AE MTech Curriculum

Core courses → 15 credits
Experimental techniques in aerospace engineering → 1 credit
Aerospace seminar → 1 credit
Math requirement → 3 credits
MTech project dissertation → 20 credits
Electives → 24 credits
Total → 64 credits (minimum)

MTech Dissertation adviser to be chosen by the MTech student at the end of first semester.

Math requirement, all electives, and the independent study course, will be credited by a student in consultation with the MTech dissertation adviser.

Students should register for a minimum of 12 credits per semester

<table>
<thead>
<tr>
<th>Semester I</th>
<th>Semester 2</th>
<th>Semester 3</th>
<th>Semester 4</th>
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</thead>
<tbody>
<tr>
<td>Flight and Space Mechanics</td>
<td>Math requirement</td>
<td>Aerospace Seminar</td>
<td></td>
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<tr>
<td></td>
<td>Either 2(^{\text{nd}}) or 3(^{\text{rd}}) semester</td>
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<tr>
<td>Fluid Dynamics</td>
<td>Elective 1</td>
<td>Elective 5</td>
<td></td>
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<tr>
<td>Mechanics and Thermodynamics of Propulsion</td>
<td>Elective 2</td>
<td>Elective 6</td>
<td></td>
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<tr>
<td>Flight Vehicle Structures</td>
<td>Elective 3</td>
<td>Elective 7</td>
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<tr>
<td>Navigation, Guidance and Control</td>
<td>Elective 4</td>
<td>Elective 8</td>
<td></td>
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<tr>
<td>Experimental Techniques in Aerospace Engineering</td>
<td></td>
<td></td>
<td>(\text{MTech Dissertation}) Distributed over 3(^{\text{rd}}) and 4(^{\text{th}}) semesters</td>
</tr>
<tr>
<td>16 credits</td>
<td></td>
<td>48 credits</td>
<td>(\text{Minimum 12 credits per semester})</td>
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</tbody>
</table>
Core courses

AE 201 (AUG) 3:0
Flight and Space Mechanics
Instructor(s) AE Faculty
Reference

AE 202 (AUG) 3:0
Fluid Dynamics
Properties of fluids, kinematics of fluid motion, conservation laws of mass, momentum and energy, potential flows, inviscid flows, vortex dynamics, dimensional analysis, principles of aerodynamics, introduction to laminar viscous flows.
Instructor(s) AE Aerodynamics Faculty
References

AE 203 (AUG) 3:0
Mechanics and Thermodynamics of Propulsion
Classical thermodynamics, conservation equations for systems and control volumes, one dimensional flow of a compressible perfect gas – isentropic and non-isentropic flows. Propulsion system performance, the gas generator Brayton cycle, zero dimensional analysis of ideal ramjet, turbojet and turbofan cycles, non-ideality and isentropic efficiencies. Performance analysis of inlets and nozzles, gas turbine combustors, compressors and turbines and discussion of factors limiting performance. Chemical rockets - thrust equation, specific impulse, distinction between solid and liquid rockets, maximum height gained analysis, multi-staging, characteristics of propellants.
Instructor(s) AE Propulsion Faculty
References

AE 204 (AUG) 3:0
Flight Vehicle Structures
Introduction to aircraft structures and materials; introduction to elasticity, torsion, bending and flexural shear, flexural shear flow in thin-walled sections; elastic buckling; failure theories; variational principles and energy methods; loads on aircraft.

Instructor(s) **AE Structures Faculty**

**References**


Lecture notes.

**AE 205 (AUG) 3:0**

**Navigation, Guidance and Control**

Navigation: Continuous waves and frequency modulated radars, MTI and Doppler radars; Hyperbolic navigation systems: INS, GPS, SLAM; Guidance: Guided missiles, guidance laws: pursuit, LOS and PN laws, Guidance of UAVs; Control: Linear time invariant systems, transfer functions and state space modeling, analysis and synthesis of linear control systems, applications to aerospace engineering.

Instructor(s) **AE Navigation, Guidance and Control (NGC) Faculty**

**References**

AE NGC Faculty, *Lecture Notes*.


**Non-theory Core Courses**

**AE 296 (AUG) 0:1**

**Experimental Techniques in Aerospace Engineering**

Experimental techniques in aerospace engineering is a 0:1 credit course that will include demonstrations of experiments in the major sub-disciplines of aerospace engineering. The intent of this course is to give an overview of the experimental facilities and techniques that are commonly used in research in aerospace.

Instructor(s) **AE Faculty**

**AE 297 (4th semester) 1 credit**

**Aerospace Seminar**

Aerospace Seminar is a 1 credit course offered in the 4th semester. This course will have lectures by AE faculty as well as lectures by staff from Archives and Publications Cell on best
practices in scientific written and oral communication. Thereafter the MTech students will present a report and seminar during the 4th semester on a topic chosen in consultation with their faculty advisor.

Special topics in Aerospace Engineering

AE 291 and AE 292 (2nd (August) and 3rd semester (January)) 3 credits each

Special Topics in Aerospace Engineering 1 & 2

These 2 electives, one each in the August and January semesters, will be of 3 credits each. These two electives will be of an advanced nature on topics of current research being pursued by AE faculty. These courses will be offered by interested AE faculty. These elective courses will be open to all students in the Institute and pre-requisites for registering for these electives will be with instructor’s consent.

Instructor(s) AE Faculty

MTech Dissertation

AE 299 (3rd and 4th semester) 20 credits

Dissertation Project

The MTech dissertation project is aimed at training students to analyse independently any problem posed to them. The project may be a purely analytical piece of work, a completely experimental one or a combination of both. In a few cases, the project may also involve a sophisticated design work. The project report is expected to show clarity of thought and expression, critical appreciation of the existing literature and analytical and/or experimental or design skill.

Instructor(s) AE Faculty

Math requirement

Math requirement can be AE math courses, or courses from Math@IISc, or courses from CDS@IISc.

AE 211 (JAN) 3:0

Mathematical methods for Aerospace Engineers

Ordinary differential equations; Elementary numerical methods; Finite differences; Topics in linear algebra; Partial differential equations.

Instructor(s) AE Faculty

References
Electives

Aerodynamics
(Course numbers in the range AE 221 - AE 239; AE 321 - AE 339)

Aerospace Propulsion
(Course numbers in the range AE 241 - AE 249; AE 341 - AE 349)

Aerospace Structures
(Course numbers in the range AE 251 - AE 269; AE 351 - AE 369)

Navigation, Guidance, and Control
(Course numbers in the range AE 271 - AE 279; AE 371 - AE 379)

Aerodynamics
(Course numbers in the range AE 221 - AE 239; AE 321 - AE 339)

AE 221 (JAN) 3:0
Aerodynamics
Prerequisite AE 202

Introduction to aerodynamics, potential flows, conformal mapping and Joukowski airfoils, Kutta condition, thin airfoil theory, viscous effects and high-lift flows, lifting line theory, vortex lattice method, delta wings, compressibility effect, supersonic flows, unsteady aerodynamics.

Instructor O N Ramesh or N Balakrishnan

References

AE 222 (JAN) 3:0
Gas Dynamics
Prerequisite AE 202

Fundamentals of thermodynamics, propagation of small disturbances in gases, normal and oblique shock relations, nozzle flows, one-dimensional unsteady flow, small disturbance theory of supersonic speeds, generation of supersonic flows in tunnels, supersonic flow diagnostics, supersonic flow over two-dimensional bodies, shock expansion analysis, method of characteristics, one-dimensional rarefaction and compression waves, flow in shock tube.

Instructor G Jagadeesh or Srisha Rao or J Mathew

References
AE 223 (AUG) 3:0

Hypersonic Flow Theory
Prerequisites AE 202, AE 222

Characteristic features of hypersonic flow, basic equations boundary conditions for inviscid flow, shock shapes over bodies, flow over flat plate, flow over a wedge, hypersonic approximations, Prandtl-Meyer flow, axisymmetric flow over a cone. Hypersonic small disturbance theory, applications to flow over a wedge and a cone, blast wave analogy, Newtonian impact theory, Busemann centrifugal correction and shock expansion method, tangent cone and tangent wedge methods. Introduction to viscous flows, hypersonic boundary layers, non-equilibrium high enthalpy flows. High enthalpy impulse test facilities and instrumentation. Computational fluid mechanics techniques for hypersonic flows, methods of generating experimental data for numerical code validation at hypersonic Mach numbers in hypervelocity facilities.

Instructor G Jagadeesh

References

AE 224 (JAN) 3:0

Advanced Fluid Dynamics
Prerequisites AE 202 or equivalent

Viscosity, stress tensor, Navier-Stokes equations, boundary conditions. Parallel flows in ducts, Stokes/Rayleigh problems, laminar boundary layers, viscous compressible flow. Nature of turbulent flows, Reynolds decomposition and equations, turbulence modelling and computation, free shear and wall-bounded flows, DNS/LES.

Instructor J Mathew

References

AE 225 (JAN) 3:0

Boundary Layer Theory
Prerequisites AE 202 or equivalent

Discussions on Navier-Stokes equation and its exact solutions, boundary layer approximations, two-dimensional boundary layer equations, asymptotic theory, Blasius and Falkner Skan solutions, momentum integral methods, introduction to axisymmetric and three-dimensional boundary layers, compressible boundary layer equations, thermal boundary layers in presence of heat transfer, higher-order corrections to the boundary layer equations, flow separation -
breakdown of the boundary layer approximation and the triple deck analysis, transitional and turbulent boundary layers - introduction and basic concepts.

Instructor **Sourabh S Diwan**

**References**

Recent Literature.

**AE 226 (JAN) 3:0**

**Turbulent Shear Flows**

Prerequisite **AE 202 or equivalent**

Origin of turbulence, laminar-turbulent transition, vortex dynamics, statistical aspects of turbulence, scales in turbulence, spectrum of turbulence, boundary layers, pipe flow, free shear layers, concepts of equilibrium and similarity, basic ideas of turbulence modeling, measurement techniques.

Instructor **O N Ramesh or J Mathew**

**References**
Tritton, D.J., Physical Fluid Dynamics, Oxford University Press.

**AE 227 (JAN) 3:0**

**Numerical Fluid Flow**

Prerequisite **AE 202 or equivalent**

Introduction to CFD, equations governing fluid flow, hyperbolic partial differential equations and shocks, finite difference technique and difference equations, implicit difference formula, time discretization and stability, schemes for linear convective equation, analysis of time integration schemes, monotonicity, schemes for Euler equations, finite volume methodology. Introduction to unstructured mesh computations.

Instructor **N Balakrishnan**

**References**

**AE 228 (AUG) 2:1**

**Computation of Viscous flows**

Prerequisite **AE 227**

Review of schemes for Euler equations, structured and unstructured mesh calculations, reconstruction procedure, convergence acceleration devices, schemes for viscous flow discretization, positivity, turbulence model implementation for unstructured mesh calculations, computation of incompressible flows. Introduction to LES and DNS.
Instructor N Balakrishnan

AE 229 (JAN) 3:0
Computational Gas Dynamics
Prerequisites AE 202, AE 222, courses in Numerical Analysis/Numerical Methods, and any programming language.
Instructor S V Raghurama Rao
Laney, B., Computational Gas Dynamics.
Toro, E.F., Riemann Solvers and Numerical Methods for Fluid Dynamics.

AE 230 (JAN) 3:0
Numerical Grid Generation and Flow Computations
Basics of fluid dynamics, gas dynamics, governing equations of fluid dynamics, various levels of approximation, partial differential equations, basics of discretization, finite difference, finite volume methods, mesh-less methods, space marching and time marching approaches, geometrical complexities for mesh generation, methods of mesh generation, examples of simple flow computations
Instructor Prakash S Kulkarni
Anderson, Computational Fluid Dynamics - Basics and applications.
Joe Thompson, Numerical Grid Generation.

AE 231 (AUG) 3:0
Aerodynamic Testing Facilities and Measurements
Prerequisite AE 202 or equivalent
Aerodynamic testing in various speed regimes, requirements of aerodynamic testing, design aspects of low speed wind tunnels, flow visualization methods, measurement methods for flow variables. Wind tunnel balances, elements of computer-based instrumentation, measurements and analyses methods. Elements of high speed wind tunnel testing: design aspects to supersonic and hypersonic wind-tunnels, other high speed facilities like shock tube shock tunnels, free piston tunnels, ballistic ranges and low density tunnels, special aspects of instrumentation for high speed flows.
Instructors Duvvuri Subrahmanyam, Sourabh S Diwan, and Srisha Rao
References
AE 321 (JAN) 3:0
Hydrodynamic Stability
Prerequisite AE 202 or equivalent and consent of Instructor.
Instructor Arnab Samanta
References
Recent Literature.

AE 322 (JAN) 3:0
Aeroacoustics
Prerequisite AE 202 or equivalent and consent of instructor.
Instructor Arnab Samanta
References
Lecture notes.

*Aerospace Propulsion*
*(Course numbers in the range AE 241 - AE 249; AE 341 - AE 349)*

**AE 241 (JAN) 3:0**

**Combustion**
Instructor **K N Lakshmisha**

**References**

**AE 242 (JAN) 3:0**

**Aircraft Engines**
Description of air breathing engines, propeller theory, engine propeller matching, piston engines, turbofan, turbo-prop, turbojet, component analysis, ramjets, velocity and altitude performance, thrust augmentation starting, principles of component design/selection and matching.
Instructor **T S Sheshadri or D Sivakumar**

**References**

**AE 243 (JAN) 3:0**

**Rocket Propulsion**
Introduction to rocket engines, features of chemical rocket propulsion, rocket equation, thrust equation, quasi-one-dimensional nozzle flow, types of nozzles, thrust control and vectoring, aerothermochemistry, propellant chemistry, performance parameters, solid propellant rocket internal ballistics, components and motor design of solid propellant rockets, ignition transients, elements of liquid propellant rocket engines, and spacecraft propulsion.
Instructor **Charlie Oommen or NKS Rajan**
References

AE 244 (AUG) 3:0
Introduction to Acoustics - I
Conservation equations, wave equation, acoustic energy, intensity and source power, spherical waves, frequency content of rounds, levels and the decibel Fourier series and long duration rounds. Reflection, transmission and excitation of plane waves, specific acoustic impedance, multilayer transmission and reflection, radiation from vibrating bodies. Monopoles and Green's functions. Reciprocity in acoustics.
Instructor T S Sheshadri
Reference

AE 245 (AUG) 3:0
Advanced Combustion
Prerequisites AE 203 or AE 241 or AE 242 or AE 243, or equivalent. These can however be waived after discussion with the course instructors.
Instructors Santosh Hemchandra or Swetaprovo Chaudhuri
References
Recent literature.

Aerospace Structures
(Course numbers in the range AE 251 - AE 269; AE 351 - AE 369)
AE 251 (JAN) 3:0
Energy and Finite Element Methods
Prerequisite AE 204 or ME 242 or CE 214 and knowledge of MATLAB
Instructor S Gopalakrishnan
References

AE 252 (JAN) 3:0
Analysis and Design of Composite Structures
Introduction to composite materials, concepts of isotropy vs. anisotropy, composite micromechanics (effective stiffness/strength predictions, load-transfer mechanisms), Classical Lamination Plate theory (CLPT), failure criteria, hygrothermal stresses, bending of composite plates, analysis of sandwich plates, buckling analysis of laminated composite plates, inter-laminar stresses, First Order Shear Deformation Theory (FSDT), delamination models, composite tailoring and design issues, statics and elastic stability of initially curved and twisted composite beams, design of laminates using carpet and AML plots, preliminary design of composite structures for aerospace and automotive applications. Overview of current research in composites.
Instructor Dineshkumar Harursampath, G Narayana Naik
References
AE 253 (AUG) 3:0
Multi-Body Dynamics using Symbolic Manipulators
Computer-aided modeling and simulation of 3D motions of multi-body systems. Coupled, multibody kinematics and dynamics, reference frames, vector differentiation, configuration and motion constraints, holonomicity, generalized speeds, partial velocities and partial angular velocities, Rodrigues parameter, inertia dyadics, parallel axes theorems, angular momentum, generalized forces, energy integrals, momentum integrals, generalized impulses and momentum, exact closed – form and approximate numerical solutions. Comparing Newton/Euler’s, Lagrange’s and Kane’s methods. Generation and solution of equations of motion using computer algorithms and software packages from amongst MotionGenesis™ Kane, AUTOLEVTM, MATHAMATICA® and MATLAB®. Overview of flexible multi-body dynamics and applications in aerospace vehicular dynamics.
Instructor Dineshkumar Harursampath
References

AE 254 (AUG) 3:0
Fatigue and Failure of Materials
Fatigue and damage tolerance in aerospace structures. Fatigue mechanism (macro and micro aspects), fatigue properties and strength, concept of stress concentration factor, effect of residual stresses, total-life approaches (stress-life, strain-life, fracture mechanics), effect of notches, constant and variable amplitude loading (cycle counting, damage summation, etc), multi-axial fatigue theories. Special topics on fatigue in composites will also be covered.
Instructor Suhasini Gururaja
References

AE 255 (JAN) 3:0
Aeroelasticity
Pre-requiste A course in solid or fluid mechanics.
Effect of wing flexibility on lift distribution; Torsional wing divergence; Vibration of single, two, and multi-degree of freedom models of wing with control surfaces; Unsteady aerodynamics of oscillating airfoil; Bending-torsion flutter of wing; Gust response of an aeroelastic airplane; Aeroservoelasticity of wing with control surfaces.
Instructor Kartik Venkatraman
References

AE 256 (JAN) 3:0
Wave Propagation in Structures
Structural dynamics and wave propagation, continuous and discrete Fourier transform, FFT, sampled wave forms, spectral analysis of wave motion, propagating and reconstructing waves, dispersion relations, signal processing and spectral estimation, longitudinal wave propagation in rods, higher order rod theory, flexural wave propagation in beams, higher order beam theories, wave propagation in complex structures, spectral element formulation, wave propagation in two dimensions, wave propagation in plates.
Instructor S Gopalakrishnan
References

AE 257 (JAN) 3:0
Engineering Optimization
Constrained and unconstrained minimization of linear and nonlinear functions of one or more variables, necessary and sufficient conditions in optimization, KKT conditions, numerical methods in unconstrained optimization, one dimensional search, steepest descent and conjugate gradient methods, Newton and quasi-Newton methods. Finite difference, analytical and automatic differentiation, linear programming, numerical methods for constrained optimization, response surface methods in optimization, orthogonal arrays, stochastic optimization methods.
Instructor Ranjan Ganguli
Reference

AE 258 (JAN) 3:0
Non-Destructive Testing and Evaluation
Prerequisite AE 204 or equivalent
Fundamentals and basic concepts of NDT & E, Principles and applications of different NDE tools used for testing and evaluation of aerospace structures viz., ultrasonics, radiography, electromagnetic methods, acoustic emission, thermography. Detection and characterization of defects and damage in metallic and composite structural components.
Instructor M R Bhat
Reference
AE 259 (JAN) 3:0
Rotary Wing Aeroelasticity
Instructor Ranjan Ganguli
References

AE 260 (JAN) 3:0
Modal analysis: Theory and Applications
Introduction to modal testing and applications, Frequency Response Function (FRF) measurement, properties of FRF data for SDOF and MDOF systems, signal and system analysis, modal analysis of rotating structures; exciters, sensors application in modal parameter (natural frequency, damping and mode shape) estimation. Vibration standards for human and machines, calibration and sensitivity analysis in modal testing, modal parameter estimation methods, global modal analysis methods in time and frequency domain, derivation of mathematical models – modal model, response model and spatial models. Coupled and modified structure analysis. Application of modal analysis to practical structures and condition health monitoring.
Instructor S B Kandagal
References

AE 261 (AUG) 3:0
Structural Vibration Control
Instructor S B Kandagal
References

AE 262 (JAN) 3:0
Introduction to Helicopters
Hover, axial flight and autorotation, rigid blade flapping in forward flight, multi-blade coordinates, different reference planes. Helicopter quasi-steady and unsteady aerodynamics, rotor wake modeling and dynamic stall. Floquet theory, introduction to rotor control performance and vibration. Helicopter design process.
Instructors Ranjan Ganguli and S N Omkar
References

AE 263 (JAN) 3:0
Atmospheric Flight Dynamics
Prerequisite AE 201 or equivalent
Review of equations of motion, stability derivative estimation, static stability and control, longitudinal and lateral modes, transfer function and response characteristics, feedback and automatic control, response to atmospheric gust and turbulence. Handling qualities, human pilot modelling case studies of typical airplanes, roll and spin characteristics, flight simulators, stability and control derivative estimation from wind tunnel and flight tests.
Instructors Dinesh K Harursampath and Radhakant Padhi
References
Babistor, A.H., Aircraft Stability and Control, Pergamon Press.
Elkin, B., Dynamics of Atmospheric Flight, John Wiley and Sons.
ESDU Data Sheets

AE 351 (AUG) 3:0
Research Techniques in Non-Destructive Evaluation
Prerequisite Ae 258 or equivalent and consent of instructor
Quantitative non destructive evaluation involved probabilistic methods of quality control and life assessment. Signal analysis and image processing in NDE, ultrasonic, thermographic and tomographic methods for evaluation of composites.
Instructor M R Bhat
References
American Society of Metal (ASM) Hand Book, Volume 17.

**AE 352 (JAN) 3:0**  
**Nonlinear Mechanics of Composite Structures**  
Pre-requisite **AE 252 or equivalent and consent of instructor**  
Instructor **Dineshkumar Harursampath**  

**AE 353 (JAN) 3:0**  
**Micromechanics of composites**  
Prerequisites **Solid mechanics or equivalent and consent of instructor**  
Introduction to tensors, properties of tensors, concepts of isotropy and anisotropy, micromechanical homogenization theory, Eshelby's approach, self-consistent schemes, Mori-Tanaka Mean field theory, bounds on effective properties, concentric cylinder models, introduction to computational homogenization, introduction to damage mechanics, statistical aspects of microstructure  
Instructor **Suhasini Gururaja**  
References  
Micromechanics of defects in solids, T. Mura 1982  
Micromechanics of composite materials, Brett Bendnarcyk et al, 2012  
Open literature

*Navigation, Guidance, and Control*  
(Course numbers in the range AE 271 - AE 279; AE 371 - AE 379)

**AE 271 (JAN) 3:0**  
**Guidance Theory and Applications**  
Prerequisite **AE 205 or equivalent**  
Fundamentals of guidance; interception and avoidance; taxonomy of guidance laws, classical and empirical guidance laws; applied optimal control and optimal guidance laws; differential

Instructors A Ratnoo and Debasish Ghose

References

AE 272 (AUG) 3:0
Biologically Inspired Computing and its Applications
Prerequisite Working knowledge of MATLAB or any other programming language
Instructor S N Omkar

References

AE 273 (JAN) 3:0
Unmanned Aerial Vehicles
Prerequisites AE 201 and AE 205
History of Unmanned Air Vehicle (UAV) development. Unmanned aircraft systems: coordinate frames, kinematics and dynamics, forces and moments, lateral and longitudinal autopilots. UAV navigation: accelerometers, gyros, GPS. Path planning algorithms: Dubin’s curves, way-points, Voronoi partitions.
Path following and guidance: Straight line and curve following, vision based guidance; Future directions and the road ahead.
Instructor Ashwini Ratnoo

References

AE 274 (JAN) 3:0
Topics in Neural Computation
Prerequisite Knowledge of algebra, numerical methods, calculus and familiarity with programming in Python and MATLAB.
Foundation of neural networks: perceptron, multi-layer perceptron, radial basis function network, recurrent neural network; Evolving/online learning algorithms; Deep neural networks: Convolutional neural network, restricted Boltzmann machine; Unsupervised learning; Advanced topics: Reinforcement learning and deep-reinforcement learning; Spiking neural network—spiking neuron, STDP, rank-order learning, synapse model, SEFRON.
Instructors Suresh Sundaram
References

AE 371 (JAN) 3:0
Applied Nonlinear Control
Instructor Radhakant Padhi
Prerequisite AE 205 and 272 or equivalent; familiarity with MATLAB
Lecture Notes.

AE 372 (JAN) 3:0
Applied Optimal Control and State Estimation
Prerequisites AE 205 or equivalent and familiarity with MATLAB
Introduction and motivation review of static optimization, calculus of variations and optimal control formulation; numerical solution of two-point boundary value problems: shooting method, gradient method and quasi-linearization; Linear Quadratic Regulator (LQR) design: Riccati solution, stability proof, extensions of LQR, State Transition Matrix (STM) solution; State Dependent Riccati Equation (SDRE) design; dynamic programming: HJB theory; approximate dynamic programming and adaptive critic design; MPSP Design; optimal state estimation: Kalman filter, extended Kalman filter; robust control design through optimal control and state estimation; constrained optimal control systems: Pontryagin minimum principle, control
constrained problems, state constrained problems; neighbouring extremals and sufficiency conditions. Discrete time optimal control: Generic formulation, discrete LQR.

Instructor Radhakant Padhi

References
Lecture Notes.

AE 373 (JAN) 3:0
Cooperative Control with Aerospace Applications
Introduction to cooperative control, mathematical preliminaries: algebraic graph theory, matrices for cooperative control, stability of formations. Consensus algorithms, consensus for single and double integrator dynamics, consensus in position, direction, and attitude dynamics. Distributed multi-vehicular cooperative control. Generalized cyclic pursuit; spacecraft formation flying. UAV applications in search, coverage, and surveillance of large areas, and in monitoring and controlling of hazards. Routing and path planning of UAVs. Role of communication. Operation in uncertain environments and uncertainty.

Instructor D Ghose

References