**Master of Technology**
**(Aerodynamics Engineering)**

## Program Outcomes (POs)

**PO1: An ability to independently carry out research / investigation and development work to solve practical problems.**
**PO2: An ability to write and present a substantial technical report / document.**
**PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor.**

## Program Specific Outcomes (PSO)

- ✓ **PSO 1: Graduates will possess skills in design, development and testing of aerodynamic engineering.**
- ✓ **PSO 2: Graduates will become professionally competent to take up real time projects through aerospace industries.**
- ✓ **PSO 3: Graduates will become globally competitive by pursuing research in the area of avionics.**

**Department of Aerospace Engineering (Aerodynamics)**

**Course Outcomes (COs)**

**2018 – 2020 Batch**

| Semester | Course Code | Course Name | Course Outcomes (COs) |
|---|---|---|---|
| I | 18MTADE101 | INTRODUCTION TO AEROSPACE VEHICLES | CO1 :To explain characteristics of airfoils, use of wind tunnel, basics if airplane stability, and Helicopters<br>CO2: To identify the materials used for aircraft structure and its structural layout<br>CO3: To explain working principles of different types of air breathing propulsion systems and propulsion in helicopters<br>CO4: To explain major aircraft systems and aircraft navigational aids<br>CO5: To explain forces on a body in a central force field, rocket propulsion, and typical launch vehicle configurations |
| | 18MTMAE101 | MATHEMATICS FOR AEROSPACE ENGINEERS | CO1 : Solve ordinary and partial differential equations using numerical techniques<br>CO2 : Apply principles of matrix algebra to linear transformations.<br>CO3 : Analyze the functions and signals using Fourier series and Fourier transforms<br>CO4 : Apply the concept of Calculus on Complex functions |
| | 18MTASD101 | AEROSPACE STRUCTURES | CO1 : The students who learn the basics can handle the design of modern aircraft design<br>CO2 : The research career aspiring students have introduction to sufficient novel concepts from the course and they can embark on innovating work touching the frontiers of science.<br>CO3 : Sufficient learning will be acquired by the students o the computational aspects of Structural Mechanics<br>CO4 : Students gain confidence not to get scared and consequently refrain from using the modern aspects of structural science. |
| | 18MTADE102 | AERODYNAMICS AND FLIGHT MECHANICS | CO1 : Modeling of bodies for aerodynamic analysis.<br>CO2 : Exposure to different airfoils, understating the influence of each of geometric parameter of the airfoil on aerodynamic forces & moments.<br>CO3 : Calculation of aircraft performance with specific reference to different speeds, range & endurance.<br>CO4 : Ability to do flight mechanics |

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| | | | **calculations.** |
| | **18MTMCC01** | **ENGLISH FOR RESEARCH PAPER WRITING** | **CO 1: To craft persuasive, complex, inquiry-driven arguments dealing with engineering and technology**<br>**CO2: To work strategically with complex information in order to generate and support inquiry by reading, analyzing, and synthesizing a diverse range of data**<br>**CO3: To compose technical articles for a variety of audiences and contexts, both within and outside the academia**<br>**CO 4: To practice writing technical articles as a collaborative process and to develop flexible strategies to deal with giving, receiving, interpreting, and incorporating constructive feedback** |
| | **18MTASD101L** | **AERO STRUCTURES LAB** | **CO1 : To measure the dimensions of various specimen by Vernier Caliper, Dial Gauge that finds applications in all the experiments.**<br>**CO2 : To enable the students to understand the various theorems and calculations based on Strength of Materials and Aircraft Structures approach.**<br>**CO3 : To study the fringe patterns of Stress and Strain using Photoelastic techniques.**<br>**CO4 : To understand the concepts of Vibrations and Elastic Stability.** |
| | **18MTAPT102** | **AIRCRAFT PROPULSION** | **CO1 :Understand the basic principles of propulsion systems.**<br>**CO2 :Analyze the basic performance parameters of propulsion systems.**<br>**CO3 :Describe the design of propulsion systems**<br>**CO4 :Solve problems on design and performance of propulsion systems.**<br>**CO5 :Explain the working principles of different components of propulsion systems.** |
| | **18MTAPT132** | **FAILURE AND RISK ANALYSIS OF AERO-PROPULSION 7 SYSTEMS** | **CO1 : Explain the concept of failure and risk analysis with respect to engineering structures.**<br>**CO2 : Explain basic failure analysis methodology.**<br>**CO3 : Explain techniques for failure analysis**<br>**CO4 : Understand failures occurring during component testing and flight testing**<br>**CO5 :. Carry out basic failure analysis of engine components** |
| | **18MTADE201** | **COMPUTATIONAL FLUID DYNAMICS** | **CO1 : Derive governing equations for fluid flow. Learn various forms of governing equations and their significance.** |

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| II | | | **CO2 :Classify partial differential equations and learn the properties.**<br>**CO3 :Learn different kinds of discretization methods for partial differential equations.**<br>**CO4 :Identify the conditions to be satisfied by the numerical scheme, consistency, stability and accuracy.**<br>**CO5 :Develop computer codes for Computational fluid dynamics.** |
| | **18MTADE202** | **WIND TUNNEL THEORY AND TESTING** | **CO1 : Understanding fundamentals of design of different types of wind tunnels eg. Subsonic, transonic, supersonic and hypersonic, Blow down and suction types, open circuit and closed circuit; Aeronautical wind tunnel, water tunnel, environmental wind tunnels.**<br>**CO2 : Ability to plan & conduct wind tunnel experiments.**<br>**CO3 : Ability to collect and interpret wind tunnel data.**<br>**CO4 : Ability to apply flow visualization techniques using wind tunnel** |
| | **18MTADE203** | **BASICS OF HELICOPTERS** | **CO1 : Understand the basic concepts associated with rotary wing aerodynamics.**<br>**CO2 : Helicopter configurations based on various rotor classifications.**<br>**CO3 : Aerodynamics & performance of helicopter in Hover, climb, descent, forward flight and autorotation.**<br>**CO4 : Introduction to helicopter dynamics highlighting the interaction & coupling of aerodynamics and blade motions.**<br>**CO5 : Basic helicopter controls and mechanism for achieving these controls.**<br>**CO6 : Overview of static & dynamic stability of helicopter.**<br>**CO7 : Sources of vibration of helicopter. Isolation and or reduction of vibrations.** |
| | **18MTADE202L** | **WIND TUNNEL LAB** | **CO1 : Understanding fundamentals of design of different types of wind tunnels eg. Subsonic, transonic, supersonic and hypersonic, Blow down and suction types, open circuit and closed circuit; Aeronautical wind tunnel, water tunnel, environmental wind tunnels. - IA**<br>**CO2 : Ability to plan & conduct wind tunnel experiments**<br>**CO3 :Ability to collect and interpret wind tunnel data -**<br>**CO4: Ability to conduct flow visualization studies** |

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| | 18MTASD221 | INTRODUCTION TO AEROELASTICITY | CO1 : Understanding of principles of vibration, elements of a vibrating system, classification of vibration , types of damping , free and forced vibration of undamped and damped single and two degree of freedom systems, principal coordinates, natural frequencies and mode shapes, normal modes, modal analysis etc.<br>CO2 : Understanding of aeroelastic phenomenon and the multidisciplinary interactions involved, historical background, static aeroelastic phenomena like divergence, control effectiveness and reverasal , ability to model them, solution methods , extension to 3-D wings from 2-D airfoil models.<br>CO3 : Understanding of dynamic aeroelastic phenomenon like flutter and ability to model and analyse them using simple two dimensional models and extension to 3-D flutter analysis. |
| | 18MTADE222 | FLIGHT TESTING - PERFORMANCE AND AERODYNAMICS | CO1 : Able to understand aircraft performance, flight testing, and aircraft performance evealuation at different flight conditions<br>CO2 : Apply flight testing techniques associated with stability requirements<br>CO3 :Apply flight testing procedures for helicopters<br>CO4 : Ability to undertake flight testing of aircraft components<br>CO5 : Apply flight data collection, reduction, analysis and reporting for aircraft. |
| | 18MTADE231 | VISCOUS FLOWS AND TURBULENCE | CO1 : Apply concepts of boundary layer theory to fluid flow problems.<br>CO2 :Apply statistical description of turbulent flows<br>CO3 : Ability to analyze wall bounded flows, Free shear flows, Turbulent motion scales, velocity spectra.<br>CO4 : Apply turbulence modeling theory |
| | 18MTADE232 | AIRPLANE STABILITY AND CONTROL | CO1 : To explain characteristics of airfoils, use of wind tunnel, basics if airplane stability, and Helicopters<br>CO2 : To identify the materials used for aircraft structure and its structural layout<br>CO3 : To explain working principles of different types of airbreathing propulsion systems and propulsion in helicopters.<br>CO4 : To explain major aircraft systems and aircraft navigational aids<br>CO5 : To explain forces on a body in a central force field, rocket propulsion, and typical |

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| | | | launch vehicle configurations |
| III | 18MTAE301 | RESEARCH METHODOLOGY | CO1 : : Apply a range of quantitative and / or qualitative research techniques to business and management problems / issues<br>CO2 :Demonstrate knowledge and understanding of data analysis and interpretation in relation to the research process.<br>CO3 :Conceptualise the research process.<br>CO4 : Assess critically the following methods: literature study, case study, structured surveys, interviews, focus groups, participatory approaches, narrative analysis, scenario methodology and basic statistical methods. |
| | 18MTAE305 | INTELLECTUAL PROPERTY RIGHTS | CO1 :Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.<br>CO2 :Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits |
| | 18MTADE321 | HIGH SPEED AERODYNAMICS | CO1 : Calculate one dimensional flow properties, speed of sound and compressible flow relationships.<br>CO2 : Analysis of flow conditions involving normal shocks, oblique shock and expansion waves and their interactions.<br>CO3 : Apply various theories used to simplify the high speed flow analysis by linearization of governing equations.<br>CO4 : Apply slender body theory<br>CO5 : Analyse flow using method of characteristics and its use in design of high speed flow devices<br>CO6 : Analyse and apply experimental flow techniques for high speed flows |
| | 18MTADE322 | AEROSPACE DESIGN | CO1 : The students will be able to make layouts for payloads and systems and Estimate various loads acting on aircraft.<br>CO2 : Will be able to create preliminary structural design using aerodynamic load. and limit loads.<br>CO3 : Student will be able to estimate sizing and weight to calculate stresses, strains and |

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| | | | **displacements of critical structures, while subjected to allowable, limit and ultimate load. CO4 : Knowledge on trends in Design, Manufacturing and testing in aerospace industry.** |