



ANNA UNIVERSITY, CHENNAI AFFILIATED INSTITUTIONS

B.E. AEROSPACE ENGINEERING REGULATIONS – 2017

HS8151 COMMUNICATIVE ENGLISH

- C101.1 Participate effectively in informal conversations; introduce themselves and their friends and express opinions in English.
- C101.2 Comprehend conversations and short talks delivered in English
- C101.3 Write short essays of a general kind and personal letters and emails in English.

MA8151

ENGINEERING MATHEMATICS – I

- C102.1 Use both the limit definition and rules of differentiation to differentiate functions.
- C102.2 Apply differentiation to solve maxima and minima problems.
- C102.3 Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
- C102.4 Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
- C102.5 Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- C102.6 Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
- C102.7 Apply various techniques in solving differential equations.

PH8151 ENGINEERING PHYSICS

- C103.1 the students will gain knowledge on the basics of properties of matter and its applications,
- C103.2 the students will acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics,
- C103.3 the students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers.
- C103.4 the students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes, and
- C103.5 the students will understand the basics of crystals, their structures and different crystal growth techniques.

CY8151 ENGINEERING CHEMISTRY

- C104.1 The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

GE8151 PROBLEM SOLVING AND PYTHON PROGRAMMING

- C105.1 Develop algorithmic solutions to simple computational problems
- C105.2 Read, write, execute by hand simple Python programs.
- C105.3 Structure simple Python programs for solving problems.
- C105.4 Decompose a Python program into functions.
- C105.5 Represent compound data using Python lists, tuples, dictionaries.
- C105.6 Read and write data from/to files in Python Programs.

GE8152 ENGINEERING GRAPHICS

- C106.1 familiarize with the fundamentals and standards of Engineering graphics

- C106.2 perform freehand sketching of basic geometrical constructions and multiple views of objects.
- C106.3 project orthographic projections of lines and plane surfaces.
- C106.4 draw projections and solids and development of surfaces.
- C106.5 visualize and to project isometric and perspective sections of simple solids.

GE8161 PROBLEM SOLVING AND PYTHON PROGRAMMING

- C107.1 Write, test, and debug simple Python programs.
- C107.2 Implement Python programs with conditionals and loops.

BS8161 PHYSICS AND CHEMISTRY LABORATORY

- C108.1 apply principles of elasticity, optics and thermal properties for engineering applications.
- C108.2 The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

HS8251 TECHNICAL ENGLISH OBJECTIVES:

- C109.1 Read technical texts and write area- specific texts effortlessly.
- C109.2 Listen and comprehend lectures and talks in their area of specialization successfully.
- C109.3 Speak appropriately and effectively in varied formal and informal contexts.
- C109.4 Write reports and winning job applications.

MA8251 ENGINEERING MATHEMATICS – II

- C110.1 Eigen values and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.
- C110.2 Gradient, divergence and curl of a vector point function and related identities.
- C110.3 Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.
- C110.4 Analytic functions, conformal mapping and complex integration.
- C110.5 Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with

PH8251 MATERIALS SCIENCE

- C111.1 the students will have knowledge on the various phase diagrams and their applications
- C111.2 the students will acquire knowledge on Fe-Fe₃C phase diagram, various microstructures and alloys
- C111.3 the students will get knowledge on mechanical properties of materials and their measurement
- C111.4 the students will gain knowledge on magnetic, dielectric and superconducting properties of materials
- C111.5 the students will understand the basics of ceramics, composites and nanomaterials.

BE8253 BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION

- C112.1 Understand electric circuits and working principles of electrical machines
- C112.2 Understand the concepts of various electronic devices
- C112.3 Choose appropriate instruments for electrical measurement for a specific application

AC8201 INTRODUCTION TO AEROSPACE ENGINEERING

- C113.1 Ability to understand aerodynamics, lift, drag, and the standard atmosphere, aircraft performance, stability, and control, propulsion, structures, rocket and spacecraft trajectories and orbits.

GE8292 ENGINEERING MECHANICS

- C114.1 illustrate the vectorial and scalar representation of forces and moments
- C114.2 analyse the rigid body in equilibrium
- C114.3 evaluate the properties of surfaces and solids
- C114.4 calculate dynamic forces exerted in rigid body
- C114.5 determine the friction and the effects by the laws of friction

GE8261 ENGINEERING PRACTICES LABORATORY

- C115.1 fabricate carpentry components and pipe connections including plumbing works.
- C115.2 use welding equipments to join the structures.
- C115.3 Carry out the basic machining operations
- C115.4 Make the models using sheet metal works
- C115.5 Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundary and fittings
- C115.6 Carry out basic home electrical works and appliances
- C115.7 Measure the electrical quantities
- C115.8 Elaborate on the components, gates, soldering practices.

BE8261 BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION

- C116.1 Ability to determine the speed characteristic of different electrical machines
- C116.2 Ability to design simple circuits involving diodes and transistors
- C116.3 Ability to use operational amplifiers

MA8353 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

- C201.1 Understand how to solve the given standard partial differential equations.
- C201.2 Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
- C201.3 Appreciate the physical significance of Fourier series techniques in solving one- and two- dimensional heat flow problems and one-dimensional wave equations.
- C201.4 matical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical
- C201.5 Use the effective mathematical tools for the solutions of partial differential equations by using Z-transform techniques for discrete time systems.

AE8301 AERO ENGINEERING THERMODYNAMICS

- C202.1 Able to relate laws of thermodynamics to jet engine components.
- C202.2 Understands principle operation of piston engine and jet engines.
- C202.3 Able to identify efficient cycle of air and jet engines.
- C202.4 Capable to illustrate condition of working medium.
- C202.5 Eligible to recognize and calculate heat transfer in complex systems involving several heat transfer mechanisms.

CE8394 FLUID MECHANICS AND MACHINERY

- C203.1 Apply mathematical knowledge to predict the properties and characteristics of a fluid.
- C203.2 Can analyse and calculate major and minor losses associated with pipe flow in piping networks.
- C203.3 Can mathematically predict the nature of physical quantities
- C203.4 Can critically analyse the performance of pumps
- C203.5 Can critically analyse the performance of turbines.

CE8395 STRENGTH OF MATERIALS FOR MECHANICAL ENGINEERS

- C204.1 Understand the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal
- C204.2 Understand the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.
- C204.3 Apply basic equation of simple torsion in designing of shafts and helical spring
- C204.4 Calculate the slope and deflection in beams using different methods.
- C204.5 Analyze and design thin and thick shells for the applied internal and external pressures.

ME8392 MANUFACTURING TECHNOLOGY

- C205.1 The Students can able to use different manufacturing process and use this in industry for component production

AC8301 SPACE SCIENCE

- C206.1 Obtain a broad, basic knowledge of the space sciences.
- C206.2 Understand the scientific concepts such as evolution by means of natural selection, age of the Earth and solar system.
- C206.3 Detail the main features and formation theories of the various types of observed galaxies, in particular the Milky Way.
- C206.4 Explain stellar evolution, including red giants, supernovas, neutron stars, pulsars, white dwarfs and black holes, using evidence
- C206.5 Detail the presently accepted formation theories of the solar system based upon observational and physical constraints;

AE8311 THERMODYNAMICS LABORATORY

- C207.1 Ability to perform test on diesel/petrol engine
- C207.2 Ability to explain the characteristics of the diesel/Petrol engine
- C207.3 Ability to determine the properties of the fuels.

CE8481 STRENGTH OF MATERIALS LABORATORY

- C208.1 The students will have the required knowledge in the area of testing of materials and components of structural element

CE8462 FLUID MECHANICS AND MACHINERY LABORATORY

- C209.1 Ability to use the measurement equipment for flow measurement
- C209.2 Ability to do performance trust on different fluid machinery

MA8491 NUMERICAL METHODS

- C210.1 Understand the basic concepts and techniques of solving algebraic and transcendental equations.
- C210.2 Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.
- C210.3 Apply the numerical techniques of differentiation and integration for engineering problems.
- C210.4 Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- C210.5 Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques.

AC8401 AERODYNAMICS

- C211.1 Calculate the airspeed, static and dynamic pressure of the flow at any point using Continuity and Bernoulli equations.
- C211.2 Explain the effect of airflow on an aircraft and its components using the laws of physics and fundamental mathematical methods
- C211.3 Describe the conformal transformation and its application to fluid flow problems
- C211.4 Understand the fluid flow characteristics over aerofoils, wings, and airplanes.

C211.5 Obtain the knowledge in shock phenomenon and fluid waves.

AC8402 AEROSPACE STRUCTURAL MECHANICS

- C212.1 Recognize phenomena such as deformation, stress, and strain in simple aerospace structural elements.
- C212.2 Solve the simple 1D axial deformation, torsion, and bending problems.
- C212.3 Compute shear stresses and twist angles in torsion for solid sections, closed thin-walled sections and open thin-walled sections.
- C212.4 Understand the shear centre of a beam and an ability to predict its location.
- C212.5 Evaluate the suitability of composite materials for the simple structural elements for specific aerospace applications.

AC8403 FLIGHT SYSTEMS AND INSTRUMENTATION

- C213.1 Understand the controls and operation of an aircraft.
- C213.2 Understand the aircraft systems are maintained.
- C213.3 Understand the systems available in the aircraft engines.
- C213.4 Know the systems available in a missile.
- C213.5 Know the basics of systems available in a spacecraft.

PR8451 MECHANICS OF MACHINES

- C214.1 Understand the principles in the formation of mechanisms and their kinematics.
- C214.2 Understand the construction features of Gears and Gear Trains.
- C214.3 Understand the effect of friction in different machine elements.
- C214.4 Understand the importance of balancing.
- C214.5 Understand the importance of Governors and Gyroscopic effects.
- C214.6 Understand the importance of vibration.

GE8291 ENVIRONMENTAL SCIENCE AND ENGINEERING

- C215.1 Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves.
- C215.2 Public awareness of environmental is at infant stage.
- C215.3 Ignorance and incomplete knowledge have led to misconceptions
- C215.4 Development and improvement in std. of living has led to serious environmental disasters

AC8411 LOW AND HIGH SPEED AERODYNAMICS LABORATORY

- C216.1 Critically assess the wind tunnel for wall effect, blockage and support interference on the measurements.
- C216.1 Find the pressure distribution and forces acting over aerodynamical models.
- C216.1 Understand flow over the aerodynamical model through flow visualisation.
- C216.1 Understand the limits and usefulness of the experimental approach.
- C216.1 Present the experimental findings in clear oral and concise report.

AC8412 STRUCTURES LABORATORY

- C217.1 Understand the effects of bending in the aerospace structures.
- C217.2 Find the shear centre of the aerospace structures.
- C217.3 Conduct test on beams for the structural analysis.
- C217.4 Use the photo-elastic techniques on the aerospace structures.

AC8413 FLIGHT SYSTEMS LABORATORY

- C218.1 Understand the procedure of ground level checking.
- C218.2 Conduct test on the various systems available in the spacecraft.
- C218.3 Understand the procedures of maintenance and rectification.
- C218.4 Present the experimental findings in clear oral and concise report.

AE8001 SPACE MECHANICS

- C301.1 Ability to perform satellite injection, satellite perturbations and trajectory control
- C301.2 Apply orbital mechanics to control ballistic missile.
- C301.3 Estimate the trajectory/orbit of a space vehicle or a satellite in a suitable coordinate system.
- C301.4 Calculate the delta-v required for transferring a spacecraft from one orbit to another.
- C301.5 Perform orbit perturbation analysis for satellite orbits.

AC8501 AIR BREATHING PROPULSION

- C302.1 Acquire the fundamentals in internal flow, turbomachinery aerodynamics, and air-breathing propulsion system design.
- C302.2 Understand the performance characteristics of the compressors.
- C302.3 Understand the performance characteristics of the turbines.
- C302.4 Develop physical insight into the phenomena which characterize the fluid dynamic behaviour of air-breathing propulsion.
- C302.5 Determine the approximate use parameters of an existing gas turbine engine.

AE8501 FLIGHT DYNAMICS

- C303.1 Know about the forces and moments that are acting on an aircraft, the different types of drag, drag polar, ISA, variation of thrust.
- C303.2 Have understanding about performance in level flight, minimum drag and power required, climbing, gliding and turning flight.
- C303.3 Knowledge about degrees of stability, stick fixed and stick free stability, stability criteria, effect of fuselage and CG location, stick.
- C303.4 Understanding about lateral control, rolling and yawing moments, static directional stability, rudder and aileron control
- C303.5 Understanding about dynamic longitudinal stability, stability derivatives, modes and stability criterion, lateral.

AC8502 FUNDAMENTALS OF AEROSPACE CONTROL ENGINEERING

- C304.1 Characterise the behaviour of elementary feedback control systems.
- C304.2 Synthesise feedback controllers using root locus, Nyquist and Bode techniques.
- C304.3 Analytically quantify the time and frequency domain behaviour of dynamic systems.
- C304.4 Specify steady state control system requirements and select prototype controller structures to achieve these requirements.
- C304.5 Formulate dynamic feedback controller design specifications in the frequency domain.

AC8503 ELEMENTS OF SPACEFLIGHT

- C305.1 Summarise the historical evaluation of aviation.
- C305.2 Explain the forces and moments acting on a space flight.
- C305.3 Understand the materials used in the manufacturing of aerospace structures.
- C305.4 Identify the suitable power plant for the aerospace vehicles.
- C305.5 Explain the governing dynamics of spaceflight, with emphasis on rocket dynamics and basic orbital mechanics.

AC8511 AEROSPACE PROPULSION LABORATORY

- C306.1 Analyse the performance of the propeller.
- C306.2 Measure the wall pressure of the engine components.
- C306.3 Visualize the flow pattern in the engine components.
- C306.4 Explain the concepts of free jet and wall jet.

AC8512 SPACE LAUNCH VEHICLE MINI PROJECT – I

- C307.1 Translate a design brief for a complex, indeterminate aerospace system into a set of well- defined engineering requirement.
- C307.2 Generate, using creative techniques, credible design concepts for aerospace systems based on a set of engineering requirements.
- C307.3 Evaluate design concepts for aerospace systems using analysis, experiment or simulation methods.
- C307.4 Demonstrate effective teamworking and project management skills.

HS8581 PROFESSIONAL COMMUNICATION

- C308.1 • Make effective presentations
- C308.2 • Participate confidently in Group Discussions.
- C308.3 • Attend job interviews and be successful in them.
- C308.4 • Develop adequate Soft Skills required for the workplace

AC8601 SPACE PROPULSION

- C309.1 Explain hypersonic propulsion systems and their application to aerospace vehicles.
- C309.2 Understand the traditional propulsion concepts, including liquid, solid, hybrid, ion, and thermal rockets.
- C309.3 Know the applications and principles of solid, liquid, and hybrid rocket propulsion systems.
- C309.4 Understand the performances of various rocket propulsion systems.
- C309.5 Apply the concepts of electrical propulsion in rocket.

AE8008 VIBRATION AND ELEMENTS OF AEROELASTICITY

- C310.1 Gaining understanding of single and multi-degree vibrating systems
- C310.2 Ability to use numerical techniques for vibration problems
- C310.3 Knowledge acquired in aero elasticity and fluttering.
- C310.4 Differentiate types of vibrations according to dampness and particle motion.
- C310.5 Solve Rayleigh and Holzer method to find natural frequency of an object.
- C310.6 Understand the formation of Aileron reversal, flutter and wing divergence.

AE8601 FINITE ELEMENT METHODS

- C311.1 Write flow chart of finite element steps and understand the convergence of the problem
- C311.2 Solve stiffness matrix for bar, beam and frame problems using suitable boundary condition.
- C311.3 Plane stress and plane strain condition are used to understand 2d structures.
- C311.4 Modelling of 2d and 3d structures using isoparametric elements
- C311.5 Apply the concepts of finite element methods to solve fluid flow and heat transfer problems.

AC8602 SPACECRAFT DYNAMICS

- C312.1 Develop math models of flight vehicles.

- C312.2 Understand the operations of the satellite.
- C312.3 Analyse dynamics and control of flight vehicles.
- C312.4 Make effective use of gyroscopes.
- C312.5 Demonstrate knowledge on the attitude dynamics of aerospace flight vehicles.

AE8751 AVIONICS

- C313.1 Ability to build Digital avionics architecture
- C313.2 Ability to Design Navigation system
- C313.3 Ability to design and perform analysis on air system.
- C313.4 Integrate avionics systems using data buses.
- C313.5 Analyze the performance of various cockpit display technologies.
- C313.6 Design autopilot for small aircrafts using MATLAB

AC8001 COMPUTER AIDED DESIGN AND ANALYSIS

- C314.1 Prepare and read engineering drawings.
- C314.2 Visualize an engineering object.
- C314.3 Understand solid models created in computer.
- C314.4 Understand the relation between 2D drafting and 3D models.
- C314.5 Understand the graphical models for further engineering applications.

AC8611 CAD LABORATORY

- C315.1 Use commercial design software and understand its structure.
- C315.2 Design the aircraft and spacecraft components and solve engineering problems.
- C315.3 Write formal technical report and convey engineering.

AC8612 SPACE LAUNCH VEHICLE MINI PROJECT – II

- C316.1 execute the conceptual stage of a spacecraft design in respect of its stability.
- C316.2 plan and co-ordinate the activities of a mini project.
- C316.3 implement the necessary phases in the design process and produce the required outcomes of each phase.
- C316.4 communicate design outcomes to technical and lay readers.
- C316.5 apply a number of standard methods to various phases of the design process.

AC8613 AVIONICS LABORATORY

- C317.1 Research at the lab deals with the different aspects of the Guidance, Navigation and Control loop which is instrumental
- C317.2 Understand the applications of current activities include rendezvous and docking between spacecraft, grasping and deorbiting.
- C317.3 Understand the significant heritage on formation flying, large and deployable space systems and structures
- C317.4 Know the lab stresses, whenever possible, real world testing with the available experimental setups.

AC8701 HYPERSONIC AERODYNAMICS FOR AEROSPACE VEHICLES

- C401.1 Analyse the trajectories of ballistic missiles, space planes, and air-breathing hypersonic vehicles.
- C401.2 Have a basic understanding of real gas effects such as vibrational activation, dissociation, ionization, and molecular.
- C401.3 Perform perfect and real gas analyses of shock waves.

- C401.4 Determine the stagnation properties of a hypersonic vehicle.
- C401.5 Determine profiles of pressure, skin friction, and heat transfer around a vehicle.

AC8702 COMPUTATIONAL FLUID DYNAMICS FOR AEROSPACE

- C402.1 Explain and calculate the governing equations for fluid flow.
- C402.2 Explain how grids are generated and conduct a grid-convergence assessment.
- C402.3 Understand the issues about two-phase flow modelling.
- C402.4 Understand the concept of discretization, upwind differencing and implicit, explicit solutions.
- C402.5 Apply finite difference and finite volume methods to fluid flow problems.

AC8703 ROCKETS AND LAUNCH VEHICLES

- C403.1 Learn about the different systems of rockets and launch vehicles, formulation of the equation of motion.
- C403.2 Understand the function of the solid propellant propulsion and pyrotechnic systems and the design principles.
- C403.3 Understand the function of the liquid propellant propulsion and control systems and the design principles.
- C403.4 Formulate the equation of motions for a mission and spent stage separation dynamics
- C403.5 Understand the system design, construction, function, performance and testing aspects.

AC8711 COMPUTATIONAL ANALYSIS LABORATORY

- C404.1 Effectively employ solid modelling and simulation tools.
- C404.2 Read a specification and create a simple trade diagram.
- C404.3 Choose appropriate structural models.

AC8712 INDUSTRIAL TRAINING

- C405.1 Work in actual working environment.
- C405.2 Utilize technical resources.
- C405.3 Write technical documents and give oral presentations related to the work completed.

AC8005 AEROSPACE MATERIALS

- C406.1 Understand the advanced concepts of aerospace materials.
- C406.2 Provide the necessary mathematical knowledge that are needed in understanding their significance and operation.
- C406.3 Have an exposure on various topics such elements of aerospace materials, mechanical behaviour of materials, ceramics.
- C406.4 Deploy the skills effectively in the understanding of aerospace materials.

AE8603 COMPOSITE MATERIALS AND STRUCTURES

- C407.1 Understanding the mechanics of composite materials
- C407.2 Ability to analyse the laminated composites for various loading cases
- C407.3 Knowledge gained in manufacture of composites.
- C407.4 Should analyse sandwich and laminated plates
- C407.5 Should be able to construct and analysis different composite technique

AC8012 COMBUSTION ENGINEERING

- C408.1 Understand the concept of gaseous fuels.

- C408.2 Differentiate solid, gaseous, and liquid fuels.
- C408.3 Relate the thermo chemistry and kinetics of combustion to evolve mathematical models for combustion.
- C408.4 Apply the different principles of flame stabilization and ignition to design combustor.
- C408.5 Understands the fundamentals in combustion of fuels and propellants.

AC8811

PROJECT WORK

- C409.1 Demonstrate a sound technical knowledge of their selected project topic.
- C409.2 Undertake problem identification, formulation, and solution.
- C409.3 Design engineering solutions to complex problems utilising systems approach.
- C409.4 Conduct an engineering project
- C409.5 Communicate with engineers and the community at large in written and oral forms.
- C409.6 Demonstrate the knowledge, skills and attitudes of a professional engineer.