.
4.	acquaint the knowledge of various techniques and methods of solving ordinary differential equations.
5.	apply finite difference methods of solving boundary value problems.

UNIT I	SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS	12

Solution of equations - Iteration method: Numerical solution to transcendental equations by Newton Raphson method; Solution of linear system by Gaussian elimination and Gauss - Jordon method; Inverse of a matrix by Gauss Jordon method; Iterative method: Gauss-Seidel method, Eigenvalue of a matrix by power method.

UNIT II	INTERPOLATION AND APPROXIMATION	12

Newton's forward and backward difference formulas; Lagrangian method for Polynomials; Divided differences, Newton's Divided Difference; Hermite Interpolation Polynomial and Interpolating with a cubic spline.

UNIT III	NUMERICAL DIFFERENTIATION AND INTEGRATION	12

Differentiation using interpolation formulae; Numerical integration by trapezoidal, Simpson's 1/3, Romberg's method, Two and Three point Gaussian quadrature formulas; Double integrals using trapezoidal and Simpsons rule.

UNIT IV	INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS	12

Single step methods - Taylor series method, Modified Euler method for first order equation, Fourth order Runge - Kutta method for solving first and second order equations; Multistep methods - Milne's and Adam's predictor and corrector methods.

UNIT V	BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS	12

Finite difference solution of second order ordinary differential equation; Finite difference solution of one dimensional heat equation by Crank Nicolson and Bender Schmidt Method; One dimensional wave equation and two dimensional Laplace and Poisson equations.

	TOTAL PERIODS	60

COURSE OUTCOMES

At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	apply various numerical techniques to solve algebraic and transcendental equations	Applying (K3)
CO2	apply the interpolation methods for constructing approximate polynomials	Applying (K3)
CO3	derive the concepts of numerical differentiation and integration	Applying (K3)

CO4	compute the solution of first order ordinary differential equations by numerical techniques.	Applying (K3)
CO5	derive the computational methods of solving various boundary value problems	Applying (K3)

TEXT BOOKS

1. C.F. Gerald and P.O. Wheatley, "Applied Numerical Analysis" 6th Edition, Pearson Education Asia, New Delhi, 2002.
2. K. Sankar Rao, " Numerical Methods for Scientists and Engineers –3rd Edition,Prentice Hall of India Pvt. Ltd, New Delhi, 2007.

REFERENCES

1. P. Kandasamy, K. Thilagavathy and K. Gunavathy, "Numerical Methods", S.Chand Co. Ltd., New Delhi, 2003.
2. Erwin Kreyszig., "Advanced Engineering Mathematics" 10th Edition, Wiley Publications, 2010.
3. M.K.Jain, S.R.K. Iyangar, R.K.Jain, "Numerical Methods for Scientific & Engineering Computation" New Age International (P) Ltd, New Delhi, 2005.
4. M.B.K. Moorthy and P.Geetha, "Numerical Methods", Tata McGraw Hill Publications Company, New Delhi, 2011.

CO PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes :
(1,2,3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

COs	Programme Outcomes (POs)												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	3	-	-	-	-	-	-	-	2	2	2
CO2	3	3	2	3	-	-	-	-	-	-	-	2	2	2
CO3	3	2	2	2	-	-	-	-	-	-	-	3	2	2
CO4	3	3	2	3	-	-	-	-	-	-	-	2	2	2
CO5	3	2	3	2	-	-	-	-	-	-	-	3	2	2

PAAVAI ENGINEERING COLLEGE, NAMA
Approved
BOARD OF STUDIES
Mathematics
AUTONOMOUS

AE23401	GAS TURBINE PROPULSION	3	0	0	3

COURSE OBJECTIVES

To enable the students to

1	define fundamental approach and functions of jet engine components
2	infer about the analysis of flow phenomenon and estimation of thrust developed by jet engine..
3	learn the concepts of jet engine combustion chambers and processes
4	acquire knowledge on jet engine compressors
5	acquire knowledge on jet engine turbines

UNIT I	PRINCIPLES OF AIR BREATHING ENGINES	9

Classification of gas turbines – Open cycle and closed cycle turbines, efficiencies illustration of working of gas turbine engines – factors affecting thrust – methods of thrust augmentation –. Numerical Problems.

UNIT II	JET ENGINE INTAKES AND EXHAUST NOZZLES	9

Internal flow and Stall in subsonic inlets – relation between minimum area ratio and eternal deceleration ratio – diffuser performance – modes of operation - supersonic inlets – starting problem on supersonic inlets – shock swallowing by area variation – real flow through nozzles and nozzle efficiency – losses in nozzles – ejector and variable area nozzles - interaction of nozzle flow with adjacent surfaces – thrust reversal. Numerical problems.

UNIT III	JET ENGINE COMBUSTION CHAMBERS	9

Chemistry of combustion, Combustion equations, Combustion process, classification of combustion chambers – combustion chamber performance – effect of operating variables on performance – flame stabilization, Cooling process, Materials, Aircraft fuels, HHV, LHV, Orsat apparatus.

UNIT IV	JET ENGINE COMPRESSORS	9

Euler's turbo machinery equation, Principle operation of centrifugal compressor, Principle operation of axial flow compressor– Work done and pressure rise – velocity diagrams – degree of reaction – free vortex and constant reaction designs of axial flow compressor – performance parameters axial flow compressors– stage efficiency.

UNIT V	JET ENGINE TURBINES	9

Principle of operation of axial flow turbines– limitations of radial flow turbines- Work done and pressure rise – Velocity diagrams – degree of reaction – constant nozzle angle designs – performance parameters of axial flow turbine– turbine blade cooling methods – stage efficiency calculations – basic blade profile design considerations –matching of compressor and turbine. Numerical problems.

	TOTAL PERIODS	45

COURSE OUTCOMES

	At the end of this course, students will be able to	BT Mapped (Highest Level)
CO1	interpret the performance and characteristics of turboprop, turbofan	Understanding (K2)

	and turbojet.	
CO2	measure the performance of inlets and nozzles and its modes of operation with respect to Mach number regimes.	Applying (K3)
CO3	compile the process and performance of combustion chambers and its cooling methods.	Analyzing (K4)
CO4	design the compressor blades by utilizing the elementary theory of compressors.	Applying (K3)
CO5	analyze the different types of turbines and its elementary theory of blades.	Analyzing (K4)

TEXT BOOKS

1. Boyce, Gas Turbine Engineering Handbook.4th Edn, Elsevier India, 2012.
2. Hill, P.G. & Peterson, C.R. "Mechanics & Thermodynamics of Propulsion" Pearson education (2009)

REFERENCES

1. Cohen, H. Rogers, G.F.C. and Saravana muttoo, H.I.H. "Gas Turbine Theory", Pearson Education Canada; 6th edition, 2008.
2. Mathur, M.L. and Sharma, R.P., "Gas Turbine, Jet and Rocket Propulsion", Standard Publishers & Distributors, Delhi, 2nd edition 2014.
3. Oates, G.C., "Aero thermodynamics of Aircraft Engine Components", AIAA Education Series, New York, 1985.
4. Rathakrishnan., E, "Gas Dynamics", 5th edition Published by PHI Learning, 2014.

CO-PO MAPPING :

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	1	-	-	-	-	-	-	-	2	2	2
CO2	3	2	2	1	-	-	-	-	-	-	-	2	2	2
CO3	3	2	2	1	-	-	-	-	-	-	-	2	2	2
CO4	3	2	2	1	-	-	-	-	-	-	-	2	2	2
CO5	3	2	2	1	-	-	-	-	-	-	-	2	2	2

PAAVAI ENGINEERING COLLEGE
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BOARD OF STUDIES
Aeronautical Engineering
03/05/24
AUTONOMOUS

AE23402	LOW SPEED AERODYNAMICS	3	0	0	3

COURSE OBJECTIVES

To enable the students to

1	understand foundational principles of low-speed aerodynamics
2	analyze two-dimensional in viscid incompressible flow and its practical implications on various aerodynamic phenomena.
3	apply conformal transformation techniques to solve complex aerodynamic problems.
4	comprehend the principles of subsonic wing theory, including finite wing effects, downwash, induced drag, and lifting line theory.
5	gain an introductory understanding of boundary layer theory, including its fundamental equations, boundary layer growth, and the transition from laminar to turbulent flow.

UNIT I — INTRODUCTION TO LOW-SPEED FLOW — 9

Euler equation, incompressible Bernoulli's equation. circulation and vorticity, barotropic flow, kelvin's theorem, streamline, stream function, irrotational flow, potential function, Equipotential lines, elementary flows and their combinations.

UNIT II — TWO-DIMENSIONAL INVISCID INCOMPRESSIBLE FLOW — 9

Ideal Flow over a circular cylinder, D'Alembert's paradox, magnus effect, Kutta Joukowski's theorem, starting vortex, Kutta condition, real flow over smooth and rough cylinder.

UNIT III — CONFORMAL TRANSFORMATION — 9

Cauchy-Riemann relations, complex potential, methodology of conformal transformation, Kutta-Joukowski transformation and its applications, thin airfoil theory and its applications.

UNIT IV — SUBSONIC WING THEORY — 9

Introduction to Finite wing, Downwash and Induced Drag, Biot -Savart law and Helmhotz's theorems, Horse shoe vortex, Prandtl's Classical Lifting line theory and its limitations.

UNIT V — INTRODUCTION TO BOUNDARY LAYER THEORY — 9

Boundary layer and boundary layer thickness - displacement thickness, momentum thickness, energy thickness, shape parameter; Boundary layer equations for a steady; T wo dimensional incompressible flow - boundary layer growth over a flat plate, critical Reynolds number, Blasius solution, basics of turbulent flow.

TOTAL PERIODS: 45

COURSE OUTCOMES

At the end of this course, students will be able to		**BT Mapped (Highest Level)**
CO1	interpret low-speed, incompressible flow, and the concepts of circulation, vorticity, and potential functions.	Understanding (K2)

CO2	corelate the flow over a circular cylinder	Analyzing (K4)
CO3	apply conformal and Kutta-Joukowski transformation techniques, and thin airfoil theory, to solve complex aerodynamic problems.	Applying (K3)
CO4	Apply Prandtl's Classical Lifting Line Theory to determine the lift and drag characteristics of subsonic wings.	Applying (K3)
CO5	estimate the boundary layer growth over flat plates, including the transition from laminar to turbulent flow.	Understanding (K2)

TEXT BOOKS

1. Anderson, J.D., "Fundamentals of Aerodynamics", 7th Edition, McGraw-Hill Book Co., New York, 2024
2. Houghton E L, P.W.Carpenter, Steven H. Collicott, and Daniel T. Valentine, "Aerodynamics for Engineering Students", 7th Edition, Butter worth-Heinemann, 2016.

REFERENCES

1. L. J. Clancey, "Aerodynamics", Shroff Publications, 2007.
2. Kuethe A M and C-Y Chow, "Foundations of Aerodynamics: Bases of Aerodynamic Design", Fifth Edition, Wiley, 1997.
3. John J. Bertin and Russell M. Cummings, "Aerodynamics for Engineers", Sixth Edition, Pearson, 2013.
4. Ethirajan Rathakrishnan, "Theoretical Aerodynamics", 1st Edition, Wiley Publications, 2013.

CO-PO MAPPING :

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	3	-	-	-	-	-	-	-	2	2	2
CO2	3	3	2	3	-	-	-	-	-	-	-	2	2	2
CO3	3	3	2	3	-	-	-	-	-	-	-	2	2	2
CO4	3	3	2	3	-	-	-	-	-	-	-	2	2	2
CO5	3	3	2	3	-	-	-	-	-	-	-	2	2	2

PAAVAI ENGINEERING COLLEGE, NAMAKKAL
Approved
BOARD OF STUDIES
Aeronautical Engineering
03/05/24
AUTONOMOUS

AE23403	AIRCRAFT SYSTEMS AND INSTRUMENTS	3	0	0	3

COURSE OBJECTIVES

To enable the students to

1	understand the types of instruments and its operation including navigational instruments.
2	impart knowledge of the hydraulic and pneumatic systems components.
3	acquire the knowledge of essential systems of safe aircraft operation.
4	apply the concepts of aircraft air conditioning and pressurizing
5	understand the working of basic aircraft instruments.

UNIT I — AIRPLANE CONTROL SYSTEMS — 9

Flight Control System: Conventional, Powered control system, Power Assisted control system and Modern Flight control system - Fly by wire systems, Auto pilot system, Active Control Technology - Instrument landing systems.

UNIT II — HYDRAULIC AND PNEUMATIC SYSTEMS — 9

Hydraulic Systems: Types of Hydraulic oil and its properties, Components, modes of Operation. Pneumatic Systems: methods of air pressure system, Components, modes of operation. Landing Gear Systems: Classification, Retractive mechanism.

UNIT III — ENGINE SYSTEMS — 9

Fuel system - Lubricating systems - Starting system - Ignition systems. Engine Control System: Electronic Engine Control (EEC) System, Full Authority Digital Engine Control (FADEC) system.

UNIT IV — AIRCONDITIONING AND PRESSURIZING SYSTEM — 9

Basic Air Cycle systems – Vapour Cycle Systems, Boot-strap air cycle system – Evaporative vapour cycle systems – Evaporation air cycle systems – Oxygen systems – Fire extinguishing system and smokedetection system, Deicing and anti-icing system.

UNIT V — AIRCRAFT INSTRUMENTS — 9

Gyroscopic Instruments: principle and operation of gyroscope, Attitude Indicator (AI), Heading Indicator (HI), Turn Coordinator. Pitot static instruments: Airspeed Indicator, Altimeter, and the Vertical Speed Indicator (VSI). Accelerometers, Mach Meters IAS, TAS, CAS, EAS.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, students will be able to		**BT Mapped (Highest Level)**
CO1	understand various flight control system and its recent advancements.	Apply (K3)
CO2	demonstrate the ability to design a various system using pneumatic and hydraulic components.	Apply (K3)
CO3	demonstrate the fundamental understanding of the operation of engine auxiliary systems.	Apply (K3)

CO4	distinguish the types of air cycle and pressurization	Apply (K3)
CO5	explore the pitot and gyro-based instruments.	Analyze (K4)

TEXT BOOKS

1. Mekinley, J.L. and R.D. Bent, Aircraft Power Plants, McGraw Hill, 2020.
2. Pallet, E.H.J. Aircraft Instruments & Principles, Pitman & Co, 2016

REFERENCES

1. Handbooks of "Airframe and Power plant Mechanics", US dept. of Transportation, Federal, Aviation Administration, the English Book Store, New Delhi, 2015.
2. Mc Kinley, J.L. and Bent R.D. "Aircraft Maintenance & Repair", Mc Graw Hill, 2013.
3. Teager, S, "Aircraft Gas Turbine Technology", McGraw Hill 2017
4. Nagabhushana.S and Sudha.L.K, "Aircraft Instrumentation and Systems", I.K.International Publishing House Pvt. Ltd, New Delhi, 2020.

CO-PO MAPPING :

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	1	1	-	-	-	-	-	-	-	-	1	1	1
CO2	3	1	1	-	-	-	-	-	-	-	-	1	1	1
CO3	3	1	1	-	-	-	-	-	-	-	-	1	1	1
CO4	3	1	1	-	-	-	-	-	-	-	-	1	1	1
CO5	3	1	1	-	-	-	-	-	-	-	-	1	1	1

ENGINEERING COLLEGE
Approved
BOARD OF STUDIES
Aeronautical Engineering
03/07/24
AUTONOMOUS

MC23401	ENVIRONMENTAL SCIENCES AND SUSTAINABILITY	2	0	0	0

COURSE OBJECTIVES

To enable the students to

1	establish the knowledge of precious resources of the environment and their various impacts.
2	create awareness on ecosystem and biodiversity preserve.
3	learn scientific and technological solutions to current day pollution issues.
4	analyze climate changes, concept of carbon credit and the challenges of environmental management.
5	understand green materials, energy cycles and the role of sustainable urbanization.

UNIT I	ENVIRONMENT AND NATURAL RESOURCES	6

Definition, scope and importance of Environment. Forest resources: Use and over-exploitation, deforestation, - mining, dams and their effects on forests and tribal people. Water resources: Use and over- utilization of surface and ground water, dams-benefits and problems. Food resources: effects of modern agriculture, fertilizer-pesticide problems. Role of an individual in conservation of natural resources.

UNIT II	ECOSYSTEMS AND BIODIVERSITY	6

Concept of an ecosystem: Structure and function of an ecosystem - ecological succession - food chains and food webs. Ecosystems- Types of ecosystem: Introduction - forest ecosystem and lake ecosystems. Biodiversity: Introduction - definition (genetic - species - ecosystem). Diversity - Value of biodiversity - Hotspots of biodiversity - Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

UNIT III	ENVIRONMENTAL POLLUTION	6

Pollution: Définition - air pollution - water pollution - marine pollution - noise pollution. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - Electronic waste -Sources-Causes and its effects- Pollution case studies-Field study of local polluted site – Industrial/Agricultural

UNIT IV	SUSTAINABILITY AND ENVIRONMENT	6

Sustainability - from unsustainability to sustainability-millennium development goals, and protocols. Sustainable development goals-targets, indicators and intervention areas. Climate change— acid rain - ozone layer depletion. Regional and local environmental issues and possible solutions-case studies. Concept of carbon credit, carbon footprint. Environmental management in industry-A case study.

UNIT V	SUSTAINABILITY PRACTICES	6

Zero waste and R concept, Circular economy, ISO 14000 Series, Environmental Impact Assessment - Sustainable energy: Non-conventional Sources, Green materials, Energy Cycles - carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio economical and technological change.

	TOTAL PERIODS	30

COURSE OUTCOMES

At the end of this course, students will be able to	BT Mapped (Highest Level)

CO1	find the method of conservation of natural resources	Understand(K2)
CO2	understand ecosystem and the conservation of biodiversity.	Understand(K2)
CO3	aware of environmental pollution and interpret its effects.	Understand(K2)
CO4	apply sustainable development for technological advancement and societal development.	Apply (K3)
CO5	measure the sustainability practices for green energy cycles.	Analyze (K4)

TEXT BOOKS

1. Benny Joseph, "Environmental Science and Engineering", Tata Mc Graw Hill, 1st edition, 2017.
2. Gilbert M. Masters, Wendell P. Ela, "Introduction to Environmental Engineering and Science", 3rd edition, Pearson, 2022.

REFERENCES

1. William P. Cunningham and Mary Ann Cunningham, "Environmental Science: A Global Concern", Mc Graw Hill, 16th edition, 2023.
2. C. S. Rao, "Environmental Pollution and Control engineering", New Age International (P) ltd Publication, New Delhi, 4th edition, 2021.
3. Erach Bharucha, "Text book of Environmental Studies", Universities Press Pvt. Ltd., edition, 2020.
4. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 4th Edition, 2015.

CO-PO MAPPING :

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	1	-	-	-	2	-	-	1	1	-	-	2	2
CO2	-	2	-	-	1	1	-	1	-	-	-	-	-	2
CO3	2	-	1	1	-	-	-	2	-	-	-	2	2	2
CO4	-	2	-	-	1	-	3	1	1	-	1	1	2	2
CO5	2	2	-	1	-	-	2	1	-	-	-	1	2	2

PAAVAI ENGINEERING COLLEGE, NAMAKKAL
Approved
BOARD OF STUDIES
Chemistry
AUTONOMOUS

AE23404	AIRCRAFT STRUCTURAL MECHANICS	3	0	2	4

COURSE OBJECTIVES

To enable the students to

1	understand the linear static analysis of determinate structure
2	understand the linear static analysis of indeterminate structure
3	know the energy theorem and their application
4	gain the knowledge of column and their critical load
5	know the failure theory on material

UNIT I	**STATICALLY DETERMINATE STRUCTURES**	**9**

Truss – types; Condition for statically determinate structure ; Analysis of plane truss; Numerical problem on Method of joints; 3DTruss introduction; Beam - degree of indeterminacy; Types of statically determinate beam.

UNIT II	**STATICALLY INDETERMINATE STRUCTURES**	**9**

Beam - degree of indeterminacy, types of statically indeterminate beam ; Analysis - Clapeyron's Three Moment Equation; Numerical problem for Continuous beam.

UNIT III	**ENERGY METHODS**	**9**

Strain Energy in axial, bending and torsion loading; Castigliano's theorems and their applications; Energy theorems ; Numerical problems on dummy load and unit load methods.

UNIT IV	**COLUMNS**	**9**

Columns with various end conditions; Euler's Column curve; Column with initial curvature; Eccentric loading; Beam column; Numerical Problem on Rankine's formula.

UNIT V	**FAILURE THEORIES**	**9**

Maximum Stress theory; Maximum Strain Theory; Maximum Shear Stress Theory; Distortion Theory; Maximum strain energy theory; Application to aircraft structural problems.

	TOTAL PERIODS	**45**

LIST OF EXPERIMENTS

1. Determination of deflection of a simply supported beam.
2. Determination of deflection of a cantilever beam.
3. Verification of Principle of superposition.
4. Verification of Maxwell's Reciprocal theorem
5. Column – Testing using various materials
6. South – well's plot.
7. Determination of membrane stresses in a thin cylinder under internal pressure.

TOTAL PERIODS: 75

COURSE OUTCOMES

	At the end of this course, students will be able to	**BT Mapped (Highest Level)**
CO1	examine the statically determinate structures.	Apply (K3)
CO2	analyze the response of statically indeterminate structures under various loading conditions	Apply (K3)

CO3	determine the reactions of structures using strain energy concept.	Analyze (K4)
CO4	correlate different numerical methods available to solve a single structural problem.	Apply (K3)
CO5	classify the structural failures using failure theories.	Analyze (K4)

TEXT BOOKS

1. Megson, T.H.G., "Aircraft Structures for Engineering Students", Fifth Edition (Rev.), Butterworth-Heinemann, 2017.
2. David J. Peery, "Aircraft Structures (Dover Books on Aeronautical Engineering)", Dover Publications, 2013.

REFERENCES

1. Bruhn E F, "Analysis and Design of Flight Vehicle Structures", Tri-State Off-set Company, USA, 1985
2. Donaldson, B.K., "Analysis of Aircraft Structures - An Introduction" Cambridge University Press publishers, 2nd edition, 2008
3. Peery, D.J., and Azar, J.J., "Aircraft Structures", 2nd edition, McGraw – Hill, N.Y., 1999.
4. L. S. Srinath ., "Advanced Mechanics Of Solids", 3rd edition, McGraw – Hill.,2009

CO-PO MAPPING :

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	1	3	2	-	-	-	2	1	-	2	3	3
CO2	3	3	1	3	2	-	-	-	2	1	-	2	3	3
CO3	3	3	1	3	2	-	-	-	2	1	-	2	3	3
CO4	3	3	1	3	2	-	-	-	2	1	-	2	3	3
CO5	3	3	1	3	2	-	-	-	2	1	-	2	3	3

Approved
BOARD OF STUDIES
Aeronautical Engineering
AUTONOMOUS

AE23405	PROPULSION LABORATORY	0	0	4	2

COURSE OBJECTIVES

To enable the students to

1	familiarize them practically about various aircraft engines and their performance.
2	determine the flow behavior of jets and turbo machinery.
3	understand the inspection and maintenance procedures followed for overhaul of aero engines.
4	impart knowledge on starting procedures of aircraft Piston engine.

LIST OF EXPERIMENTS

1. Study of aircraft piston engine.
2. Piston engine dismantling procedures.
3. Piston engine reassembly procedures.
4. Study of aircraft gas turbine engine.
5. Engine starting procedures.
6. Velocity profiles of free jets.
7. Velocity profiles of wall jets.
8. Free convective heat transfer over a cylinder.
9. Forced convective heat transfer over a cylinder.
10. Determination of calorific value of Aviation Fuel.

TOTAL PERIODS :60

COURSE OUTCOMES At the end of the course, the students will be able to		**BT MAPPED** (Highest level)
CO1	identify the components and understand the working principle of various aircraft engines.	Apply (K3)
CO2	analyze the velocity profile of jets and select the blade profile for compressors and turbines.	Analyze (K4)
CO3	understand the inspection and maintenance procedures followed in overhauling of aircraft engines.	Analyze (K4)
CO4	understand the starting procedures of aircraft engine for different engines	Apply (K3)

CO - PO Mapping

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO	PO	PO	PO	PO	PO	PO	PO8	PO9	PO	PO1	PO12	PSO	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	-	2	2	2
CO2	3	3	2	2	-	-	-	-	-	-	-	2	2	2
CO3	3	3	2	2	-	-	-	-	-	-	-	2	2	2
CO4	3	3	2	2	-	-	-	-	-	-	-	2	2	2

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Aeronautical Engineering
03/05/24

AE23406	AERODYNAMICS LABORATORY	0	0	4	2

COURSE OBJECTIVES

To enable the students to

1	understand the flow pattern around the airfoil.
2	familiarize the calibration of wind tunnel.
3	impart the knowledge of wind tunnel balance.
4	learn about the different airfoil lift and drag.

LIST OF EXPERIMENTS

1. Study of subsonic wind tunnel.
2. Calibration of a subsonic Wind tunnel.
3. Pressure distribution over a rough circular cylinder.
4. Pressure distribution over a smooth circular cylinder.
5. Pressure distribution over symmetric airfoil.
6. Pressure distribution over cambered airfoil.
7. Determination of lift for the given airfoil section.
8. Force measurement on an airfoil using blower balance for small aspect ratio models.
9. Water flow visualization studies in subsonic flows using water flow channels.
10. Smoke flow visualization studies in subsonic flows

		TOTAL PERIODS :60
COURSE OUTCOMES At the end of the course, the students will be able to		**BT MAPPED** (Highest level)
CO1	know the calibration of wind tunnel.	Apply (K3)
CO2	measure aerodynamic forces around airfoils.	Analyze (K4)
CO3	calculate force for small aspect ratio models.	Analyze (K4)
CO4	understand the distribution of flow over various profiles	Apply (K3)

CO - PO Mapping

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	3	2	-	-	-	2	1	-	2	3	3
CO2	3	3	1	3	2	-	-	-	2	1	-	2	3	3
CO3	3	3	1	3	2	-	-	-	2	1	-	2	3	3
CO4	3	3	1	3	2	-	-	-	2	1	-	2	3	3

PAAVAI ENGINEERING COLLEGE, NAMAKKAL
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Aeronautical Engineering
03/05/24
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GE23401	PROFESSIONAL DEVELOPMENT II	0	0	2	1

COURSE OBJECTIVES

To enable the students to

1	enhance their own behavioural skills to survive in corporate world.
2	evaluate their listening and speaking skills to face the interviews in a successful way.
3	solve advance level verbal aptitude tests to get placed in Tier I companies.
4	improve their reasoning skills to get placed in reputed companies.

UNIT I **WRITING SKILLS** **7**

Email writing; Fixing and cancelling appointments; Paper submission for seminars and conferences; Business communication; Stress management; Body language; Dress code; Self-introduction II; Update resume building II; JAM level -3.

UNIT II **PRESENTATION SKILLS** **7**

Presentation skills - Types and methods of delivering presentation, ways and methods to improve presentation skills; Mini presentation in smaller groups; Situational role play; Face to face interview; Group discussion level IL; JAM Level-4.

UNIT III **QUANTITATIVE APTITUDE - I** **8**

Simplification; Time, speed and distance; Trains; Boats and streams; Ratio and proportion; Partnership; Percentage.

UNIT IV **LOGICAL REASONING** **8**

Seating arrangement; Arithmetic reasoning; Character puzzle; Syllogisms; Matching definitions; Statements and arguments

TOTAL PERIODS **30**

COURSE OUTCOMES

At the end of this course, students will be able to		BT Mapped (Highest Level)
CO1	interpret the personality development through various activities.	Understanding (K2)
CO2	examine speaking and listening skills to excel in their jobs.	Analyzing (K4)
CO3	develop the quantitative skills and analytical skills to face the interview.	Applying (K3)
CO4	extend the reasoning abilities by scoring exceeded percentage to get placed in reputed companies.	Understanding (K2)

TEXT BOOKS

1. Agarwal, R.S. "Objective General English", S. Chand & Co.2021.
2. Agarwal, R.S. "Quantitative Aptitude", S. Chand & Co.2021.

REFERENCES

1. Abhijit Guha, "Quantitative Aptitude", Tata-Mc graw Hill, 2023.
2. Agarwal, R.S. "A modern approach to Verbal & Non Verbal Reasoning", S.Chand & Co Ltd, New Delhi.2021.

3. "Word Power Made Easy" By Norman Lewis, Wr.Goyal Publications, 2021.

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Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	-	-	-	-	-	3	3	2	3	-	3	1	1
CO2	-	-	-	-	-	-	2	3	2	3	-	3	1	1
CO3	3	2	2	2	-	1	-	-	-	-	2	-	2	2
CO4	2	1	3	2	-	3	3	1	-	1	2	-	2	2

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