AEROSPACE ENGINEERING, M.S.

The Graduate School has general requirements for M.S students that must be met by all degree candidates (including earning at least 30 credit hours beyond the bachelor's degree for master's degrees). The Aerospace Engineering Program has added requirements (which are listed below) that must be met before students can complete their degrees.

Learning Outcomes

1. Students will demonstrate a sound understanding of the characteristics of low speed aerodynamics, transonic aerodynamics and supersonic aerodynamics.
2. Students will demonstrate a sound understanding of the modelling of incompressible inviscid, viscous and compressible flow.
3. Students will demonstrate a sound understanding of applied aircraft aerodynamics, airfoil and wing theory and of aerodynamic design.
4. Students will demonstrate a sound understanding of typical aerospace materials.
5. Students will demonstrate a sound understanding of material failure modes.
6. Students will demonstrate a sound understanding of the characteristics of thin walled aerospace structures.
7. Students will demonstrate a sound understanding of mechanical and adhesive joints.
8. Students will demonstrate a sound understanding of aero-elasticity.
9. Students will demonstrate a sound understanding of testing and characterization of materials and structures.
10. Students will demonstrate a sound understanding of manufacturing principles and technology used in aerospace industry.
11. Students will demonstrate the ability to analyze aerospace structures.
12. Students will demonstrate the ability to design aerospace structures.
13. Students will demonstrate the ability to analyze steady gliding, horizontal and climbing flight, analyze turning performance (three dimensional equations of motion, coordinate systems, Euler angles, transformation matrices).
14. Students will demonstrate the ability to estimate airfield performance (take-off and landing).
15. Students will demonstrate the ability to analyze unsteady climb and descent (including minimum time to climb problem);
16. Students will demonstrate the ability to analyze cruise flight and transport performance.
17. Students will demonstrate the ability to develop equations of motion with a wind gradient present.
18. Students will have a basic understanding of how complex aerodynamic problems can be solved with the finite element method.
19. Students will demonstrate a sound understanding of how static structural problems can be solved with the finite element method.
20. Students will demonstrate a sound understanding of the interaction between aerodynamic loads, structural deformations and structural instability.
21. Students will demonstrate an in-depth understanding of compressible flows.
22. Students will demonstrate a basic understanding of turbulent flow analysis.
23. Students will demonstrate an in-depth understanding of thermodynamics.
24. Students will demonstrate an in-depth understanding of fatigue.
25. Students will demonstrate a basic understanding of buckling of plates and shells.
26. Students will demonstrate an in-depth understanding of composite material design and analysis.
27. Students will demonstrate a thorough understanding of manufacturing technology.
28. Students will demonstrate a sound understanding of energy sources and power generation in current and future propulsion systems for air and space applications.
29. Students will demonstrate a sound understanding of the working concepts of aircraft and rocket engines with emphasis on the performance and characteristics of various types of propulsion systems, including turbojet, turbofan, turboprop, ramjet, scramjet and liquid and solid propellant rockets.
30. Students will demonstrate the ability to characterize and analyze propulsion systems based on thermodynamics, chemistry, fluid mechanics and combustion fundamentals.
31. Students will demonstrate understanding of longitudinal, lateral and directional aircraft stability.
32. Students will demonstrate understanding of longitudinal, lateral and directional control systems.
33. Students will demonstrate understanding of control theory applied to aerospace systems.
34. Students will demonstrate the ability to derive mathematical models (plant models) that govern flight for various aerospace systems such as airplanes, helicopters and satellites.
35. Students will demonstrate the ability to create control laws for stable flight.