ANNASAHEB DANGE COLLEGE OF ENGINEERING AND TECHNOLOGY, ASHTA

An Empowered Autonomous Institute

(Affiliated to Shivaji University, Kolhapur)

02 Revision Curriculum and Syllabus : III Year and Semester V

Bachelor of Technology in Aeronautical Engineering

Annasaheb Dange College of Engineering and Technology Ashta

Department of Aeronautical Engineering

Teaching and Evaluation Scheme

T. Y. B. Tech Semester V

Course Code	Course Name	Teaching Scheme				THEORY							PRACTICAL						GRAND TOTAL
						ISE		MSE+ ESE			Total	Min	ISE		MSE + ESE		Total	Min	
		L	T	P	Credits	Max	Min	MSE	ESE	Min			Max	Min	Max	Min			
2AEPC301	Aircraft Performance	2	1	2	4	40	16	30	30	24	100	40	50	20	-	-	50	20	150
2AEPC302	Aircraft Stability and Control	2	1	-	3	40	16	30	30	24	100	40	-	-	-	-	-	-	100
2AEPC303	High Speed Aerodynamics	2	1	-	3	40	16	30	30	24	100	40	-	-	-	-	-	-	100
2AEPE3**	Professional Elective - II	-	-	4	2	-	-	-	-	-	-	-	50	20	50	20	100	40	100
2AEVS308	Geometric Dimensions and Tolerances (GD&T)	-	-	2	1	-	-	-	-	-	-	-	25	10	25	10	50	20	50
2AEVS309	Non Destructive Testing (NDT)	-	-	2	1	-	-	-	-	-	-	-	25	10	25	10	50	20	50
2AEEL310	Industrial Training	-	-	-	1								50	20	-	-	50	20	50
2AEHS311	Entrepreneurship	-	-	2	1								50	20	-	-	50	20	50
2AECC312	Aptitude and Reasoning Part - II	-	-	2	1								50	20	-	-	50	20	50
2*******	Minor Stream Course II	3	-	-	3	40	16	30	30	24	100	40	-	-	-	-	-	-	100
2*******	Open Elective Course I	3	-	-	3	100	40	-	-	-	-	-	-	-	-	-	-	-	100
		12	3	14	23														900
	Total Contact Hours/Week	29																	

Professional Elective - II	
2AEPE304	Analyzing Aircraft Structures Using FEA
2AEPE305	Internal and External Flow Analysis Using CFD
2AEPE306	Autonomous Navigation and Flight Control
2AEPE307	Airframe and Aero Engine Maintenance

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DOCUMENT NUMBER: ADCET/ACAD/5, Rev:00, 01/01/2020

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Course Details:

Class	T.Y B.Tech., Sem - V
Course Code and Course Name	**2AEPC301 - Aircraft Performance**
Prerequisite	2AEPC211 - Low Speed Aerodynamics 2AEPC213 - Airbreathing Propulsion
Teaching Scheme: Lecture/Tutorial/Practical	02/01/02
Credits	04
Evaluation Scheme : ISE/MSE/ESE	40/30/30

Course Objectives:

1. Make students understand the effect of atmosphere and configuration on aircraft performance
2. Calculate the performance characteristics of given aircraft configuration
3. Analyze the factors affecting the aircraft performance

Course Outcomes (CO's): After successful completion of this course, the student will be able to,

2AEPC301_1	Understand and apply the fundamental principles of atmospheric properties and their impact on aircraft performance.
2AEPC301_2	Derive and utilize mathematical expressions to calculate aircraft performance parameters under various flight conditions.
2AEPC301_3	Analyze the influence of different factors and parameters on aircraft performance within various operational envelopes.
2AEPC301_4	Evaluate the performance characteristics of an aircraft based on given design parameters and operational conditions.
2AEPC301_5	Apply computational tools and software to model and simulate aircraft performance.
2AEPC301_6	Communicate effectively, both orally and in writing, the technical aspects of aircraft performance analysis.

Course Contents:

Unit 1	**Review of Aerodynamics and Propulsion**	**04 + 02 + 04**
Aerodynamics - Lift, drag and moments, Aerodynamic force coefficients, Drag, types and drag polar. Propulsion - General thrust equation, Specific fuel consumption, Thrust and efficiency		

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Unit 2	**International Standard Atmosphere**	**04 + 02 + 04**
Introduction to International Standard Atmosphere (ISA), Variation of temperature, pressure and density with altitude under ISA conditions, Calculation of atmospheric properties in troposphere and stratosphere, Effect of humidity on air density calculation.		
Unit 3	**Steady Level Performance**	**05 + 02 + 04**
The Equations of Motion for Steady, Level Flight. The Fundamental Parameters: Thrust to Weight Ratio, Wing Loading, Drag Polar and Lift – Drag Ratio. Thrust and Maximum Velocity: Thrust and Power Required for the Steady Level Flight, Thrust Available and Maximum Velocity, Effect of Drag Divergence on Maximum Velocity, Stall and High Lift Devices		
Unit 4	**Climb, Descent, Range and Endurance**	**05 + 02 + 04**
Ceiling: Service and Absolute Ceiling, Climb: Rate of Climb, Maximum Climb Angle, Maximum Rate of Climb and Time to Climb, Effect of Wind on Climb Performance, Descent: Gliding Unpowered Flight, Descent Flight Performance, Effect of Wind on Descent Flight, Range: Breguet's Range Equation, Range for Propeller Driven Airplanes, Range for Jet Driven Airplanes, The Effect of Wind, Endurance: The General Endurance Equation, Endurance for Propeller Driven Airplanes, Endurance for Jet Driven Airplanes.		
Unit 5	**Accelerated Flight Performance**	**04 + 02 + 04**
Turning: Level Turn, Constraints on Load Factor, Minimum Turn Radius, Maximum Turn Rate, The Pull Up and Pull Down Maneuvers, The V-n Diagram: Limit Load Factor, Ultimate Load Factor, Accelerated Climb: Accelerated Rate of Climb, Energy Height, Specific Excess Power, Rate of Climb and Time to Climb.		
Unit 6	**Takeoff and Landing Performance**	**04 + 02 + 04**
Take-off Performance: Take-off Ground Roll, Minimum Control Speed on the Ground and Air, Decision Speed, Balanced Field Length, Calculation of Ground Roll, Calculation of Distance While Airborne to Clear an Obstacle, Landing Performance: The Landing Path and Landing Distance, Calculation of Approach Distance, Flare Distance, Ground Roll.		

Text Books:

Sl.No	Title	Authors	Publisher	Edition	Year
1	Aircraft Performance and Design	John D. Anderson	McGraw Hill	Indian	2017
2	Aerodynamics and Aircraft Performance	James F. Marchman	OEIL - Virginia Tech	03rd Edition	2021

Reference Books:

Sl.No	Title	Author	Publisher	Edition	Year
1	Aircraft Performance Theory and Practice	Martin E. Eshelby	Elsiver	01st	2000

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Sl.No	Title	Author	Publisher	Edition	Year
2	Aircraft Performance, An Engineering Approach	Mohammad H. Sadraey	CRC Press	02nd	2023

E-Resources/Reference Papers:

1. https://www1.grc.nasa.gov/aeronautics/
2. https://aircraft.airbus.com/en/services/operate/flight-operations-solutions/analyze-optimize
3. https://investors.boeing.com/investors/overview/default.aspx
4. https://www.aiaa.org/publications/journals
5. https://www.sciencedirect.com/journal/aerospace-science-and-technology

Assessment Modes:

Sl. No	Method/ Technique	Course Outcomes						Marks		Weightage
		1	2	3	4	5	6	Max	Min	
1	ISE : ABA	☑	☑	☑	☑	☑	☑	20	16	40 %
2	ISE : TA	☑	☑	☑	☑	☑	☑	20		
3	ISE : PA	☑	☑	☑	☑	☑	☑	50	20	
4	MSE	☑	☑	☑	☑	☐	☐	30	24	60 %
5	ESE	☑	☑	☑	☑	☐	☐	30		

- ISE - In-Semester Examination, MSE - Mid-Semester Examination, ESE - End-Semester Examination
- ABA - Activity Based Assessment, TA - Tutorial Assessment, PA - Practical Assessment

CO's - PO's & PSO's Mapping: (Low - 1, Medium - 2, High -3, No Correlation - "-")

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	-	-	-	-	-	2	3	3	-	2	2	1
2	3	3	2	-	3	2	2	2	3	3	-	3	2	1
3	3	3	2	3	3	2	2	2	3	3	-	3	2	1
4	3	3	2	3	3	2	2	2	3	3	1	3	2	1
5	3	2	-	-	3	-	-	2	3	3	-	2	2	1
6	3	2	-	-	-	-	-	2	3	3	-	2	2	1
Avg	**3.0**	**2.5**	**2.0**	**3.0**	**3.0**	**2.0**	**2.0**	**2.0**	**3.0**	**3.0**	**1.0**	**2.5**	**2.0**	**1.0**

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Course Details:

Class	T.Y B.Tech., Sem - V
Course Code and Course Name	**2AEPC302 - Aircraft Stability and Control**
Prerequisite	2AEPC201 - Mathematical Modeling and Problem Solving
Teaching Scheme: Lecture/Tutorial/Practical	02/01/00
Credits	03
Evaluation Scheme : ISE/MSE/ESE	40/30/30

Course Objectives:

1. To demonstrate the fundamental principles of physics in view of aircraft stability and control
2. To introduce and familiarize students with key concepts related to aircraft static and dynamic stability
3. To make students able to analyze the issues pertaining to aircraft stability and control

Course Outcomes (CO's): After successful completion of this course, the student will be able to,

2AEPC302_1	Apply fundamental principles of physics and aerodynamics to analyze the static and dynamic stability characteristics of aircraft.
2AEPC302_2	Model and analyze aircraft motion using appropriate coordinate systems, equations of motion, and linearization techniques.
2AEPC302_3	Investigate the influence of aircraft geometry, mass distribution, and aerodynamic characteristics on static and dynamic stability.
2AEPC302_4	Evaluate aircraft stability and controllability through the analysis of dynamic modes, time responses, and frequency responses.
2AEPC302_5	Design and analyze stability augmentation systems to enhance aircraft performance and handling qualities.
2AEPC302_6	Apply computational tools and simulation techniques to assess aircraft stability and control characteristics.

Course Contents:

Unit 1	**Introduction**	**04 + 02**
Airplane axis system, forces and moments about longitudinal, lateral and vertical axes, equilibrium of forces developed on wing and horizontal tail, center of gravity, its importance in stability and control. Control surfaces elevators ailerons and rudder.		

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Unit 2	**Static Stability and Control**	**04 + 02**
Introduction to static and dynamic stability, Trim equilibrium, The pitching moment equation, Longitudinal Static Stability, Lateral Static Stability, Directional Static Stability, Factor affecting static stability, Contribution of aircraft components (Wing, Tail, Fuselage and Power Plant).		
Unit 3	**Equations of Motion and The Solution**	**05 + 02**
The equations of motion of a rigid symmetric aircraft, the linearised equations of motion, the decoupled equations of motion, alternative forms of equations of motion, Methods of solutions, Cramer's rule, Aircraft response transfer functions, response to controls, Acceleration response transfer function, The state space method.		
Unit 4	**Longitudinal, Lateral-Directional Dynamics**	**05 + 02**
Response to control, The dynamic stability modes, Reduced order models, Frequency response, Flying and Handling qualities, Mode excitation		
Unit 5	**Stability Analysis and Augmentation**	**04 + 02**
The characteristic equation, Routh-Hurwitz stability criterion, Graphical interpretation of stability, Augmentation system design, Closed loop system analysis, The root locus plot, Longitudinal stability augmentation, Lateral-directional stability augmentation.		
Unit 6	**Aerodynamic Modeling, Stability and Control Derivatives**	**04 + 02**
Introduction to aerodynamic modeling, quasi-static derivatives, derivative estimation, the effects of compressibility, limitations of aerodynamic modeling, longitudinal aerodynamic stability derivatives, lateral-directional aerodynamic stability derivatives, aerodynamic control derivatives.		

Text Books:

Sl.No	Title	Authors	Publisher	Edition	Year
1	Flight Stability and Automatic Control	Robert C Nelson	McGraw Hill	2nd (SIE)	2017
2	Dynamics of Flight: Stability and Control	Bernard Etkin Lloyd Duff Reif	Wiley	3rd	2015

Reference Books:

Sl.No	Title	Author	Publisher	Edition	Year
1	Flight Dynamics Principles	Michael V. Cook	Elsiver	3rd	2013

E-Resources/Reference Papers:

1. http://wpage.unina.it/danilo.ciliberti/doc/Pacelli.pdf
2. https://in.mathworks.com/products/aerospace-toolbox.html
3. https://in.mathworks.com/help/aerotbx/reference-applications.html

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Assessment Modes:

Sl. No	Method/ Technique	Course Outcomes						Marks		Weightage
		1	2	3	4	5	6	Max	Min	
1	ISE : ABA	☑	☑	☑	☑	☑	☑	20	16	40 %
2	ISE : TA	☑	☑	☑	☑	☑	☑	20		
3	MSE	☑	☑	☑	☐	☐	☐	30	24	60 %
4	ESE	☐	☐	☑	☑	☑	☐	30		

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- ABA - Activity Based Assessment, TA - Tutorial Assessment

CO's - PO's & PSO's Mapping: (Low - 1, Medium - 2, High -3, No Correlation - "-")

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	1	3	-	-	-	-	3	-	-	2	1
2	3	3	3	1	3	-	-	-	-	3	-	-	2	1
3	3	3	3	3	3	3	-	3	-	3	-	-	2	1
4	3	3	3	3	3	3	-	-	-	3	-	3	2	1
5	3	3	3	3	3	3	3	3	3	3	-	3	2	1
6	3	3	3	1	3	-	-	-	-	3	-	-	2	1
Avg	**3.0**	**3.0**	**3.0**	**2.0**	**3.0**	**3.0**	**3.0**	**3.0**	**3.0**	**3.0**	**-**	**3.0**	**2.0**	**1.0**

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Course Details:

Class	T.Y B.Tech., Sem - V
Course Code and Course Name	**2AEPC303 - High Speed Aerodynamics**
Prerequisite	2AEPC211 - Low Speed Aerodynamics
Teaching Scheme: Lecture/Tutorial/Practical	02/01/00
Credits	03
Evaluation Scheme : ISE/MSE/ESE	40/30/30

Course Objectives:

1. Understand the concept of compressibility.
2. Interpret the theory behind the formation of shock waves, Expansions waves at supersonic flows
3. To apply the linearized flow concepts at supersonic flow regions
4. To apply the concept of method of characteristics to design Convergent Divergent nozzle and diffuser

Course Outcomes (CO's): After successful completion of this course, the student will be able to,

2AEPC303_1	Demonstrate a strong grasp of fundamental high-speed aerodynamics principles and equations to effectively solve a variety of aerodynamic problems, including those involving high-speed, one-dimensional, and compressible airflow.
2AEPC303_2	Determine and explain how the properties of a high-speed gas flow change across shock waves or expansion waves by calculating relevant flow parameters.
2AEPC303_3	Evaluate the aerodynamic characteristics of multiple airfoil and wing types across different speed regimes, focusing on predicting lift and drag.
2AEPC303_4	Solve practical problems, analyze windward and leeward surfaces in supersonic flow, and calculate lift and drag on flat plate wings at supersonic speeds.
2AEPC303_5	Develop CD nozzles and diffusers for supersonic airflow applications, and determine the lift and drag forces acting on flat plate wings in transonic flight conditions.

Course Contents:

Unit 1	**One Dimensional Isentropic flows**	**05 + 02**
Introduction concepts to compressible flow- velocity of sound, mach number, characteristic mach number, General features of Adiabatic flow and isentropic flow of perfect gas, process and relations, stagnation state of a system, compressible Bernoulli's Equation,isentropic one dimensional flow, critical parameters, Area Mach number relation, flow through a De Laval nozzle, Nozzle performance under various back pressure, flow through diffusers		

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Unit 2	**Normal Shock Waves**	**04 + 02**
Governing relations of Normal shocks, Formation of shock waves, Normal shock in the duct, Prandtl relation- Rankine Hugoniot relation, Normal shock relations and Numericals		
Unit 3	**Oblique Shock Waves**	**04 + 02**
Oblique shocks and corresponding equations, Concepts of flow over concave and convex corners, Θ-β-M relations Strong, Weak and detached shocks, curved shocks, shock polar, shock hodograph and pressure turning angles		
Unit 4	**Expansion Flow and Linearized Potential flow**	**05 + 02**
Concept of expansion waves, Prandtl- Meyer Expansion Fan, Prandtl- Meyer functions, The velocity potential flow equation, velocity perturbations, Linearized velocity potential equation for supersonic flows		
Unit 5	**Application of Method of Characteristics**	
Design of Convergent divergent (CD) nozzle- Flow with waves of one family by extension Linear theory, Flow with waves of both family by extension Linear theory, flow in throat of CD nozzle, Design of supersonic tunnel and shock tube, Supersonic diffuser		
Unit 6	**Applications of Transonic and Supersonic Flow**	**04 + 02**
Shock expansion theory, Flow over a - flat plate, Diamond shaped aerofoil and Biconvex aerofoil, Effect of swept back and delta wings, Transonic flow over a wing- Transonic area rule, supersonic pitot tube		

Text Books:

Sl.No	Title	Authors	Publisher	Edition	Year
1	Modern Compressible Flow with Historical Perspective	John D Anderson	McGraw-Hill Publications	3	2003
2	Foundations of Aerodynamics	A. M. Kuethe and Chuen- Yen Chow	WILEY INDIA	5	2010
3	Elements of Gas Dynamics	Liepmann, H.W., and Roshko, A	John Wiley	1	1957

Reference Books:

Sl.No	Title	Author	Publisher	Edition	Year
1	Aerodynamics, Aeronautics and Flight Mechanics	McCormick, B.W.	John Wiley	2nd	1995
2	The Dynamics and Thermodynamics of Compressible Fluid Flow	A H Shapiro		1	1952

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Assessment Modes:

Sl. No	Method/ Technique	Course Outcomes					Marks		Weightage
		1	2	3	4	5	Max	Min	
1	ISE : ABA	☑	☑	☑	☑	☑	20	16	40 %
2	ISE : TA	☑	☑	☑	☑	☑	20		
3	MSE	☑	☑	☑	☐	☐	30	24	60 %
4	ESE	☐	☐	☑	☑	☑	30		

- ISE - In-Semester Examination, MSE - Mid-Semester Examination, ESE - End-Semester Examination
- ABA - Activity Based Assessment, TA - Tutorial Assessment, PA - Practical Assessment

CO's - PO's & PSO's Mapping: (Low - 1, Medium - 2, High -3, No Correlation - "-")

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1	1	2	-	-	-	-	1	-	-	-	-
2	3	2	1	1	2	-	-	-	-	1	-	-	-	-
3	3	2	1	1	2	-	-	-	-	1	-	-	2	-
4	3	2	1	1	2	-	-	-	-	1	-	-	2	-
5	3	2	1	1	2	-	-	-	-	1	-	-	2	-
Avg	**3.0**	**2.0**	**1.0**	**1.0**	**2.0**	**-**	**-**	**-**	**-**	**1.0**	**-**	**-**	**2.0**	**-**

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Course Details:

Class	T.Y B.Tech., Sem - V
Course Code and Course Name	**2AEPE304 - Analyzing Aircraft Structures Using FEA**
Prerequisite	2AEPE214 - Introduction to Finite Element Analysis
Teaching Scheme: Lecture/Tutorial/Practical	00/00/04
Credits	02
Evaluation Scheme : ISE/ESE	50/50

Course Objectives:

1. To equip students with practical skills in using ANSYS software for analyzing and solving complex aircraft structural problems.
2. To develop students' ability to interpret and evaluate results from finite element analysis (FEA) in the context of aircraft structures.
3. To enhance students' understanding of the practical applications of theoretical concepts in aircraft structures through hands-on experiments and projects.

Course Outcomes (CO's):

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

2AEPE304_1	Successfully interpret FEA simulations for different types of analysis, using Finite Element Analysis (FEA) tools to perform static, modal, thermal, and impact analysis on various aircraft components for given specific problems.
2AEPE304_2	Demonstrate enthusiasm and diligence in conducting analysis on various aircraft structural components, to evaluate the structural integrity and performance using FEA software and identify critical stress concentrations and potential failure modes.
2AEPE304_3	Promote ethical considerations and sustainable practices in the analysis and optimization of aircraft components with effectiveness in improving structural performance and reducing weight compliance with initial designs and performance criteria for optimization.
2AEPE304_4	Show a proactive attitude to carry out modal analysis on a wing and stress analysis on a pressurized fuselage, interpreting the results to understand dynamic behavior and stress concentration, for the given complex structural models and load conditions.
2AEPE304_5	Engage actively in learning new techniques, tools, and methodologies in FEA, by displaying a dedication to continuous improvement in the field of FEA and illustrate a commitment to lifelong learning by exploring advanced analysis methods to improve their understanding and skills.

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Course Contents:

1. Introduction to FEA tools and Buckling Analysis of a Fuselage Section
2. Static Structural Analysis of a Rectangular and Tapered Wing Section
3. Modal Analysis of an Aircraft Wing
4. Thermal Stress Analysis of an Turbine Blade
5. Fatigue Analysis of a Landing Gear Component
6. Impact Analysis of a Bird Strike on an Aircraft Windshield
7. Optimization of a Wing Spar
8. Static Load Analysis of Aircraft Control Surfaces
9. Stress Analysis of a Pressurized Fuselage with Bulkhead, Longerons and Skin
10. Analysis of Stress Concentrations in Aircraft Fittings
11. Airframe Stress analysis of Aircraft

Reference Books:

Sl.No	Title	Author	Publisher	Edition	Year
1	Aircraft Structures for Engineering Students	T.H.G. Megson	Butterworth-Heinemann	6th	2011
2	Introduction to the Finite Element Method in Engineering	T.R. Chandrupatla and A.D. Belegundu	Wiley	4th	2011
3	Practical Stress Analysis with Finite Elements	Bryan J. Mac Donald	CRC Press	2nd	1994
4	Finite Element Analysis: Theory and Application with ANSYS	Saeed Moaveni	Pearson	3rd	2015

Assessment Modes:

Sl. No	Method/ Technique	Course Outcomes					Marks		Weightage
		1	2	3	4	5	Max	Min	
1	ISE : ABA	☑	☑	☐	☑	☑	20	20	50 %
2	ISE : PA	☑	☑	☑	☑	☑	30		
4	ESE : OE	☑	☑	☑	☑	☑	20	20	50 %
5	ESE : PE	☑	☑	☑	☑	☑	30		

- ISE - In-Semester Examination, ESE - End-Semester Examination
- ABA - Activity Based Assessment, PA - Pactical Assessment, OE - Oral Examination, PE - Practical Examination

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CO's - PO's & PSO's Mapping: (Low - 1, Medium - 2, High -3, No Correlation - "-")

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	1	3	3	-	-	-	-	2	-	-	2	-
2	3	3	1	3	3	-	-	-	-	2	-	-	2	-
3	3	3	1	3	3	-	1	2	-	2	-	-	2	-
4	3	3	1	3	3	-	-	-	-	2	-	-	2	-
5	3	3	1	3	3	-	-	-	-	-	-	3	2	-
Avg	**3**	**3**	**1**	**3**	**3**	**-**	**1**	**2**	**-**	**2**	**-**	**3**	**2**	**-**

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Course Details:

Class	T.Y B.Tech., Sem - V
Course Code and Course Name	**2AEPE305 - Internal and External Flow Analysis Using CFD**
Prerequisite	2AEPE215 - Introduction to Computational Fluid Dynamics
Teaching Scheme: Lecture/Tutorial/Practical	00/00/04
Credits	02
Evaluation Scheme : ISE/ESE	50/50

Course Objectives:

1. The course envisions to equip undergraduate aeronautical engineering student with the fundamentals and applications of Computational Fluid Dynamics for analyzing internal and external flows relevant to aircraft design.

Course Outcomes (CO's):

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

2AEPE305_1	Understand the governing equations of fluid mechanics and their application in CFD
2AEPE305_2	Gain proficiency in pre-processing techniques for CFD simulations
2AEPE305_3	Develop skills in solving internal and external flow problems using CFD Tools
2AEPE305_4	Analyze and interpret CFD results for aerodynamic performance evaluation
2AEPE305_5	Communicate CFD findings effectively through reports and presentations

Course Contents:

1. Governing Equations of Fluid Mechanics
2. Basics of Discretization in CFD
3. Introduction to Turbulence Modeling
4. Introduction to Heat Transfer Modeling
5. Verification and Validation of CFD Results
6. Internal Flow Analysis
7. Case Studies on Internal Flow Analysis
8. External Flow Analysis
9. Case Studies on External Flow Analysis

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Reference Books:

Sl.No	Title	Author	Publisher	Edition	Year
1	Numerical Computation of Internal and External Flows	Charles Hirsch	Butterworth-Heinemann	02nd	2007

E-Resources:

1. https://cfd.fossee.in/case-study-project/completed-case-studies

Assessment Modes:

Sl. No	Method/ Technique	Course Outcomes					Marks		Weightage
		1	2	3	4	5	Max	Min	
1	ISE : ABA	☑	☑	☐	☑	☑	20	20	50 %
2	ISE : PA	☑	☑	☑	☑	☑	30		
4	ESE : OE	☑	☑	☑	☑	☑	20	20	50 %
5	ESE : PE	☑	☑	☑	☑	☑	30		

- ISE - In-Semester Examination, ESE - End-Semester Examination
- ABA - Activity Based Assessment, PA - Pactical Assessment, OE - Oral Examination, PE - Practical Examination

CO's - PO's & PSO's Mapping: (Low - 1, Medium - 2, High -3, No Correlation - "-")

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	1	-	-	-	-	-	-	-	3	-	2	-	-
2	3	3	2	-	-	-	-	-	-	3	-	2	-	-
3	3	3	2	-	3	3	-	-	-	3	-	2	-	-
4	3	3	2	-	3	3	-	-	-	3	-	2	3	3
5	3	1	-	-	-	-	-	-	-	3	-	2	-	-
Avg	**3.0**	**2.0**	**2.0**	**-**	**3.0**	**3.0**	**-**	**-**	**-**	**3.0**	**-**	**2.0**	**3.0**	**3.0**

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Department of Aeronautical Engineering

Changing Lives... Enriching Future...

Course Details:

Class	T.Y B.Tech., Sem - V
Course Code and Course Name	**2AEPE306 - Autonomous Navigation and Flight Control**
Prerequisite	2AEPE216 - Introduction to Unmanned Aerial Vehicles
Teaching Scheme: Lecture/Tutorial/Practical	00/00/04
Credits	02
Evaluation Scheme : ISE/ESE	50/50

Course Objectives:

1. To provide hands-on experience in designing, implementing, and testing autonomous navigation algorithms for unmanned aerial vehicles (UAVs).
2. To familiarize students with the practical aspects of flight control systems, including sensor integration, data fusion, and real-time control algorithms.
3. To develop students' skills in troubleshooting, debugging, and optimizing autonomous navigation and flight control systems for UAVs.

Course Outcomes (CO's):

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

2AEPE306_1	Demonstrate proficiency in programming of configuring UAVs for autonomous flight missions.
2AEPE306_2	Analyze and evaluate the performance of different navigation algorithms and flight control strategies through practical experimentation.
2AEPE306_3	Acquire the ability to identify and resolve technical challenges encountered during the development and deployment of autonomous UAV systems.
2AEPE306_4	Practical experience in documenting their experimental procedures, results, and conclusions in laboratory reports.

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Course Contents

1. Introduction to UAV Hardware and Software
2. Manual Flight Control
3. GPS-based Navigation
4. IMU Calibration and Sensor Fusion
5. Altitude and Terrain Following
6. Vision-based Navigation
7. Path Planning and Collision Avoidance
8. Indoor Localization and Mapping
9. Autonomous Mission Execution
10. Real-time Control and Telemetry
11. Fault Detection and Recovery
12. Swarm Intelligence and Cooperative Control

Text Books:

Sl.No	Title	Authors	Publisher	Edition	Year
1	Small Unmanned Aircraft: Theory and Practice	Randal W. Beard and Timothy W. McLain	Princeton University Press	1st	2012
2	Introduction to Autonomous Robots: Mechanics, Sensors, Actuators, and Algorithms	Nikolaus Correll, Bradley Hayes, and Amir Deghani	CRC Press	1st	2020
3	Principles of Flight Simulation	David Allerton	Wiley	1st	2009

Reference Books:

Sl.No	Title	Author	Publisher	Edition	Year
1	Unmanned Aircraft Systems: UAV Design, Development and Deployment	Reg Austin	Wiley	2nd	2015
2	Autonomous Mobile Robots: Sensing, Control, Decision Making, and Applications	Saeed B. Niku	Wiley	2nd	2011
3	Probabilistic Robotics	Sebastian Thrun, Wolfram Burgard, and Dieter Fox	The MIT Press	1st	2005

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E-Resources/Reference Papers:

1. ArduPilot - https://ardupilot.org/
2. PX4 Autopilot - https://px4.io/
3. ROS (Robot Operating System) - https://www.ros.org/
4. Dronecode - https://www.dronecode.org/
5. IEEE Robotics and Automation Society - https://www.ieee-ras.org/
6. DIY Drones - https://diydrones.com/

Assessment Modes:

Sl. No	Method/ Technique	Course Outcomes					Marks		Weightage
		1	2	3	4	5	Max	Min	
1	ISE : ABA	☑	☑	☐	☑	☑	20	20	50 %
2	ISE : PA	☑	☑	☑	☑	☑	30		
4	ESE : OE	☑	☑	☑	☑	☑	20	20	50 %
5	ESE : PE	☑	☑	☑	☑	☑	30		

- ISE - In-Semester Examination, ESE - End-Semester Examination
- ABA - Activity Based Assessment, PA - Pactical Assessment, OE - Oral Examination, PE - Practical Examination

CO's - PO's & PSO's Mapping: (Low - 1, Medium - 2, High -3, No Correlation - "-")

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	-	2	2	2	2	-	3	2	1	-	-	1	1
2	3	3	2	3	3	2	2	-	2	-	-	3	2	2
3	2	3	2	2	3	2	2	-	2	-	2	1	1	2
4	3	1	2	1	3	2	-	3	2	3	3	-	1	-
Avg	**2.5**	**2.0**	**2.0**	**2.0**	**3.0**	**2.0**	**2.0**	**3.0**	**2.0**	**2.0**	**2.5**	**2.0**	**1**	**2**

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Course Details:

Class	T.Y B.Tech., Sem - V
Course Code and Course Name	**2AEPE307 - Airframe and Aeroengine Maintenance**
Prerequisite	2AEPE217 - Introduction to Aircraft Maintenance
Teaching Scheme: Lecture/Tutorial/Practical	00/00/04
Credits	02
Evaluation Scheme : ISE/ESE	50/50

Course Objectives:

1. Students will enhance their ability to diagnose and troubleshoot common issues in airframe and aero engines, employing effective problem-solving strategies.
2. Students will acquire hands-on experience with the maintenance, inspection, and repair of the Cessna 152 airframe and its engine systems adhering to aviation safety standards and regulations, ensuring compliance with industry and governmental guidelines.

Course Outcomes (CO's):

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

2AEPE307_1	Access to regulatory documentation and logbooks, students will accurately complete maintenance records and logs, ensuring all entries are complete, accurate, and compliant with FAA/EASA regulations.
2AEPE307_2	Perform a detailed visual inspection, identifying and documenting any discrepancies or potential issues according to the standard inspection checklist.
2AEPE307_3	Perform sheet metal repairs, correctly applying techniques to restore structural integrity and ensuring compliance with repair standards and guidelines.
2AEPE307_4	Demonstrate proficiency in identifying and explaining the operation principles of key power plant components with accuracy, when presented with detailed illustrations, models, and interactive simulations of aircraft powerplant systems.

Course Contents:

1. Introduction to Airframe Maintenance
2. Airframe Inspection, Repair and Maintenance
3. Fundamentals of Jet Engine Maintenance
4. Jet Engine Systems and Components
5. Jet Engine Inspection and Maintenance

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Reference Books:

Sl.No	Title	Author	Publisher	Edition	Year
1	Aircraft Powerplants - Aviation Maintenance Technician Handbook	Michael J. Kroes and Thomas W. Wild	FAA	-	-

Assessment Modes:

Sl. No	Method/ Technique	Course Outcomes					Marks		Weightage
		1	2	3	4	5	Max	Min	
1	ISE : ABA	☑	☑	☐	☑	☑	20	20	50 %
2	ISE : PA	☑	☑	☑	☑	☑	30		
4	ESE : OE	☑	☑	☑	☑	☑	20	20	50 %
5	ESE : PE	☑	☑	☑	☑	☑	30		

- ISE - In-Semester Examination, ESE - End-Semester Examination
- ABA - Activity Based Assessment, PA - Pactical Assessment, OE - Oral Examination, PE - Practical Examination

CO's - PO's & PSO's Mapping: (Low - 1, Medium - 2, High -3, No Correlation - "-")

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1						3	1	3	1	3			1	
2	1	1		1			1		3	3		1	2	
3	1	1	1	1	1		1		3	3		1	2	
4	1						1		3	3		1	2	
Avg	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**3.0**	**1.0**	**3.0**	**2.5**	**3.0**	**-**	**1.0**	**1.8**	**-**

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Changing Lives.., Enriching Future...

Course Details:

Class	T.Y B.Tech., Sem - V
Course Code and Course Name	**2AEVS308 - Geometric Dimensions and Tolerances (GD&T)**
Prerequisite	2AEVS206 - Parametric Modeling & Assembly
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme : ISE/ESE	25/25

Course Objectives:

1. This course will equip students with knowledge and skills to interpret and apply Geometric Dimensioning and Tolerancing (GD&T) principles on engineering drawings.
2. Make students understand the significance of GD&T for proper communication between design engineers, manufacturing personnel, and inspectors.

Course Outcomes (CO's):

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

2AEVS206_1	Interpret GD&T symbols and annotations on engineering drawings
2AEVS206_2	Apply appropriate GD&T to define form, orientation, location, and runout tolerances on mechanical parts
2AEVS206_3	Select proper datum features and establish datum reference frames
2AEVS206_4	Understand and apply Material Condition Modifiers
2AEVS206_5	Interpret GD&T on engineering drawings for manufacturing and inspection purposes.

Course Contents:

1. Introduction and Fundamentals of GD&T
2. Dimensioning System
3. GD&T Symbols and Terminology
4. Features and Tolerances
5. Datums and Datum Reference Frames
6. Orientation and Position Tolerance
7. Runout and Profile Tolerance
8. Concentricity & Symmetric Tolerances
9. Material Condition and Other Modifiers
10. Tolerance Stack-Up Analysis
11. Tolerance Analysis Software
12. GD&T Applications and Inspection

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Reference Books:

Sl.No	Title	Author	Publisher	Edition	Year
1	Engineering drawing and design	Cencil Jensen	McGraw Hill	7th	2007
2	Engineering graphics with AutoCAD 2009	James D. Bethune	PHI learning	Indian	2009

E-Resources:

1. https://www.gdandtbasics.com/applying-gdandt-solidworks-drawing/
2. https://neat.aicte-india.org/course-details/NEAT2020616_PROD_3

Assessment Modes:

Sl. No	Method/ Technique	Course Outcomes					Marks		Weightage
		1	2	3	4	5	Max	Min	
1	ISE : CAS	☑	☑	☑	☑	☑	15	10	50 %
2	ISE : VCC	☑	☑	☑	☑	☑	10		
3	ESE : OE	☑	☑	☑	☑	☑	15	10	50 %
4	ESE : PE	☑	☑	☑	☑	☑	10		

- ISE - In-Semester Examination, ESE - End-Semester Examination
- PA - Pactical Assessment, VCC - Vocational Course Certification
- OE - Oral Examination, PE - Practical Examination

CO's - PO's & PSO's Mapping: (Low - 1, Medium - 2, High -3, No Correlation - "-")

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	3	3	-	3	3	3	-	-	-	-
2	-	-	-	-	3	3	-	3	3	3	-	-	-	-
3	-	-	1	-	3	3	-	3	3	3	-	-	-	-
4	-	-	1	-	3	3	-	3	3	3	-	-	-	-
5	-	-	-	-	3	3	-	3	3	3	-	-	-	-
Avg	-	-	**1.0**	-	**3.0**	**3.0**	-	**3.0**	**3.0**	**3.0**	-	-	-	-

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Course Details:

Class	T.Y B.Tech., Sem - V
Course Code and Course Name	**2AEVS309 - Non Destructive Testing (NDT)**
Prerequisite	NIL
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme : ISE/ESE	25/25

Course Objectives:

1. This course will provide undergraduate engineering students with a foundational understanding of the principles and applications of various NDT methods.

Course Outcomes (CO's):

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

2AEVS309_1	Understand the importance of NDT in engineering applications.
2AEVS309_2	Identify different NDT methods and their underlying principles.
2AEVS309_3	Select appropriate NDT techniques for various materials and defect types
2AEVS309_4	Interpret NDT results for identifying defects and assess their significance

Course Contents:

1. Introduction to Non Destructive Testing
2. Visual Inspection
3. Dye/Liquid Penetrant Testing
4. Magnetic Particle Testing
5. Ultrasonic Testing
6. Eddy Current Testing
7. Radiographic Testing
8. Infrared Thermography
9. Acoustic Emission Testing
10. Time-of-Flight Diffraction (TOFD) and Phased Array Ultrasound Testing (PAUT)
11. Strain Measurement (Resistance and Optical)
12. Non Invasive Flow Measurement

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Reference Books:

Sl.No	Title	Author	Publisher	Edition	Year
1	Practical Non-Destructive Testing	Baldev Raj; Jayakumar, T.; Thavasimuthu, T.	Alpha Science	1st	2007

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc20_mm07/preview

Assessment Modes:

Sl. No	Method/ Technique	Course Outcomes				Marks		Weightage
		1	2	3	4	Max	Min	
1	ISE : CAS	☑	☑	☑	☑	15	10	50 %
2	ISE : VCC	☑	☑	☑	☑	10		
3	ESE : OE	☑	☑	☑	☑	15	10	50 %
4	ESE : PE	☑	☑	☑	☑	10		

- ISE - In-Semester Examination, ESE - End-Semester Examination
- PA - Pactical Assessment, VCC - Vocational Course Certification
- OE - Oral Examination, PE - Practical Examination

CO's - PO's & PSO's Mapping: (Low - 1, Medium - 2, High -3, No Correlation - "-")

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	1	-	1	-	2	2	-	-	3	-	-	-	-
2	2	1	1	2	2	3	2	-	-	3	-	3	2	-
3	2	2	1	3	3	2	-	-	-	3	-	3	2	-
4	2	2	1	3	3	2	-	-	3	3	-	-	2	-
Avg	**2.0**	**2.0**	**1.0**	**2.0**	**2.0**	**2.0**	**1.0**	**-**	**3**	**3.0**	**-**	**3**	**2**	**-**

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Changing Lives.., Enriching Future...

Course Details:

Class	T.Y B.Tech., Sem - V
Course Code and Course Name	**2AEEL310 - Industrial Training**
Prerequisite	NIL
Teaching Scheme: Lecture/Tutorial/Practical	00/00/00
Credits	01
Evaluation Scheme : ISE/ESE	50/00

Course Objectives:

1. The objective of the course is to make students aware of the Industrial Practices, and allow them to acquire the knowledge and skills as per the Industrial Needs.

Course Outcomes (CO's):

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

2AEEL310_1	Apply theoretical knowledge to real-world engineering problems and processes within the aerospace and allied industries.
2AEEL310_2	Develop practical skills in areas such as design, analysis, manufacturing, testing, and quality control.
2AEEL310_3	Gain hands-on experience with industry-standard tools, equipment, and software.
2AEEL310_4	Understand the organizational structure, work culture, and professional ethics of an aerospace company.
2AEEL310_5	Demonstrate the ability to work effectively as part of a team in a professional engineering environment.
2AEEL310_6	Communicate technical information effectively, both orally and in writing, to a variety of audiences.

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Course Policy:

- The Industrial Training aims to bridge the gap between theoretical knowledge acquired in the classroom and practical applications in the industry. It provides students with hands-on experience, industry exposure, and an opportunity to apply their academic learning in a real-world setting.
- All students enrolled in the Aeronautical Engineering undergraduate program must successfully complete the industrial training as a mandatory requirement for graduation.
- Students are eligible for industrial training after IV Semester of their Study.
- Student must undergo minimum 15 days of Industrial Training
- Students may undertake industrial training at any recognized organization/industry approved by the department.
- Students may also identify potential training organizations, subject to approval by the department.

Assessment Policy:

- Students are required to submit a detailed training report at the end of the training period.
- The report should include a comprehensive overview of the work undertaken, skills acquired, and learning outcomes.
- The department will conduct an internal evaluation based on the training report and external evaluation.

Assessment Modes:

Sl. No	Method/ Technique	Course Outcomes						Marks		Weightage
		1	2	3	4	5	6	Max	Min	
1	ISE : PA	☑	☑	☑	☑	☑	☑	50	20	40 %

- ISE - In-Semester Examination,
- ABA - Activity Based Assessment, TA - Tutorial Assessment, PA - Practical Assessment

CO's - PO's & PSO's Mapping: (Low - 1, Medium - 2, High -3, No Correlation - "-")

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	1	-	-	-	-	-	-	-	3	-	-	-	-
2	-	-	1	1	3	-	-	-	-	3	-	3	1	-
3	-	-	1	1	3	-	-	-	-	3	-	-	1	-
4	-	-	1	1	3	3	3	3	-	3	-	-	1	-
5	-	-	1	3	3	3	3	3	-	3	3	-	1	-
6	3	1	-	-	-	-	-	-	-	3	3	3	-	-
Avg	3.0	1.0	1.0	2.0	3.0	3.0	3.0	3.0	-	3.0	3.0	3.0	1.0	-

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Course Details:

Class	T.Y B.Tech., Sem - V
Course Code and Course Name	**2AEHS311 - Entrepreneurship**
Prerequisite	NIL
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme : ISE/ESE	50/00

Course Objectives:

1. This course aims to equip engineering students with the knowledge and skills to identify opportunities, develop innovative solutions, and launch successful engineering-based ventures.

Course Outcomes (CO's):

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

2AEHS311_1	Identify and evaluate potential business opportunities in the engineering domain.
2AEHS311_2	Conduct market research and analyze the competitive landscape.
2AEHS311_3	Craft a comprehensive business plan, including financial projections.
2AEHS311_4	Understand the fundamentals of marketing, sales, and operations for engineering ventures.
2AEHS311_5	Pitch their business ideas to potential investors.
2AEHS311_6	Grasp the legal and ethical considerations of starting a business.

Course Contents:

1. The Entrepreneurial Ecosystem
2. Idea Identification and Prototyping
3. Testing, Validation and Commercialisation
4. Market Analysis and Competitive Landscape
5. Legal Procedure to setup an Startup Business
6. Understanding Finance Basics
7. Business Planning and Development
8. Marketing and Sustainability
9. Pitching and Fundraising
10. Startup Case Studies

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Assessment Activities:

Assessment 1 : Business Plan
Assessment 2 : Peer Review of Business Plan
Assessment 3 : Elevator Pitch Competition
Assessment 4 : "Shark Tank" Simulation

Reference Materials:

1. https://www.startupindia.gov.in/content/sih/en/international/go-to-market-guide/indian-startup-ecosystem.html
2. https://www.startupindia.gov.in/content/sih/en/learning-and-development_v2.html
3. https://onlinecourses.nptel.ac.in/noc24_mg93/preview

Assessment Modes:

Sl. No	Method/ Technique	Course Outcomes						Marks		Weightage
		1	2	3	4	5	6	Max	Min	
1	ISE : BP	☑	☑	☑	☑	☐	☑	10	20	20 %
2	ISE : PR	☑	☑	☑	☑	☐	☑	10		20 %
3	ISE : EPC	☑	☑	☐	☑	☑	☐	10		20 %
4	ISE : STS	☑	☑	☑	☑	☑	☑	20		40 %

- ISE - In-Semester Examination,
- BP - Business Plan, PR - Peer Review of Business Plan
- EPC - Elevator Pitch Competition, STS - "Shark Tank" Simulation

CO's - PO's & PSO's Mapping: (Low - 1, Medium - 2, High -3, No Correlation - "-")

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	2	-	3	3	-	-	-	-
2	-	-	-	-	-	-	-	-	3	3	-	-	-	-
3	-	-	-	-	-	-	2	-	3	3	3	2	-	-
4	-	-	-	-	-	-	-	-	3	3	-	1	-	-
5	-	-	-	-	-	-	-	-	3	3	-	2	-	-
6	-	-	-	-	-	3	-	2	3	3	-	1	-	-
Avg	-	-	-	-	-	**3**	**2**	**2**	**3**	**3**	**3**	**1.5**	-	-

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Changing Lives.., Enriching Future...

Course Details:

Class	T.Y B.Tech., Sem - V
Course Code and Course Name	**2AECC312 - Aptitude and Reasoning Part III**
Prerequisite	2AECC223 - Aptitude and Reasoning Part II
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme : ISE/ESE	50/00

Course Objectives:

1. To develop students quantitative reasoning skills, such as the ability to solve mathematical problems, interpret data and make predictions.
2. To prepare students for various competitive examinations and job interviews that require aptitude and reasoning skills.

Course Outcomes (CO's):

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

2AECC312_1	Solve problem based on basic and advance Permutation and Combination
2AECC312_2	Solve problem based on Probability, Application of Probability, Cubes, Dices, cube painting and Syllogism
2AECC312_3	Solve problem based on Mensuration 3D, Circle & Triangle
2AECC312_4	Demonstrate on Resume writing skill, closed, advanced grammar, Synonyms and Antonyms

Course Contents:

1. Basic Permutation and Combination
2. Advance Permutation and Combination
3. Probability
4. Application of Probability
5. Cubes, Dices and Cube Painting
6. Syllogism
7. Mensuration 3D
8. Circle and Triangle
9. Resume Writing and Resume Making
10. Interview Techniques
11. Closed Test & Advance Grammar
12. Synonyms and Antonyms

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Reference Books:

Sl.No	Title	Author	Publisher	Edition	Year
1	Aptitude and Reasoning	R.S. Agarwal	S Chand	-	2019
2	Verbal & Non-verbal Reasoning	R.S. Agarwal	S Chand	-	2010
3	Verbal, Grammar	P.C.Wren	S Chand	-	2017

Assessment Modes:

Sl.No	Method/Technique	CO's				Marks		Weightage
		1	2	3	4	Max	Min	
1	ISE : Quiz	☑	☑	☑	☑	50	20	100 %

- ISE - In-Semester Examination, CAS - Continuous Assessment

CO's - PO's & PSO's Mapping: (Low - 1, Medium - 2, High -3, No Correlation - "-")

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	-	-	-	-	-	-	-	-	-	-	-	-
2	2	2	-	-	-	-	-	-	-	-	-	-	-	-
3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
4	2	-	-	-	-	-	-	-	-	2	-	-	-	-
Avg	2	2	-	-	-	-	-	-	-	2	-	-	-	-

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List of Open Electives

Sl.No	Course Code	Course Category	Course Name
1	2ILOE351	Health Care Management	Economics of Health and Education
2	2ILOE352	Business Marketing	Business to Business Marketing (B2B)
3	2ILOE353	Intellectual Property Rights	Patent Law for Engineers and Scientists
4	2ILOE354		Economics of Innovation
5	2ILOE355	Business Laws	E-Business
6	2ILOE356	Finance and Accounting	Management Accounting
7	2ILOE357	Banking and Insurance	Economics of Banking and Finance Markets
8	2ILOE358	Investment Management	Quantitative Investment Management
9	2ILOE359	Human Resource Management	Human Resource Development
10	2ILOE360	Business Management	Advanced Business Decision Support Systems
11	2ILOE361	Language	Introduction to Japanese Language and Culture - II
12	2ILOE362		German - I
13	2ILOE363	Retail and Channel Management	Operations and Supply Chain Management

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Course Details:

Class	T.Y B.Tech., Sem - V (Minors in Unmanned Aerial Vehicles)
Course Code and Course Name	**2AEUV301 - UAV Electronics and Sensors**
Prerequisite	2AEUV201 - Introduction to Unmanned Aerial Vehicles
Teaching Scheme: Lecture/Tutorial/Practical	3/0/0
Credits	3
Evaluation Scheme : ISE/MSE/ESE	40/30/30

Course Objectives:

1. To provide students with a comprehensive understanding of the electronic components and sensors used in unmanned aerial vehicles (UAVs).
2. To familiarize students with the principles of operation, design considerations, and applications of various electronic systems and sensors in UAVs.
3. To enable students to analyze, select, and integrate appropriate electronic components and sensors to meet specific mission requirements for UAVs.

Course Outcomes (CO's):

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

2AEUV301_1	Describe the functions and characteristics of key electronic components and sensors commonly employed in UAVs.
2AEUV301_2	Demonstrate the ability to evaluate the performance and suitability of electronic systems and sensors for different UAV applications.
2AEUV301_3	Proficient in designing and implementing electronic systems and sensor configurations for specific UAV missions.
2AEUV301_4	Possess the skills to troubleshoot and diagnose issues related to electronic systems and sensors in UAVs.

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Course Contents:

Unit 1	**Introduction to UAV Electronics**	**06**
Overview of UAVs and their components - Role of electronics in UAVs - Basic electronic components: resistors, capacitors, diodes, transistors - Introduction to sensor types used in UAVs		
Unit 2	**Power Systems and Communication**	**06**
Power sources and management in UAVs - Power distribution systems - Radiofrequency (RF) communication systems - Data link protocols and communication interfaces		
Unit 3	**Flight Control Systems**	**07**
Principles of flight control - Introduction to autopilot systems - Sensors for attitude estimation: accelerometers, gyroscopes, magnetometers - PID control algorithms		
Unit 4	**Navigation and Positioning**	**06**
GPS/GNSS fundamentals - Inertial navigation systems (INS) - Integration of GPS/INS for navigation - Altitude sensors: barometers, ultrasonic sensors		
Unit 5	**Payload Systems**	**06**
Types of payloads in UAVs: cameras, sensors, actuators - Payload integration, and interfacing - Image processing and analysis for UAV payloads - Sensor fusion techniques		
Unit 6	**Advanced Sensors and Future Trends**	**08**
Emerging sensor technologies for UAVs - Hyperspectral imaging and multispectral sensors - LiDAR and radar systems for UAVs - Integration of artificial intelligence and machine learning in UAV sensor systems		

Text Books:

Sl.No	Title	Authors	Publisher	Edition	Year
1	Introduction to UAV Systems	Paul Fahlstrom & Thomas McEwen	Wiley	5th	2022
2	Small Unmanned Aircraft: Theory and Practice	Randal W. Beard & Timothy W. McLain	Princeton University Press	1st	2012
3	Unmanned Aircraft Systems: UAV Design, Development and Deployment	Reg Austin	Wiley	2nd	2015

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Reference Books:

Sl.No	Title	Author	Publisher	Edition	Year
1	Flight Stability and Automatic Control	Robert C. Nelson	McGraw-Hill Education	2nd	1998
2	Principles of Electronic Materials and Devices	Safa O. Kasap	McGraw-Hill Education	4th	2017
3	Sensor Technologies: Healthcare, Wellness, and Environmental Applications	Michael J. McGrath and Cliodhna N. Foley-Fisher	Apress	1st	2017

E-Resources/Reference Papers:

1. ArduPilot - https://ardupilot.org/
2. PX4 Autopilot - https://px4.io/
3. ROS (Robot Operating System) - https://www.ros.org/
4. Dronecode - https://www.dronecode.org/
5. IEEE Robotics and Automation Society - https://www.ieee-ras.org/
6. DIY Drones - https://diydrones.com/

Assessment Modes:

Sl. No	Method/ Technique	Course Outcomes				Marks		Weightage
		1	2	3	4	Max	Min	
1	ISE: ABA	☑	☑	☑	☑	40	16	40 %
2	MSE	☑	☑	☐	☐	30	24	60 %
3	ESE	☐	☐	☑	☑	30		

- ISE - In-Semester Examination, MSE - Mid-Semester Examination, ESE - End-Semester Examination
- ABA - Activity Based Assessment, TA - Tutorial Assessment, PA - Practical Assessment

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CO's - PO's & PSO's Mapping: (Low - 1, Medium - 2, High -3, No Correlation - "-")

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1	-	-	-	-	-	-	3	3	-	2	-
2	3	1	1	1	2	-	-	-	2	2	-	-	1	-
3	3	3	3	-	3	2	2	3	-	3	3	3	3	3
4	3	2	2	3	2	-	-	-	1	3	-	3	2	-
Avg	**3.0**	**2.0**	**1.8**	**2.0**	**2.3**	**2.0**	**2.0**	**3.0**	**1.5**	**2.8**	**3.0**	**3.0**	**2.0**	**3.0**

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Course Details:

Class	T.Y B.Tech., Sem - V (Minors in Air Transportation)
Course Code and Course Name	**2AEAT301 - Airport Operations and Air Traffic Control**
Prerequisite	2AEAT201 - Introduction to Air Transportation
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme : ISE/MSE/ESE	40/30/30

Course Objectives:

1. Understand the various components and operations of an airport
2. Gain knowledge of Air Traffic Management (ATM) systems and procedures.
3. Develop an understanding of the regulations governing airport safety and security.

Course Outcomes (CO's):

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

2AEAT301_1	Explain the complexities of airport operations, management, and organizational influences on airport authority policies to provide with case studies and real-world examples of airport operations.
2AEAT301_2	Describe the processing of passenger and ground handling to ensure safety and operational efficiency by exploring the technologies and equipment involved in critical airport functions.
2AEAT301_3	Develop strategic and tactical approaches to airport operations management, focusing on the roles of control centers in coordinating and administering airport activities.
2AEAT301_4	Ascertain the ATC services, to maintain safety and orderly air traffic flow by exploring the importance in monitoring and controlling air traffic that affects airport management.
2AEAT301_5	Administer response actions to handle emergencies effectively through role-play and implement emergency management plans for different types of airport emergencies.

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Course Contents:

Unit 1	**The Airport as an Operational System**	**06**
Classifications of Airports - Components of an Airports - The Airport as a System - The functions of Airport - Complexity of the Airport Operations - Management and Operations - Organizations influence airport authority policies.		
Unit 2	**Ground Handling and Passenger Terminal**	**07**
Passenger Handling - Ramp Handling - Aircraft Ramp servicing - Ramp Layout - Departure control - Baggage Handling process - Equipment, Systems and Technologies - Functions of the passenger terminal - Terminal functions.		
Unit 3	**Airport Operational Administration & Control Centers**	**07**
Strategic and tactical approach to administration of Airport operations - Organizational considerations - Airport Operations control center - Management philosophy - Strategic significance - Airport Operations Control Systems - Airport Operation Coordination function.		
Unit 4	**Airspace and Air traffic management**	**07**
Objectives of air traffic control systems - Parts of ATC services – Scope and Provision of ATCs – Flight rules – Classification of ATS air spaces – Area control service - Approach control - Aerodrome Control - RNAV and RNP – Vertical, lateral and longitudinal separations based on time / distance – ATC clearances - Airport Surveillance Radar.		
Unit 5	**The Airfield**	**06**
Navigational aids (NAVAIDS) located on airfields - Wind direction indicator – Landing direction indicator – Markings, general requirements – Various markings. Aerodrome beacon, identification beacon – Simple approach lighting system and various lighting systems – VASI & PAPI - Visual aids for denoting obstacles.		
Unit 6	**Emergency Management and Response at Airports**	**06**
Types of Emergencies - Level of Protection required - Communication and Alarm Requirements - The Airport Emergency plan - Aircraft Firefighting and Rescue Procedures - Foaming of runways - Removal of Disabled Aircraft - Future outlook for airport management.		

Text Books:

Sl.No	Title	Authors	Publisher	Edition	Year
1	Airport Operations	Norman J. Ashford, Pierre Coutu , John R. Beasley	McGraw Hill	03rd	2012
2	Airport Planning & Management	Seth Young, Alexander T. Wells	McGraw Hill	07th	2019

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Sl.No	Title	Authors	Publisher	Edition	Year
3	Airport Operations - International Aviation Training Program	IATA	-	2nd	2011

Assessment Modes:

Sl. No	Method/ Technique	Course Outcomes						Marks		Weightage
		1	2	3	4	5	6	Max	Min	
1	ISE : ABA	☐	☐	☐	☐	☐	☐	40	16	40 %
4	MSE	☐	☐	☐	☐	☐	☐	30	24	60 %
5	ESE	☐	☐	☐	☐	☐	☐	30		

- ISE - In-Semester Examination, MSE - Mid-Semester Examination, ESE - End-Semester Examination
- ABA - Activity Based Assessment, TA - Tutorial Assessment, PA - Practical Assessment

CO's - PO's & PSO's Mapping: (Low - 1, Medium - 2, High -3, No Correlation - "-")

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	1					2								
2	1				1	2						2		
3	1					2		2				1		
4	1				2	3		2				2		
5			1			3			3	1				
Avg	**1.0**		**1.0**		**1.5**	**2.4**		**2.0**	**3.0**	**1.0**		**1.7**		

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Course Details:

Class	T.Y B.Tech., Sem - V (Minors in Avionics)
Course Code and Course Name	**2AEAV301 - Aircraft Systems and Instruments**
Prerequisite	2AEAV201 - Introduction to Flight and Avionics
Teaching Scheme: Lecture/Tutorial/Practical	03/00/00
Credits	03
Evaluation Scheme : ISE/MSE/ESE	40/30/30

Course Objectives:

1. To provide students with a theoretical understanding of the various systems and instruments used in aircraft.
2. To develop students' analytical skills in assessing the functionality and integration of aircraft systems and instruments.
3. To familiarize students with the principles of operation and maintenance of aircraft systems through detailed theoretical instruction.

Course Outcomes (CO's):

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

2AEAV301_1	Critically analyze and synthesize the working principles of key aircraft systems using theoretical knowledge and schematic diagrams
2AEAV301_2	Evaluate and compare the components and functionalities of various aircraft instruments with provided examples and information like charts, diagrams, maps, manual e.t.c
2AEAV301_3	Analyze common issues in aircraft systems and propose theoretical solutions with accuracy based on provided scenarios, examples and contents
2AEAV301_4	Interpret and critically assess data from aircraft instruments to evaluate aircraft performance and health with given example datasets and instructional material.
2AEAV301_5	Integrate and apply knowledge of various aircraft systems to discuss their operations and interactions in normal and emergency conditions using case studies and theoretical scenarios

Course Contents:

Unit 1	**Introduction to Aircraft Systems**	**06**
Overview of aircraft systems and their importance, types of aircraft systems (hydraulic, pneumatic, electrical, fuel), basic components and functions of each system, interaction and integration of different aircraft systems.		
Unit 2	**Aircraft Hydraulic and Pneumatic Systems**	**07**

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Principles of hydraulic systems: components, operation, and maintenance, common hydraulic systems in aircraft (landing gear, brakes, flight controls), principles of pneumatic systems: components, operation, and maintenance, common pneumatic systems in aircraft (de-icing, pressurization).		
Unit 3	**Aircraft Fuel Systems**	**06**
Types of aircraft fuel systems and their components, fuel storage, transfer, and management, fuel system design considerations and safety features, fuel system maintenance and troubleshooting.		
Unit 4	**Aircraft Electrical Systems**	**06**
Basics of aircraft electrical systems: AC and DC power, generators, batteries, electrical system architecture and components, power distribution and management, troubleshooting electrical systems.		
Unit 5	**Aircraft Instrumentation**	**07**
Types of aircraft instruments: flight instruments, navigation instruments, engine instruments, principles of operation for key instruments (altimeter, airspeed indicator, artificial horizon), electronic and digital instrument systems (EFIS, glass cockpit), maintenance and calibration of aircraft instruments.		
Unit 6	**Flight Control Systems and Integration**	**07**
Basics of flight control systems: primary and secondary controls, fly-by-wire and automated flight control systems, integration of flight control systems with other aircraft systems, emergency procedures and system redundancy.		

Text Books:

Sl.No	Title	Authors	Publisher	Edition	Year
1	Aircraft Hydraulic Systems: An Introduction to the Analysis of Systems and Components	E. H. J. Pallett	Longman Group United Kingdom	2nd	1992
2	Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration	Moir, I. and Sea bridge, A	AIAA	3rd	2011
3	Avionics Training Systems, Installation and Troubleshooting	Len Buckwalter	Avionics Communications Inc	-	-

Reference Books:

Sl.No	Title	Author	Publisher	Edition	Year
1	Aerodynamics, Aeronautics and Flight Mechanics	McCormick, B.W.	John Wiley	2nd	1995
2	Aircraft Fuel Systems	Roy Langton	Wiley-Blackwell	2nd	2009
3	Aircraft Structures for Engineering Students	Megson, T.H.G	Elsevier	4th	2007

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Assessment Modes:

Sl. No	Method/ Technique	Course Outcomes					Marks		Weightage
		1	2	3	4	5	Max	Min	
1	ISE : ABA	☑	☑	☑	☑	☑	40	16	40 %
2	MSE	☑	☑	☑	☐	☐	30	24	60 %
3	ESE	☐	☐	☐	☑	☑	30		

- ISE - In-Semester Examination, MSE - Mid-Semester Examination, ESE - End-Semester Examination
- ABA - Activity Based Assessment, TA - Tutorial Assessment, PA - Practical Assessment

CO's - PO's & PSO's Mapping: (Low - 1, Medium - 2, High -3, No Correlation - "-")

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	-	-	-	-	2	1	-	1	3	-	1	1	-
2	2	-	-	-	-	-	1	-	3	3	-	1	1	-
3	2	-	-	-	-	-	1	-	3	3	-	1	1	-
4	2	-	-	-	-	2	1	-	3	3	-	1	1	-
5	2	-	-	-	-	2	1	-	3	3	-	1	1	-
Avg	2.0	-	-	-	-	2.0	1.0	-	3.0	3.0	-	1.0	1.0	-

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