The department of Aeronautical and Automobile Engineering, MIT, established in the year 2008, prepares engineers for success and leadership in the conception, design, implementation, and operation of aerospace, automobile and related engineering systems. We achieve this through our commitment to the Educational excellence, creation, development and application of technologies critical to aerospace vehicle and automobile engineering, the architecture and engineering of complex high-performance systems. The department has very good industry-institute interaction and has conducted workshops for working professionals and students from various institutes and industries.

**Academic Programmes Offered**
- B. Tech - Aeronautical Engineering (since 2008)
- B. Tech - Automobile Engineering (since 2008)

**Facilities and Resources**
- World class Infrastructure.
- Well equipped Aerodynamics, Propulsion and Aircraft Structures Laboratories.
- Automobile Laboratory equipped with automotive engines, automotive transmission system, computerized vehicle testing, and automotive machine shop.
- Fabrication lab including filament winding machine, composite materials and other related facilities.

**Faculty List**

**Head of the Department**
Dr Sathish Shenoy B., Ph.D (Manipal University)

**Professor**
Dr Rammohan Pai B., Ph.D (Manipal University)

**Associate Professor**
Dr Dayananda Pai K., Ph.D (NITK, Suratkal)

**Assistant Professor - Selection grade**
Mr Mahesh G. T., M.Tech

**Assistant Professor - Senior Scale**
Mr Laxmikant G. Keni, M.Tech

**Assistant Professor**
Mr Padmara N. H., M.Tech
Mr Srinivas G., M.Tech
Mr Shiva Prasad U., M.Tech
Mr Ravishanker Baliga B., M.Tech
Mr Chethan K. N., M.Tech
Mr Kamlesh Kumar, M.E
Mr Jayakrishnan Radhakrishnan, MS
Mr Umananda K. V., M.Tech
Mr Yogeesh Pai, M.Tech
Mr Manikandan M., M.Tech
Mr Vishnu G. Nair, M.Tech
Mr Balbir Singh., M.Tech
Ms Thara Reshma I. V., M.Tech
Mr Gajula Rahul, M.Tech
Mr Anand Pai, BE (on contract)
Ms Divya D. Shetty, BE., BE (on contract)
## B. Tech in AERONAUTICAL ENGINEERING

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|       | AAE 3102     | Gas Dynamics                               | 2  | 1  | 0  | 3  | AAE 3201     | Aircraft Design – II                       | 2  | 1  | 0  | 3  |
|       | AAE 3103     | Rocket Propulsion                          | 3  | 1  | 0  | 4  | AAE 3202     | Finite Element Method                      | 2  | 1  | 0  | 3  |
|       | AAE 3104     | Aircraft design – I                        | 2  | 1  | 0  | 3  | AAE ****     | Program Elective – III                    | 3  | 0  | 0  | 3  |
|       | AAE ****     | Program Elective – I                       | 3  | 0  | 0  | 3  | AAE ****     | Program Elective – IV                     | 3  | 0  | 0  | 3  |
|       | AAE 3111     | Geometric Modelling – Lab - I              | 0  | 0  | 3  | 1  | AAE 3211     | Geometric Modeling – Lab – II              | 0  | 0  | 6  | 2  |
|       | AAE 3112     | Aircraft Design Lab                        | 0  | 0  | 6  | 2  | AAE 3212     | Structural Analysis Lab                    | 0  | 0  | 6  | 2  |
|       |              |                                           | 16 | 4  | 9  | 23 |              |                                           | 15 | 3  | 12 | 22 |

| IV    | HUM 4002     | Engg Economics and Financial Management    | 2  | 1  | 0  | 3  | AAE 4297     | Seminar                                   | 1  |    |    |    |
|       | AAE 4101     | Theory of Vibrations                       | 3  | 1  | 0  | 4  | AAE 4298     | Industrial Training                       | 1  |    |    |    |
|       | AAE 4102     | Helicopter Aerodynamics                    | 2  | 1  | 0  | 3  | AAE 4299     | Project Work/Practice School              | 12 |    |    |    |
|       | AAE 4103     | Avionics & Navigation Systems              | 3  | 0  | 0  | 3  | AAE 4299     | Project Work/Practice School              | 12 |    |    |    |
|       | AAE ****     | Program Elective – V                      | 3  | 0  | 0  | 3  | AAE 4297     | Seminar                                   | 1  |    |    |    |
|       | AAE ****     | Program Elective – VI                     | 3  | 0  | 0  | 3  | AAE 4298     | Industrial Training                       | 1  |    |    |    |
|       | AAE 4111     | Avionics Lab                               | 0  | 0  | 6  | 2  | AAE 4299     | Project Work/Practice School              | 12 |    |    |    |
|       |              |                                           | 16 | 3  | 6  | 21 |              |                                           |    |    |    |    |

### Notes:
- **L T P C** denotes the number of lectures, tutorials, practicals, and credit hours respectively.
- **Fifth Semester**
  - AAE 3101: Flight Dynamics
  - AAE 3102: Gas Dynamics
  - AAE 3103: Rocket Propulsion
  - AAE 3104: Aircraft Design – I
  - AAE ****: Program Elective – I
  - AAE ****: Program Elective – II
  - AAE 3111: Geometric Modelling – Lab - I
  - AAE 3112: Aircraft Design Lab

### Sixth Semester (cont.)
- HUM 4001: Essentials of Management
- AAE 4297: Seminar
- AAE 4298: Industrial Training
- AAE 4299: Project Work/Practice School
Minor Specializations

I. Aerodynamics
1. AAE 4001, Aerodynamics of Rockets and Missiles
2. AAE 4002, Computational Fluid Dynamics
3. AAE 4003, Hypersonic Aerothermodynamics
4. AAE 4004, Unsteady Aerodynamics

II. Business Management
1. HUM 4011, Financial Management
2. HUM 4012, Human Resource Management
3. HUM 4013, Marketing Management
4. HUM 4014, Operations and Systems Management

Other Programme Electives
1. AAE 4005, Aeroelasticity
2. AAE 4006, Aircraft Systems and Instruments
3. AAE 4007, Composite structures
4. AAE 4008, Computer Integrated Manufacturing
5. AAE 4009, Navigation, Guidance and Control
6. AAE 4010, Optimal Control
7. AAE 4011, Optimization Techniques
8. AAE 4012, Orbital Mechanics
9. AAE 4013, Performance of Gas Turbine
10. AAE 4014, Robust Control
11. AAE 4015, Space Flight Dynamics
12. AAE 4016, Statistical Quality control
13. AAE 4017, Turbo machinery Aerodynamics

Open Electives
1. AAE 3281, Introduction to Aerospace Engineering
2. AAE 3282, Introduction to Avionics and Navigation systems

THIRD SEMESTER

MAT 2101: ENGINEERING MATHEMATICS - III [2 1 0 3]
Gradient, divergence and curl, line, surface and volume integrals, Green's divergence and Stoke's theorems, Fourier series of periodic functions, Half range expansions, Harmonic analysis, Fourier integrals, Sine and cosine integrals, Fourier transform, Sine and cosine transforms, Partial differential equation-Basic concepts, solutions of equations involving derivatives with respect to one variable only, Solutions by indicated transformations and separation of variables, One-dimensional wave equation, one dimensional heat equation and their solutions, Numerical solutions of boundary valued problems, Laplace and Poisson equations and heat and wave equations by explicit methods.

References:

AAE 2101: AIRCRAFT STRUCTURES [3 1 0 4]
Introduction to basic elasticity, Euler buckling of columns, Bending of Beams, Shear force and bending moment diagrams in beams, Theory of symmetrical and unsymmetrical bending of beams, Bending of open and closed thin-walled beams, Stress, strain and displacement relationships for open and single cell closed section thin-walled beams under shear loads, Shear of open and closed section beams, Torsion of solid sections, open and closed section beams, Analysis of Combined open and closed section beams under Bending and Torsion, Structural idealization, Effect of idealization on the analysis of open and closed section beams Stress analysis of aircraft components wing and fuselage, Theory of Plates and Shells.

References:

AAE 2102: AIRCRAFT PRODUCTION TECHNIQUES [3 1 0 4]

References:

AAE 2103: INTRODUCTION TO AEROSPACE ENGINEERING [2 1 0 3]
The first Aeronautical Engineers, Have an overview of the history of flight, Fundamental Thoughts, Ballooning, Apply basic constitutive principles of mechanics of fluids - Bernoulli and control volume approaches, the source of all aerodynamic forces, Equation of state for a perfect gas, specific volume, anatomy of aircraft, anatomy of space vehicle, The Standard Atmosphere; Definition of Altitude, Hydrostatic equation, Relation between geopotential and geometric altitude, Basics of Aerodynamics, Aircraft Flight - Airfoil Nomenclature, Lift, drag and moment coefficient, Elements of Airplane Performance, Astronautics, Propulsion, Introduction, Types of Propulsion system.

References:

AAE 2104: THERMODYNAMICS [3 1 0 4]

References:

AAE 2105: FLUID MECHANICS [2 1 0 3]

References:

AAE 2111: FLUID MECHANICS LAB [0 0 3 1]
Experiments based on Fluid Properties, Calculating the viscosity using different, calorific value of fuel using gas calorimeter, Measurement of emissivity, Heat Transfer from pin fin forced convection and free convection, Thermal conductivity of metal bar, Flow through orifice, Flow through venture meter, Flow through V-notch, Flow through pipe to find the friction factor.

References:

AAE 2112: STRUCTURES LAB [0 0 3 1]
Experiments based on Tensile, Torsion, Bending, Compression, Fatigue, Impact and hardness properties of different structural materials, Non-destructive testing, Young's Modulus and Poisson ratio calculation, Superposition Principle, Maxwell's Reciprocal Theorem, Buckling of Eccentric Column and South-well plot, Wagner beam, Vibration analysis of cantilever beam.

References:

FOURTH SEMESTER

MAT 2201: ENGINEERING MATHEMATICS - IV [2 1 0 3]
Series solutions of ordinary differential equations, Series solutions of Bessel and Legendre differential equations, Statistics, Measures of central tendency mean, median, mode, measures of dispersion Correlation coefficient, regression, curve fitting, Probability, Introduction, finite sample spaces, conditional probability and
independence, Baye's theorem, one dimensional random variable, mean, variance, two and higher dimensional random variables, mean, variance, correlation coefficient, Distributions, Binomial, Poisson, uniform, normal, gamma, Chi-square and exponential distributions, simple problems, Moment generating function, Functions of one dimensional and two dimensional random variables, Sampling theory, Central limit theorem and applications.

References:

AAE 2201: AERODYNAMICS [2 1 0 3]

References:

AAE 2202: AIRCRAFT PROPULSION [2 1 0 3]

References:

AAE 2203: FLIGHT MECHANICS [2 1 0 3]

References:

AAE 2204: LINEAR CONTROL THEORY [2 1 0 3]

References:

AAE 2211: PRODUCTION LAB [0 1 0 3]
Preparation of models using welding techniques. Exercises on turning, gear cutting, shaping and grinding operations. Machining using CNC Turning Center and Vertical Machining Center.

References:
AAE212: AERODYNAMICS AND PROPULSION LAB [0 0 6 2]
Aerodynamic Lab Experiments, Wind tunnel calibration, Smoke flow visualization, Surface pressure distribution over cylinder, symmetric airfoil, cambered airfoil, combined airfoil, Measurement of typical boundary layer velocity profile on tunnel wall, Calculation of Lift, Drag and moment using six component balance, Propulsion Lab experiments, Measurement of Nozzle flow by varying the motor speeds, Free Jet and Wall Jet measurements by varying speeds and position of jet, Efficiency of Axial flow fan By variable Guide vane Position, Forced and natural convection over a flat plate, Calculation of calorific value of fuel, Measurement of Burning velocity in a premixed flame, performance analysis of Mini Gas turbine.

References:

AAE 2213: NUMERICAL COMPUTATIONAL LAB [0 0 6 2]

References:

FIFTH SEMESTER

AAE 3101: FLIGHT DYNAMICS [3 1 0 4]

References:

AAE 3102: GAS DYNAMICS [2 1 0 3]
One dimensional flows, Governing equations of inviscid compressible flow, Continuity, Momentum and Energy equations in Integral and Differential form, One dimensional flow with heat addition and friction, Normal shock conditions, Stagnation conditions, Flow through nozzle and diffusers, Subsonic and supersonic compressible flows, Oblique Shocks and Expansion Waves, Linearized Perturbation Theories, Linearized subsonic and supersonic cases, Blasius Solution, Elements of hypersonic flows, hypersonic Shock-wave relations, Inviscid Approximate Methods, Exact Numerical Methods, Method of Characteristics, Mach number Independence.

References:

AAE 3103: ROCKET PROPULSION [3 1 0 4]

References:
AAE 3104: AIRCRAFT DESIGN - I [2 1 0 3]

Purpose and scope of airplane design; stages in airplane design; Classification of airplanes based on purpose, Design requirements and configuration; factors affecting airplane configuration; historical background, Data collection and Preliminary three-view drawing, Weight estimation, Estimation of Wing loading and Thrust loading, Considerations for choice of Wing Parameters Airfoil section, Aspect ratio, Sweep, Taper ratio, Twist, Incidence, Dihedral and Vertical location, Wing Design and Selection of wing parameters. Fuselage and Tail Sizing, Weights and Center of Gravity, Design of control Surfaces.

References:

AAE 3111: GEOMETRIC MODELLING LAB-I [0 0 3 1]

Practice on 2-D part, Command Entities, Modelling of 2-D parts and Aircraft Components IC Engine connecting rod, Engine cross head, Aircraft Nose, Wing, Aileron, Assembly, 3-D modelling of Aircraft Components and Assembly.

References:

AAE 3112: AIRCRAFT DESIGN LAB [0 0 6 2]

Comparative studies of different types of airplanes and their specifications and performance details, Preliminary weight estimations, Selection of main parameters, Performance Calculations and stability estimates, Design of an aircraft wing, Design of an aircraft fuselage.

References:

SIXTH SEMESTER

HUM 4001, ESSENTIALS OF MANAGEMENT [2 1 0 3]


References:

AAE3201: AIRCRAFT DESIGN - II [2 1 0 3]

Introduction to aircraft structures, Introduction to aircraft structures, Planning and Structural weights, Design for manufacturability, producibility, maintainability, tooling and other considerations, Aircraft loads and aircraft materials, Introduction to loads, aero elasticity, flight maneuvers, wing design loads, empennage loads, Buckling & Stability, Cutouts, Fasteners and structural joints, Wing box Structure and wing leading & Trailing Edges, Empennage structure & Fuselage opening, Landing Gears & Engine Mounts, Fatigue, Damage tolerance, fail safe design and advanced composite structures, Performance and function, design criteria and ground rules, structural life estimation, fail safe design.

References:

AAE 3202: FINITE ELEMENT METHOD [2 1 0 3]

Introduction to matrix notations, role of computer, General steps in Finite element methods, Application of Finite element method, Advantages of Finite element methods, Definition of stiffness matrix, Derivation of stiffness matrix for spring elements, Transformation of vectors in 2D, Global stiffness matrix, computation of stresses in bar in x-y plane, Use of symmetric structure, beam stiffness, assemblage of beam stiffness matrices, distributed loading, beam element with nodal hinge, potential
energy method, Galerkin method for deriving he beam element equation, Basic concept of plane stress and plane strain, derivation of the constant Strain triangle element stiffness matrix and equations, Derivation of the Liner Strain triangular element stiffness matrix and examples.

References:

AAE 3211: GEOMETRIC MODELING LAB - II [0 0 6 2]
Surface Modeling and Command Entities, Different curve generation techniques, 3-D curve generation using different views, Sheet Metal Component and Modeling Aircraft Nose, Fuselage, Wing and Internal components.

References:

AAE 3212: STRUCTURAL ANALYSIS LAB [0 0 6 2]
Introduction to Ansys, 2D and 3D analysis of truss, beam, shell, plane, brick elements, 2D and 3D Thermal analysis, Modal Analysis of turbine blade, aircraft wing, nose and aileron Aerodynamics analysis of 2D and 3D Models, Crash analysis.

References:
EIGHTH SEMESTER

AAE 4297: SEMINAR
- Each student has to present a seminar individually, on any technical topic of current interest / latest advancement / topics not covered in the syllabus.
- The topic has to be approved by the Department and a report of the same has to be submitted a week before the day of the presentation.

AAE 4298: INDUSTRIAL TRAINING
- Each student has to undergo industrial training for a minimum period of 4 weeks. This may be taken in a phased manner during the vacation starting from the end of third semester.
- Student has to submit to the department a training report in the prescribed format and also make a presentation of the same. The report should include the certificates issued by the industry.

AAE 4299: PROJECT WORK / PRACTICE SCHOOL
- The project work may be carried out in the institution/industry/research laboratory or any other competent institution.
- The duration of the project work shall be a minimum of 16 weeks which may be extended up to 24 weeks.
- A mid-semester evaluation of the project work shall be done after about 8 weeks.
- An interim project report on the progress of the work shall be submitted to the department during the mid-semester evaluation.
- The final evaluation and viva-voice will be conducted after submission of the final project report in the prescribed form.
- Student has to make a presentation on the work carried out, before the department committee as part of project evaluation.

MINOR SPECIALIZATIONS

I. AERODYNAMICS

AAE 4001: AERODYNAMICS OF ROCKETS AND MISSILES [3 0 0 3]

References:
References:

AAE 4003: HYPERSONIC AEROTHERMODYNAMICS [3 0 0 3]

References:

AAE 4004: UNSTEADY AERODYNAMICS [3 0 0 3]

References:

II. BUSINESS MANAGEMENT

HUM 4011: FINANCIAL MANAGEMENT [2 1 0 3]
Introduction to financial management, Principle of accountancy, Sources of long term finance, Valuation of securities, Leverages, Working capital management, Capital budgeting, Cost of capital, Cash management, and Dividend decisions.

References:

HUM 4012: HUMAN RESOURCE MANAGEMENT [2 1 0 3]

References:
HUM 4013: MARKETING MANAGEMENT [2 1 0 3]

References:

HUM 4014: OPERATIONS AND SYSTEMS MANAGEMENT [2 1 0 3]
Types of production activities, Production consumption cycle, Functions of production and operations management, Importance and uses of forecasting, Product development and design, Product life cycle, Process design, Process charts, Flow diagrams and Man machine charts, Capacity planning, Aggregate planning, Scheduling, Operations strategy, Operation performance Frontier and productivity, Systems thinking, Systems engineering and its management, Systems decision process, Systems thinking, structure, classification, boundaries, visibility, System life cycle models, System dynamics and its importance in system thinking, System dynamics modeling process.

References:

OTHER PROGRAMME ELECTIVES

AAE 4005: AEROELASTICITY [3 0 0 3]

References:
References:

References:

References:

AAE 4014: ROBUST CONTROL [3 0 0 3]


References:

AAE 4015: SPACEFLIGHT DYNAMICS [3 0 0 3]

Particle dynamics, Newton's laws, co-ordinates and rotations, angular momentum, N-body problem, Two body problem, Orbit equation, conic section geometry, Kepler’s equation, orbital elements, tracking, Earth satellite operations, Hohmann transfer, Rendezvous, decay life time, low thrust transfer, Rigid body dynamics, Angular momentum and energy, parallel axis theory, Euler's equations, dual spin satellite, Satellite attitude dynamics and re-entry, Satellite dynamics, spinning spacecraft, gravity gradient stabilization, attitude determination, ballistic re-entry, skip re-entry, aero-braking, Interplanetary trajectories, Sphere of activity, launch windows, planetary flyby, optimal capture.

References:
OPEN ELECTIVES

AAE 3281: INTRODUCTION TO AEROSPACE ENGINEERING [3 0 0 3]
The first Aeronautical Engineers, Have an overview of the history of flight, Fundamental Thoughts, Ballooning. Apply basic/constitutive principles of mechanics of fluids - Bernoulli and control volume approaches, the source of all aerodynamic forces, Equation of state for a perfect gas, specific volume, anatomy of aircraft, anatomy of space vehicle, The Standard Atmosphere, Basics of Aerodynamics, Aircraft Flight, Airfoil Nomenclature, Lift, Drag and Moment co-efficient, Infinite versus finite wings, Pressure coefficient, Elements of Airplane Performance, Stability and Control, Astronautics, Propulsion, Introduction, Types of Propulsion system.

References:

AAE 3282: INTRODUCTION TO AVIONICS AND NAVIGATION SYSTEMS [3 0 0 3]

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### B. Tech in AUTOMOBILE ENGINEERING

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**Yearly Credits:**
- **Year II:** 16 credits
- **Year III:** 18 credits
- **Year IV:** 18 credits
- **Year V:** 16 credits
- **Year VI:** 16 credits
- **Year VII:** 15 credits
- **Year VIII:** 16 credits
THIRD SEMESTER

MAT 2101: ENGINEERING MATHEMATICS - III [2 1 0 3]

References:

AAE 2151: THEORY OF AUTOMOTIVE ENGINES [3 0 0 3]
Different Types of Automotive Power plants and applications, technical specification and terms, calculation, Otto cycle and diesel cycle engines, 2stroke and 4 Stroke engine operations. Automobile Engine Components, Function, Materials, Constructional details and Manufacturing process, Fuel supply systems in Engines-Carburetion and Gasoline Fuel Injection systems, Throttle body Injection, Multipoint injection&Gasoline direct injection systems, injection systems in diesel engines, fuel pumps, super charging, turbo chargers, governing of engines, cooling and lubrication systems for engines, modern automobile power plants, alternate power plants.

References:

AAE 2152: AUTOMOTIVE STRUCTURES AND DESIGN [3 1 0 4]
Materials and their properties- Stress-strain diagrams for ductile and brittle materials, Ductile and brittle fracture, Strength concepts, curved beams- Comparison with simple beams, Stress equation, Stresses in different cross sections in one plane. Shafts- Torsion of circular solid & hollow shafts, Misses Hacky theory for transmission shafting, Keys and pins- Types of keys, Stress in keys, Riveted joints- Types of joints, Modes of failure, Welded joints- Types of welds, Strength of welds, Threaded fasteners- Stresses in bolts, Dynamic and impact loading on bolts, Power screws, Fatigue- S-N diagram, Low cycle and high cycle fatigue, Fluctuating stresses, Goodman & Soderberg equations, Modified Goodman diagram, Stresses due to combined loading.
References:

AAE 2153: MATERIALS SCIENCE AND METALLURGY [3 0 0 3]

References:

AAE 2104: THERMODYNAMICS [3 1 0 4]

References:

AAE 2105: FLUID MECHANICS [2 1 0 3]
Fluid Properties, Fluid Statics, Intensity of pressure, Pascal's Law, Pressure variation in static fluid, Pressure measurement by manometers, Hydrostatic forces on surfaces, determination of metacentric height(experimental & Analytical), Continuity equation for one and three dimensional flow, fluid velocity and acceleration, energy possessed by fluid, Euler's equation of motion along a stream line and reducing it to Bernoulli's equation, Rayleigh's method and Buckingham's pi thermo, similitude, fluid Flow measurement devices, Viscous flow-critical Reynolds number, laminar flow through circular pipe, Laminar flow between fixed parallel plates, flow through pipes, flow past immersed bodies-lift and drag and form drag, streamlined body, bluff body, boundary layer concept, boundary layer separation.

References:

AAE 2161: COMPUTER AIDED PART MODELING [0 0 6 2]
Introduction to 2D entities, Mechanical Components, Automotive components, Introduction to 3D Entities, Introduction to Assembly commands, Automotive Component assembly, Rocker Arm Assembly, Plummer block assembly, IC Engine Connecting rod, Engine Cross Head, Screw Jack.

References:

AAE 2162: AUTOMOTIVE ENGINE LAB [0 0 3 1]
Dismantle the exteriors of the engine and service the rocker arm shaft. Service the cylinder head of the multi cylinder engine, Service the oil Sump, Oil Pump and Cam Shaft of the Engine. Dismantle and Service and assemble the Main Bearings, Fly Wheel, and Crank Shaft. Assembling of the components back to the engine.

References:


FOURTH SEMESTER

MAT 2202: ENGINEERING MATHEMATICS - IV [2 1 0 3]
Statistics: Measures of central tendency, measures of dispersion, Correlation coefficient, regression, least squares principles of curve fitting. Probability: finite sample spaces, conditional probability and independence, Bayes' theorem, one dimensional random variable, mean, variance. Two and higher dimensional random variables: mean, variance, correlation coefficient. Distributions: Binomial, Poisson, uniform, normal, gamma, Chi-square and exponential distributions, simple problems. Moment generating function, Functions of one dimensional and two dimensional random variables, Sampling theory, Central limit theorem and applications. Optimization: Basic concepts, Linear programming, Graphical and Simplex methods, penalty cost and two phase methods. Transportation problems.

References:
4. Hamdy A Taha “Operation research”, (7e), PHI

AAE2251: AUTOMOTIVE TRANSMISSION SYSTEM [3 0 0 3]
Power Required for Propulsion, Clutch: Functions and requirements of clutch in an automobile, different types of clutches, Gear box: Necessity of gear box, Calculation of gear ratios for vehicles, Fluid Coupling & Torque converters: Constructional details of various types, typical hydrodynamic transmission, Epicyclical Transmission: Principle of operation, types of planetary transmission, Calculation of gear ratio in different speeds, Numerical problems, Hydrostatic Drives, Automatic transmission, general arrangement & description of electric transmission, Drive to wheels: Introduction of propeller Shaft, types of joints, types of drives, types of axles, Front wheel drive and four wheel drives.

References:

AAE 2252: DESIGN OF MACHINE ELEMENTS [3 1 0 4]
Coil Springs, Fluctuating & impact loads, Energy stored in springs, Critical frequency, Concentric springs. Leaf Springs- Semi elliptic carriage springs, Deflection, Stresses in full length & graduate leaves, Stress equalization, Simple plate springs, Combination of leaf & coil springs. Design of - Spur Gears, Helical Gears, Worm Gears, Contact Bearings, Bearing characteristic number, Sommerfield number, Coefficient of friction, bearing modulus, Mechanism of film lubrication, Minimum oil film thickness, Rolling Contact Bearings, Life rating, Basic capacities, loading ratio, bearing materials. Belt Drives, Pulleys, Selection of belts and pulleys. Wire Rope Drives, Chain Drives, Mechanical Brakes.

References:

AAE 2204: LINEAR CONTROL THEORY [2 1 0 3]

References:

AAE 2261: COMPUTER AIDED VEHICLE MODELLING [0 0 6 2]
Introduction to command of CATIA, automotive body modelling, Introduction to command, Automotive body modelling, Sketch interface for 3D modelling, Exporting techniques for third party software, Basics of MATLAB command and Coding, Predefined MATLAB function, Plotting, Programing in MATLAB, Matrix computation, Numerical techniques.

References:

AAE 2262: AUTOMOTIVE TRANSMISSION LAB [0 0 3 1]
Use of transmission system tools, study of transmission layout, Dismantling and servicing of automobile clutches, different types of gear boxes, propeller shafts, final drive and differential, Rear axe dismantling and servicing.

References:

AAE 2263: MATERIAL TESTING LAB [0 0 3 1]
Introduction-Tensile test using UTM, load displacement and Stress Strain curves, Torsion Test, Compression Test, Bending Test, Impact Test, Impact test, Izode and Charpy Test, hardness Test, Brinell and Rockwell test, Fatigue and Shear Test, Test on Helical Spring, Flaw detection.

References:

FIFTH SEMESTER

AAE 3151: AUTOTRONICS [3 0 0 3]
Automotive Electrical system, wire diagram, automotive electronics, Open and close loop systems for engine - control algorithms and its application, automotive communication protocol, Electronic management of chassis system,Sensors and Actuators, electronic Fuel Injection and Ignition Systems, Advantages of electronic ignition systems, Digital Engine Control System: Open loop and closed loop control systems-Engine cranking and warm up control, Distributor less ignition, Exhaust emission control engineering, automotive development tools, clusters, electrical and hybrid systems, hardware architecture, software architecture.

References:

AAE 3152: THEORY OF MACHINES [3 1 0 4]
Introduction, kinematic of motion, harmonic motion, Mechanism and inversions, Degrees of freedom. Mathematical analysis of velocity and accelerations of simple mechanisms. Synthesis of cams, types of cams and followers, disc cam with reciprocating and oscillating followers, synthesis of gears; spur gear terminology, law of gearing, interference and under cutting, Gear trains, simple, compound, reverted and epicyclic gear trains, differential of an automobile, balancing of rotating masses, balancing of reciprocating engines, governors and its characteristics, porter and Hartnellgoverners. Gyroscopic effect on rotating disc, gyroscopic effect on automobiles.

References:

AAE 3153: ACTUATION SYSTEMS [3 1 0 4]
Introduction- Composition air and Gas Laws, Air Preparation system, FLR unit, Linear and rotary actuators, pneumatic valves classifications and constructional features, circuit design, cascade method, multiple cylinder actuation circuit, electro pneumatics, control elements of electro pneumatics, sensors, PE convertors, latching, direct and indirect actuation circuits, Timers, Counters, Introduction to PLC, structure of PLC, ladder programming, Hydraulic fluid properties, Power pack, construction and working of types of control valves, Hydraulic actuators, Classification of hydraulic pumps, performance of pumps, Accumulator, Intensifiers, Design of hydraulic circuits.
AAE 3154: MEASUREMENT AND METROLOGY [3 0 0 3]
Definition, types, need of inspection, metrology terminology, principle aspects of measurements, methods of measurements, errors, units, Measurements of Straightness, flatness, parallelism, squareness, roundness, cylindrical, coaxial, concept of interchangeability, selective assembly, limits and tolerances, fits, geometric tolerances, limit gauge, Optical and pneumatic comparators, Types of gears, Spur gear terminology, forms of gears, fits in spur gears, Force measurement system, force and load sensors, strain gauges, Mechanical analogy pressure gauges, pressure at high temperature, Temperature measuring devices. Determination of air flow velocity, measurement of flow direction, velocity measurement techniques.

References:

AAE 3161: THERMAL ENGINEERING LAB [0 0 3 1]
Two stage air compressors, identification of flash and fire point of fuels, I.C. Engines, centrifugal air blower, compression ratio of 2-5 petrol engine, morsen test rig, I.C. Engines Performance Test on 2-5 petrol engine. Viscometer, port timing diagrams. Refrigeration unit, Air conditioning unit.

References:

AAE 3162: SYSTEM SIMULATION LAB [0 0 6 2]
Introduction-Operation of single acting and double acting cylinders, flow control valves, Latching circuits, Oscillation and multiple actuations, Introduction to MAT LAB, Engine model simulation, Vehicle dynamics, rigid body dynamics, cruise control simulation.

References:

SIXTH SEMESTER

HUM 4001: ESSENTIALS OF MANAGEMENT [2 1 0 3]

References:

AAE 3251: VEHICLE AERODYNAMICS [2 1 0 3]
Historical development trends, Fundamental of fluid mechanics, External & Internal flow problem. Resistance to vehicle motion, Performance, Fuel consumption and performance, Potential of vehicle aerodynamics, Cars as a bluff body, Flow field around car, drag force, types of drag force, Front end modification, Boat tailing, flow over the car, front end, wind shield, roof, combination flow. Dust flow patterns at the rear, effect of fasteners, side wind problems, vehicle dynamics under side winds - the effects of forces and moments. Dust accumulation on the vehicle, wind noise, Principle of wind tunnel technology - Limitation of simulation, measurement techniques, road testing methods.

References:
AAE 3252: AUTOMOTIVE CHASSIS AND SUSPENSION [2 1 0 3]
Automotive chassis and frames, functions, requirements, classification, material used, manufacturing process, layout of chassis, Braking systems, requirements, principle of operation, classification, different types of vehicle service brakes, and mechanics of brakes, components, troubleshooting, ABS, Steering systems, condition for true steering, steering systems, steering linkages, power steering, Suspension systems, classification, functions, rigid and independent suspension systems, Automotive wheels and tyres, requirement of tyres, specification and detail of various tyre and suspension system, independent suspension system, front rear and rigid axel.

References:

AAE3261: AUTOMOTIVE MACHINE SHOP [0 0 6 2]
Preparation of models using welding techniques. Exercises on turning, gear cutting, shaping and grinding operations. Machining using CNC Turning Center and Vertical Machining Center. Cylindrical boring, Honing, Crankshaft grinding, Valve seat cutter and valve re-facing, Line re-boring.

References:

AAE 3262: VEHICLE AERODYNAMICS LAB [0 0 6 2]
Introduction-Calibration of wind tunnel, Aerodynamic analysis of different body, Drag of different bodies, Pressure distribution over an aero foil at different angle of attacks, Wake survey method, Flow Visualization Techniques, Six component balance.

References:
radial heat flow through sphere and composite spheres, Critical thickness of insulation, Extended Surfaces, Convection Heat Transfer-Application of dimensional analysis to free and forced convection, Dimensionless numbers, Boiling heat transfer, Heat Exchangers- overall heat transfer coefficient, fouling factor, Logarithmic mean temperature difference, Effectiveness and Number of transfer units, Radiation-Black Bodies, emissive power, intensity of radiation, heat transfer due to radiation between black bodies and grey bodies.

References:

EIGHTH SEMESTER

AEE 4297: SEMINAR
- Each student has to present a seminar individually, on any technical topic of current interest / latest advancement / topics not covered in the syllabus.
- The topic has to approved by the Department and a report of the same has to be submitted a week before the day of the presentation.

AEE 4298: INDUSTRIAL TRAINING
- Each student has to undergo industrial training for a minimum period of 4 weeks. This may be taken in a phased manner during the vacation starting from the end of third semester.
- Student has to submit to the department a training report in the prescribed format and also make a presentation of the same. The report should include the certificates issued by the industry.

AEE 4299: PROJECT WORK / PRACTICE SCHOOL
- The project work may be carried out in the institution/industry/ research laboratory or any other competent institutions.
- The duration of the project work shall be a minimum of 16 weeks which may be extended up to 24 weeks.
- A mid-semester evaluation of the project work shall be done after about 8 weeks.
- An interim project report on the progress of the work shall be submitted to the department during the mid-semester evaluation.
- The final evaluation and viva-voice will be conducted after submission of the final project report in the prescribed form.
- Student has to make a presentation on the work carried out, before the department committee as part of project evaluation.

MINOR SPECIALIZATION

I. POWER TRAINS

AEE 4019: ENGINE TRIBOLOGY [3 0 0 3]
Theory, Lubricants and their physical properties, Reynolds equation, Thermal, Inertia and Turbulent effects, design of fluid film bearings, lubricant flow and delivery, Performance analysis of thrust and journal bearings full, partial and pivoted journal bearing design, Special bearings, Hydrostatic lubrication, hydrostatic bearing design, Rolling element bearings, geometry and kinematics, Friction and Wear, theory of friction, sliding and rolling friction, friction properties of metallic and non-metallic materials wear, types of wear mechanism, wear resistance materials, Surface topography, electron microscope and friction and wear measurements, bearing vibration measurement.

References:
Introduction to hybrid vehicles. Social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies, Requirements of hybrid vehicles, Performance characteristics of road vehicles, lay out of hybrid vehicles, Design considerations, Classification of electric drives, DC motors-series wound, shunt wound. Compound wound and separately excited motors, Permanent magnet motors, AC motors, Hybrid architecture, Hybrid power plant specifications, Matching electric drive and ICE, sizing the propulsion motor, Energy storage technology, storage batteries, Classification of batteries, Recent developments in storage batteries, Classification of fuel cells, Application of fuel cells.

References:

AAE 4021: ELECTRIC AND HYBRID VEHICLES [3 0 0 3]

Introduction to hybrid vehicles. Social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies, Requirements of hybrid vehicles, Performance characteristics of road vehicles, lay out of hybrid vehicles, Design considerations, Classification of electric drives, DC motors-series wound, shunt wound. Compound wound and separately excited motors, Permanent magnet motors, AC motors, Hybrid architecture, Hybrid power plant specifications, Matching electric drive and ICE, sizing the propulsion motor, Energy storage technology, storage batteries, Classification of batteries, Recent developments in storage batteries, Classification of fuel cells, Application of fuel cells.

References:

AAE 4022: TWO AND THREE WHEELED VEHICLE [3 0 0 3]

Introduction- Historical background, Layouts, Classifications, Engine construction and components, Valve timing diagrams, Types of engines, Fuel supply system, Types of cooling system, Types of lubrication system, Classification and constructional details of clutch, Design of clutch systems, gearbox system, Design of gears, Transmission types, CVT, Final drive, Suspension system, Front fork assembly, Steering geometry, Types of brakes, Types of wheels, Constructional features of tyres, Seating arrangements, Vehicle stability and aerodynamic properties, Safety arrangements, Maintenance of Two and Three wheelers, Fuel economy and emissions.

References:

II. BUSINESS MANAGEMENT

HUM 4011: FINANCIAL MANAGEMENT [2 1 0 3]

Introduction to financial management. Principle of accountancy, Sources of long term finance, Valuation of securities, Leverages, Working capital management, Capital budgeting, Cost of capital, Cash management, and Dividend decisions.

References:

HUM 4012: HUMAN RESOURCE MANAGEMENT [2 1 0 3]


References:

HUM 4013: MARKETING MANAGEMENT [2 1 0 3]

References:

HUM 4014: OPERATIONS AND SYSTEMS MANAGEMENT [2 1 0 3]

References:

OTHER PROGRAMME ELECTIVES

AAE 4002: COMPUTATIONAL FLUID DYNAMICS [3 0 0 3]

References:

AAE 4007: COMPOSITE STRUCTURES [3 0 0 3]
Introduction to the FRP composites, Mechanical behaviour of a lamina, Stress-Strain relations for a unidirectional and orthotropic lamina, effective Modul of a continuous fibre reinforced lamina - Models based on mechanics of materials, theory of elasticity. Mechanical Behaviour of a Laminate, Stress displacement relationship, Stress strain relationship, Laminate stiffness, Determination of lamina stresses and strains. Special cases of laminate stiffness and Inter-laminar Stresses, Failure of Continuous Fibre-reinforced orthotropic Lamina, Maximum stress/strain criteria, Tsai-Hill and Tsai-Wu criterion, Hygrothermal effects on material properties on response of composites.

References:

AAE 4008: COMPUTER INTEGRATED MANUFACTURING [3 0 0 3]
Introduction, general construction requirements. Methods of improving machine accuracy and productivity, Co-ordinate systems, point to point and contour programming, manual method (word address format only), Adaptive Control Machining System, Introduction to Robotics, Robot anatomy physical configurations, Technical features, Automated Inspection and Testing: Principle and Methods, Part classification and coding, production flow analysis, benefits of group technology, Material Handling System, Flexible Manufacturing System, Computer aided Process planning, Computer integrated planning systems. Material requirement planning, capacity planning, shop floor control, automatic identification systems, automated data collection systems.

References:

AAE 4023: AUTOMOTIVE AIR-CONDITION [3 0 0 3]
Introduction, Fundamentals of Refrigeration, Vapour compression refrigeration, coefficient of performance, Effect of sub cooling & super heating, Psychrometric properties and processes, Components of Air conditioning system, Compressor, Evaporator, Condenser, Expansion valve, Receiver Drier, Filters, Mufflers, Special features-Compressor protection, Anti freezing relay, Operation of an Air-conditioning system-Type of Air conditioners. Heaters-Vehicle ventilation, combination heater and air conditioner, manually controlled air conditioner and heater system, automatically controlled air conditioner and heater systems, Diagnostics and trouble shooting in air conditioners, Causes of air conditioner Failure, leak testing guide, Servicing and maintenance of Air Conditioners.
References:

AAE 4029: PRODUCT DESIGN AND MANUFACTURING [3 0 0 3]
Introduction to Design by evolution & innovation, Phases of design process, phase flow chart, Feasibility study, Preliminary design, detailed design and assembly, product strategies, Standardization, role of aesthetics, human engineering considerations in product design, man/machine information exchange, Concept generation process, Theory of inventive problem solving, Principal stress trajectories, Balanced design, designing for uniform strength, tension vs. compression, Comparison of strength & rigidity based design, Design for machining, ribs, corrugates, laminates and membrane, Product & component optimization, Optimization by Linear programming & Geometric programming.

References:

AAE 4030: RAILWAY ENGINEERING [3 0 0 3]
Introduction: Indian railways, Development and classification of the Indian railway, Train resistances and rolling stock, Locomotives, Coaches, Wagons, Train brakes, Tractive effort of a locomotive, Track stresses, Rails and Rail gauges, Fastenings for rails, Sleepers: Functions of sleepers, Types of sleepers, Relaying of track. Maintenance: Necessity of maintenance, maintenance processes, Maintenance & track cleanliness, Maintenance methods, Various methods of maintenance, Maintenance and control of density and quality, Maintenance and control of stress, Maintenance and control of settlement, Maintenance and control of alignment, Maintenance and control of wear, Maintenance and control of roughness, Maintenance and control of lateral movements, Maintenance and control of structural strength, Maintenance and control of resistance to fatigue, Maintenance and control of fatigue life, Maintenance and control of fatigue cracks, Maintenance and control of creep, Maintenance and control of creep rupture, Maintenance and control of wear resistance, Maintenance and control of friction, Maintenance and control of corrosion, Maintenance and control of rust, Maintenance and control of scale, Maintenance and control of abrasion, Maintenance and control of impact, Maintenance and control of impact tests, test equipment and sensors.

References:

AAE 4031: ROBUST DESIGN [3 0 0 3]
Robustness strategy and its primary tools, hypothesis testing, testing of hypothesis using F Test, Robust parameter design, Criteria for the Use of Experiment Design Methods Orthogonal Arrays, design of orthogonal arrays, Analysis of variance (ANOVA), ANOVA for Orthogonal Arrays, robust parameter design, signal to noise ratio, Two factor factorial design, two stage nested design, fractional factorial design, introduction to multivariate analysis of variance (MANOVA) Statistical analysis, model adequacy checking Linear regression, simple regression and multiple regressions, Experimental methods for fitting the response surface, types of design, Response surface design with blocks.

References:

AAE 4032: STATISTICAL QUALITY CONTROL & RELIABILITY [3 0 0 3]
Fundamentals of quality and quality control, quality philosophy, describing variation, box plot, frequency distribution and histogram, measure of central tendencies, Probability distributions, continuous distribution and discrete distributions, tolerance allocation, Control chart for variables, X-bar and R-Chart and X-Bar and Sigma Chart, control chart for attributes, control chart for defect and number of defectives, Process capability analysis and process capability index, acceptance sampling, operating characteristic curves, Dodge Romig and MIL-STD acceptance sampling tables, concept of reliability, Reliability systems, maintainability.

References:

AAE 4033: VEHICLE BODY ENGINEERING AND SAFETY [3 0 0 3]
Introduction, Industrial organization, Non utilized body and chassis, partially utilized body and chassis, unitized body and chassis, body shape evolution, Computer Aided Styling, body modeling, Digital Mockup, Virtual Reality and body engineering, Body in white, body side, fenders, roof assembly, front frame, rear frame, compartment floor, closed body, commercial vehicles and trucks, Outer body components, weather strips, glass and mirror, moveable parts, window shield, wiper assembly, vehicle lighting and signaling and layout, Safety belts, Airbag, Dashboard design and manufacturing techniques, seats, Air-conditioning systems, Biomechanics, Simplified models for crash, impact tests, test equipment and sensors.
References:

OPEN ELECTIVES

AAE 3283: AUTOMOBILE ENGINEERING [3 0 0 3]

Introduction - Engine classifications, Cylinder arrangements, working and constructional features of Engine components, Valve operating mechanisms, valve timing diagrams, fuel supply system, Battery ignition system, types of cooling and lubrication system, classification and working of clutch system, design of clutch components, Sliding and constant mesh gear box, Calculation of power, gear ratio and tractive efforts, Torque converter and fluid coupling, Propeller shaft, Differential, Types of suspension system, types of brakes, calculation of brake torque and stopping distance, Tyres and wheel system, Starting system, Bendix drive, lighting circuit.

References:

AAE 3284: AUTOMOTIVE POLLUTION AND CONTROL [3 0 0 3]


References: