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||Jai Sri Gurudev||

Sri Adichunchanagiri Shikshana Trust (R.)

SJC INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU from 2024-25

AICTE Approved, Accredited by NAAC with A+ Grade & NBA (CSE, ISE, ECE, ME & CV), NIRF(151-300) in 2023,Gold Rated by QS I-Gauge

P.B. No.20, B.B Road, Chikkaballapur - 562 101, Karnataka

Estd : 1986

VII & VIII Semester
Scheme & Syllabus of B.E. Programme
Aerospace Engineering
(2024 Scheme)

Core Values

Spiritual, **J**udicious, **C**ommitment, **I**ntegrity, **T**rustworthy



NATIONAL INSTITUTIONAL RANKING FRAMEWORK 151-300

NAAC A+

QS I-GAUGE GOLD

INSTITUTION'S INNOVATION COUNCIL 4-Star Rating

SJC INSTITUTE OF TECHNOLOGY, CHIKKABALLAPURA

An Autonomous institution Under VTU from 2024 – 2025

AICTE Approved, Accredited by NBA(CSE, ISE, ECE, ME, CV, AE) and NAAC with 'A+' grade, QS – I Gauge Gold Rated

SCHEME OF TEACHING AND EXAMINATION – B.E. – Aerospace Engineering

(Applicable for students admitted from the Academic Year 2024-25 and onwards)

7th Semester

Aerospace Engineering

Sl. No.	Course Code	Course Title	Course Type	TD/ PSB	Teaching Hours / Week			Examination				
					L	T	P	SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks	Credits
1	BAS701	Control Engineering	IPCC	AS	3	0	2	3	50	50	100	4
2	BAS702	Computational Fluid Dynamics	IPCC	AS	3	0	2	3	50	50	100	4
3	BAS703	Guidance Navigation and Control	PCC	AS	4	0	0	3	50	50	100	4
4	BAS724x	Professional Elective Course – IV	PEC	AS	3	0	0	3	50	50	100	3
5	BAS745x	Open Elective Course – II	OEC	AS	3	0	0	3	50	50	100	3
6	BAS736	Major Project Phase – II	PROJ	AS	0	0	12	3	100	100	200	6
7	BCR707	Career Readiness and Industry Integration	NCMC	CDCAC	0	2	0	-	100	-	100	0
									450	350	800	24

ASC: Applied Science Course, PCC: Professional Core Course, IPCC: Integrated Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, NCMC: Non Credit Mandatory Course, AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, ESC: Engineering Science Course, ETC: Emerging Technology Course, PLC: Programming Language Course, L: Lecture, T: Tutorial, P: Practical, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation.

Professional Elective Course – IV

Course Code	Course Name	Course Code	Course Name
BAS724A	Boundary layer theory	BAS724C	Theory of Vibrations
BAS724B	Space Rover Design	BAS724D	Space Mechanics

Open Elective Course – II

Course Code	Course Name	Course Code	Course Name

BAS745A	Unmanned Aerial Vehicles	BAS745C	Basics of Rockets and Missiles
BAS745B	Operations Research	BAS745D	Supply Chain Management

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering (B.E.) 2024-25 may please be referred.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

Open Elective Courses: Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.

Project Work: The objective of the Project work is to:

i) Encourage independent learning and the innovative attitude of the students.
ii) Develop interactive attitude, communication skills, organization, time management, and presentation skills.
iii) Impart flexibility and adaptability.
iv) Inspire team working.
v) Expand intellectual capacity, credibility, judgment and intuition.
vi) Adhere to punctuality, setting and meeting deadlines.
vii) Install responsibilities to oneself and others.
viii) Train students to present the topic of project work in a seminar without any fear, face the audience confidently, enhance communication skills, involve in group discussion to present and exchange ideas.

CIE procedure for Project Work:

1) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the project work, shall be based on the evaluation of the project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

2) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work, shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

SEE procedure for Project Work: SEE for project work will be conducted by the two examiners appointed by the University. The SEE marks awarded for the project work shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25.

Semester: VII						
Control Engineering						
Course Code	:	BAS701		**Credits**	:	4
Hours/Week(L:T:P)	:	3:0:2		**CIE**	:	50 Marks
Total Hours	:	40T+12P		**SEE**	:	50 Marks
Course Type	:	IPCC		**SEE Duration**	:	3 Hours

Prerequisites:	
Courses	Physics, Mathematics
Knowledge on Fundamental Concepts	Basic Electronics
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students to	
CLO1	Classify open-loop and closed-loop systems, explain feedback control structures, and derive transfer function models for mechanical and electrical systems.
CLO2	Reduce complex block diagrams using algebraic rules and apply Mason's gain formula to determine system transfer functions.
CLO3	Evaluate time response specifications, determine system stability using Routh–Hurwitz criterion, and interpret the role of time constant in system speed of response.
CLO4	Construct root locus plots, determine gain margins, and analyse system stability using Bode plots with phase and gain margin calculations.
CLO5	Formulate state equations, compute state transition matrices, and assess controllability and observability using Kalman and Gilbert's tests.

Module – 1	**08Hrs**

Introduction to Control Systems and Mathematical Models

Introduction: Concept of controls, Open loop and closed loop systems with examples, Concepts of feedback and basic structure of feedback control system, requirements of an ideal control system.

Feedback control systems: Types of controllers – Proportional, Integral, Derivative controllers, Proportional – Integral, Proportional – Integral – Derivative controllers; Compensation methods – Series and feedback compensation, Lead, Lag and Lead-Lag Compensators.

Mathematical Models and Block Diagrams: Transfer function models of mechanical systems and electrical circuits, Transfer functions definition and its properties.

Text book 1: Ch 1, 2, 6, 12

Module – 2	**08Hrs**

Block Diagrams:

Block representation of control systems and terminologies, block diagram algebra and reduction of block diagrams,

Signal Flow Graphs:

Signal flow graph method, Mason's gain formula and its applications.

Text book 1: Ch 3, 4, 5

Module – 3	**08Hrs**

Transient and Steady State Response Analysis:

Introduction, type and order of systems, time response specifications, first order and second order system response to step, ramp and impulse inputs, concepts of time constant and its

importance in speed of response. Analysis using Routh's – Hurwitz Criterion. **Text book 2: Ch 4, 5 & 6**
Module – 4 **08Hrs**
Root Locus Plots Definition of root loci, General rules for constructing root loci, Analysis using root locus plots, Determination of desired gain, limit gain, gain margin and conditional stability. **Frequency Response Analysis Using Bode Plots:** Bode attenuation diagrams for first and second order systems, Simplified Bode diagrams, Stability analysis using Bode plots and determination of phase margin and gain margin and gain. **Text book 2: Ch 7 & 8**
Module – 5 **08Hrs**
State Variable Characteristics of Linear Systems: Introduction to concepts of states and state variable representation of linear systems, Advantages and Disadvantages over conventional transfer function representation, state equations of linear continuous data system. Matrix representation of state equations, Solution of state equation, State transition matrix and its properties, controllability and observability, Kalman and Gilberts test. **Text book 2: Ch 10, 11 & 6**

Practical Component of IPCC	
Sl. No	**Experiments**
1	Modelling and Comparison of Open Loop and Closed Loop Control Systems using MATLAB
2	Study and Performance Comparison of P, PI, PD and PID Controllers for a Given Plant
3	Design and Analysis of Lead, Lag and Lead-Lag Compensators using MATLAB
4	Block Diagram Reduction and Determination of Overall Transfer Function using MATLAB Commands
5	Determination of Transfer Function using Signal Flow Graph and Mason's Gain Formula
6	Analysis of Transient and Steady State Response Characteristics of First and Second Order Systems
7	Stability Analysis of Linear Control Systems using Routh-Hurwitz Criterion
8	Construction and Analysis of Root Locus Plots for Determination of Stability and Gain
9	Frequency Response Analysis using Bode Plots and Determination of Gain Margin and Phase Margin
10	Analysis of Controllability and Observability of Linear Systems using Kalman's and Gilbert's Methods

Course Outcomes: After completing the course, the students will be able to	
CO1	Establish a foundation in control system principles, feedback structures, and mathematical modelling of dynamic systems.
CO2	Strengthen problem-solving ability through block diagram representation and signal flow graph techniques.
CO3	Examine the dynamic characteristics of first- and second-order systems under standard input conditions.
CO4	Apply graphical approaches for stability evaluation and controller design using root locus and frequency response methods.
CO5	Explore modern state-space modelling and highlight its advantages compared to transfer function representation.

Text Books	
1	U.A. Bakshi and V.U. Bakshi, Control Engineering, Technical Publications, ISBN: 978-93- 5099-657-7.
2	A. Nagoor Kani, Control Systems Engineering, RBA Publications, 2014

Reference Books	
1	Katsuhiko Ogatta, Modern Control Engineering, Pearson Education,2004.
2	I.J. Nagrath and M. Gopal, Control Systems Engineering, New Age Publishers, 2017.
3	Richard. C. Dorf and Robert.H. Bishop, Modern Control Systems, Addison Wesley, 1999.
4	N.S. Nise, Control Systems Engineering, 6 th Edition, Wiley, 2012.

Web links and Video Lectures (e – Resources)	
1	https://www.classcentral.com/classroom/youtube-electrical-control-engineering-47665
2	https://www.classcentral.com/classroom/youtube-electrical-control-engineering-47665/60d2b7f83e9cc

CO - PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	2	-	-	-	-	1	-
CO2	3	3	2	2	2	-	-	-	-	1	-
CO3	3	3	2	2	2	-	-	-	-	1	-
CO4	3	3	3	2	3	-	-	-	-	1	-
CO5	3	3	2	2	3	-	-	-	-	1	-

Semester: VII						
Computational Fluid Dynamics						
Course Code	**:**	BAS702		**Credits**	**:**	4
Hours/Week (L:T:P)	**:**	3:0:2		**CIE**	**:**	50Marks
Total Hours	**:**	40T+12P		**SEE**	**:**	50Marks
Course Type	**:**	IPCC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Thermodynamics, Fluid Mechanics. Finite element method
Knowledge on Fundamental Concepts	Differential equations, and linear algebra, Numerical methods
Knowledge on Connected Tools (If any)	Ansys

Course Learning Objectives: This course will enable the students to	
CLO1	Understand Computational Fluid Dynamics (CFD) Principles.
CLO2	Apply Finite Difference Methods for Solving PDEs.
CLO3	Implement Numerical Solution Methods for Fluid Flow Problems.
CLO4	Solve Incompressible Navier-Stokes Equations.
CLO5	Analyse Finite Volume Methods for Fluid Dynamics Problems.

Module – 1	**08Hrs**
Introduction: CFD Applications. Need for Parallel Computers in CFD algorithms. Models of flows. Substantial derivative, Divergence of velocity. Continuity, Momentum, and Energy Equations-Derivation in various forms. Integral versus Differential form of equations. Comments on governing equations. Physical boundary conditions. Forms of equations especially suitable for CFD work. Shock capturing, and shock fitting **Textbook 1: Ch: 2.1-2.11**	
Module – 2	**08Hrs**
Mathematical Behaviour of Partial Differential Equations: Classification of partial differential equations. Cramer Rule and Eigen value methods for classification. Hyperbolic, parabolic, and elliptic forms of equations. Impact of classification on physical and computational fluid dynamics. Case studies: steady inviscid supersonic flow, unsteady inviscid flow, steady boundary layer flow, and unsteady thermal conduction, steady subsonic inviscid flow. **Textbook 1: Ch: 3.1-3.6** **Textbook 2: Ch: 2.1-2.4**	
Module – 3	**08Hrs**
Grid Generation and Adaptive Grids: Need for grid generation and Body-fitted coordinate system. Structured Grids-essential features. Structured Grid generation techniques-algebraic and numerical methods. Unstructured Grids-essential features. Unstructured Grid generation techniques- Delaunay-Voronoi diagram, advancing front method. Surface grid generation, multi-block grid generation, and meshless methods. Grid quality and adaptive grids. Structured grids adaptive methods and unstructured grids adaptive methods. **Textbook 1: Ch: 5.8-5.11** **Textbook 2: Ch:7.1-7.6**	

Module – 4	08Hrs
Discretization & Transformation: **Discretization:** Finite differences methods, and difference equations. Explicit and Implicit approaches. Errors and stability analysis. Time marching and space marching. Reflection boundary condition. Relaxation techniques. Alternating direction implicit method. Successive over relaxation/under relaxation. Second order Lax-Wendroff method, mid-point Leap frog method, numerical viscosity, and artificial viscosity. **Transformation:** Transformation of governing partial differential equations from physical domain to computational domain. Matrices and Jacobians of transformation. **Textbook 1: Ch:6.1-6.7**	
Module – 5	**08Hrs**
Convection and diffusion: Steady, one-dimensional convection and diffusion equation, upwind scheme, Exact solution, exponential scheme, Hybrid scheme, power law scheme, discretization equation of two dimensions, one way space coordinate, false diffusion, common view of false diffusion and proper view of false diffusion. **Calculation of Flow Field:** Need for a special procedure, Vorticity based Methods, Representation of pressure Gradient term, Staggered Grid, pressure correction equation, Simple Algorithm **Textbook 1: Ch: 6.8-6.8.5** **Textbook 3: Ch:5.1-5.7,6.1-6.8**	

Practical Component of IPCC	
Sl.No	**Experiments**
1	Modelling of 2-D Incompressible and In viscid flow over an aerofoil. Computations and analysis for velocity vectors and pressures distributions.
2	Modelling of 2-D Incompressible and Viscous flow over an aerofoil. Computations and analysis for velocity vectors and pressure distributions.
3	Geometric modelling and mesh generation of 2-D Convergent-Divergent nozzle and analyses of flow for adiabatic conditions.
4	Geometric modelling and mesh generation of 2-D Convergent-Divergent nozzle and analyses of flow for adiabatic conditions.
5	Body-Fitted Mesh Generation (STRUCTURED) for Airfoil Geometry.
6	Simulation of Fully Developed laminar Pipe Flow and pressure Distribution and validation of pressure drop.
7	Simulation of Fully Developed turbulent Pipe Flow and pressure Distribution and validation of pressure drop.
8	Investigation of Pressure and Velocity Distribution Around a Circular Cylinder Using ANSYS Fluent.
9	Simulation of Internal Thermal Flow in a Pipe with Half Heated and Half Adiabatic/Isothermal Wall.
10	Numerical Study of External Flow Over a Flat Plate and Boundary Layer Formation.

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the need for parallel computers in CFD and analyse how parallel architectures improve computational efficiency for large-scale CFD algorithms.
CO2	Analyse the impact of PDE classification on physical interpretation of fluid flow phenomena and on the selection of appropriate numerical and computational methods.
CO3	Apply structured grid generation techniques, including algebraic methods and numerical methods, to generate high-quality meshes for simple and moderately complex geometries.
CO4	Perform coordinate transformation of governing equations from the physical domain to the computational domain and compute Jacobian and transformation matrices required for numerical implementation.
CO5	Develop two-dimensional discretization equations for convection–diffusion problems and understand coupling between spatial directions.

Text Books	
1	**John D Anderson**, "Computational Fluid Dynamics, The Basics with Application" McGraw-Hill Publication,1995, **ISBN-13: 978-0070016859**
2	**T.J Chung** "Computational Fluid Dynamics" Second Edition, Cambridge Publication.2nd edition, 2010, **ISBN-13: 978-0521769693**
3	**Suhas V. Patankar** "Numerical heat transfer and fluid flow" Mcgrahill book company, first edition,1980, **ISBN-13: 978-0070487406**

Reference Books	
1	**Hirsch C** "Numerical Computation of Internal and External Flows" (Vol. I & II), John Wiley and Sons, 1994. Vol-1 **ISBN-13: 978-0471923855,** vol-2 **ISBN-13: 978-0471924524**

Web links and Video Lectures (e – Resources)	
1	https://onlinecourses.nptel.ac.in/noc21_me126/preview
2	https://onlinecourses.nptel.ac.in/noc25_ch18/preview

CO – PO Mapping:

CO/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	3	-	-	-	2	-	2
CO2	3	3	2	2	3	-	-	-	2	-	2
CO3	3	3	3	3	3	-	-	-	2	-	2
CO4	3	3	3	3	3	-	-	-	2	-	2
CO5	3	3	2	2	3	-	-	-	2	-	2

Semester: VII						
Guidance Navigation and Control						
Course Code	**:**	BAS703		**Credits**	**:**	4
Hours/Week(L:T:P)	**:**	4:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	50		**SEE**	**:**	50 Marks
Course Type	**:**	PCC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Control systems and Fluid Mechanics
Knowledge on Fundamental Concepts	Mathematics & Physics
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the fundamental concepts of navigation, guidance, control systems, air data systems, and radar principles.
CLO2	Study radar tracking techniques and modern guidance systems including inertial, infrared, and satellite-based navigation.
CLO3	Develop knowledge of transfer functions and analyze open-loop and closed-loop control systems.
CLO4	Explain missile control system dynamics, stabilization methods, and autopilot design concepts.
CLO5	Learn integrated flight and fire control systems and their control laws for missile and aircraft applications.

Module – 1	**10 Hrs**
Introduction Concepts of navigation, guidance and control. Introduction to basic principles. Air data information **Radar Systems** Principle of working of radar. MTI and Pulse Doppler radar. Moving target detector. Limitation of MTI performance. MTI from a moving platform (AMTI) **Textbook 1: Ch 1 & 4**	
Module – 2	**10 Hrs**
Tracking With Radar Mono pulse tracking. Conical scan and sequential lobbing. Automatic tracking with surveillance radar (ADT) **Other Guidance Systems** Gyros and stabilized platforms. Inertial guidance and Laser based guidance. Components of Inertial Navigation System. Imaging Infrared guidance. Satellite navigation. GPS. **Textbook 1: Ch 5 & 6**	
Module – 3	**10 Hrs**
Transfer Functions Input-output Transfer function. Basic altitude reference. Concepts of Open loop and Close Loop. **Textbook 1: Ch 3 & 9**	
Module – 4	**10 Hrs**

Missile Control System
Guided missile concept. Roll stabilization. Control of aerodynamic missile. Missile parameters for dynamic analysis. Missile autopilot schematics. Acceleration command and root locus.
Missile Guidance
Proportional navigation guidance; command guidance. Comparison of guidance system performance. Bank to turn missile guidance.
Textbook 1: Ch 7

Module – 5	**10 Hrs**

Integrated Flight/Fire Control System Director fire control system. Tracking control laws. Longitudinal flight control system. Lateral flight control system. Rate of change of Euler angle, Auto Pilot.
Textbook 1: Ch 2 & 6

Course Outcomes: After completing the course, the students will be able to	
CO1	Explain the principles of navigation, guidance, control, air data systems, and radar operation including MTI and Pulse Doppler radar.
CO2	Analyze radar tracking methods and modern guidance systems such as inertial, infrared, and satellite navigation (GPS).
CO3	Apply transfer function concepts to analyze open-loop and closed-loop control systems.
CO4	Design missile control systems including stabilization, autopilot schemes, and proportional navigation guidance.
CO5	Evaluate integrated flight and fire control systems and their tracking control law.

Text Books	
1	P.T. Kabamba and A.R. Girard, Fundamentals of Aerospace Navigation and Guidance, Cambridge Aerospace Series, 2014.
2	John H Blakelock, ` Automatic control of Aircraft & Missiles`, Wile –Inter Science Publication, 2nd edition, May 1990.

Reference Books	
1	Merrilh I. Skolnik, ` Introduction to Radar Systems`, 3rd edition, Tata Mc Graw Hill, 2001.
2	George M. Siouris, Missile Guidance and Control Systems, Springer, 2004.

Web links and Video Lectures (e – Resources)	
1	https://in.mathworks.com/videos/developing-guidance-navigation-and-control-algorithm-with-matlab-and-simulink-1708435727241.html
2	https://nescacademy.nasa.gov/catalogs/gnandc

CO - PO Mapping:

CO \ PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	-	-	1	-	-	-	-	-	-
CO2	2	3	2	1	2	-	-	-	-	-	1
CO3	2	2	3	2	2	-	-	-	-	-	2
CO4	2	3	3	2	3	-	-	-	-	-	1
CO5	2	3	2	2	3	-	-	-	-	-	2

Semester: VII						
Boundary layer Theory						
Course Code	:	BAS724A		**Credits**	:	3
Hours/Week(L:T:P)	:	3:0:0		**CIE**	:	50 Marks
Total Hours	:	40		**SEE**	:	50 Marks
Course Type	:	PEC		**SEE Duration**	:	3 Hours

Prerequisites:	
Courses	Thermodynamics, Fluid Mechanics, Aerodynamics.
Knowledge on Fundamental Concepts	Physics, Mathematics
Knowledge on Connected Tools (If any)	Ansys

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the Fundamentals of Viscosity and Boundary Layers.
CLO2	Analyze and Solve Boundary Layer Equations.
CLO3	Explore Thermal Boundary Layers and Heat Transfer.
CLO4	Study Unsteady Boundary Layers and Transition to Turbulence.
CLO5	Master Boundary Layer Control Techniques.

Module – 1	**08Hrs**
Law of Viscosity: Types of Fluids; Dependence of Boundary Layer at Different Reynolds Number, Blasius Solution and Its Series; **Asymptotic Solutions;** Theory of Similarity; Separation of Boundary Layer; Similar Solutions; Reduction of the Navier- Stokes Equation to the Boundary Layer Equations **Textbook 1: Ch: 1.1-1.7**	
Module – 2	**08Hrs**
Solution of Boundary Layer Equations: Exact Solutions; Flow Past a Wedge; Flow Past a Cylinder; Flow in the Wake of Flat Plate at Zero Incidence; Momentum Integral and Energy Integral Equations; Approximate Solutions; Application of Momentum Equation to the Flat Plate; Karman- Pouhlsen Method; Approximate Methods for 2D Flows; Comparison of Exact and Approximate Methods for Flat Plate at Zero Incidence, Two- dimensional Stagnation Flow and Flow Past a Circular Cylinder. Axially symmetric boundary layers, Mangler Transformations **Textbook 1: Ch: 2.1-2.7** **Textbook 1: Ch: 3.1-3.9**	
Module – 3	**08Hrs**
Thermal Boundary Layer: Derivation of Energy Equation; Theory of Similarity in Heat Transfer; Non-Dimensional Numbers – Grashoff's, Prandtl, Reynolds and Eckert Numbers; Analogy between Heat Transfer and Momentum Transfer; Exact Solution of Temperature Distribution in Viscous Flows; Boundary Layer Simplification; Properties of Thermal Boundary Layer; Forced and Natural Flows; Adiabatic Wall; Effect of Prandtl's Number. Relation between Velocity and Temperature Fields – Adiabatic Wall and Heat Transfer; Recovery Factor. **Textbook 1: Ch: 9.1-9.6**	
Module – 4	**08Hrs**

Unsteady Boundary Layer: Introduction to Unsteady Boundary Layers; Boundary Layer Equations, Methods of approximations, Boundary layer formation in accelerated motion, Transition and Origin of Turbulence; Turbulent boundary layer over a flat plate, Boundary layer in non-zero pressure gradients.

Textbook 1: Ch:13.1-13.2

Module – 5	**08Hrs**

Boundary Layer Control: Introduction; Fundamental Equation with Suction/ Injection; Exact and Approximate Solutions with Suction and Injection; Solution of Pressure Gradient Cases; Prevention of Separation on Aero foil; Control and Means to Increase Lift and to Reduce Drag; Some Experimental Results.

Textbook 1: Ch: 11.1-11.3

Course Outcomes: After completing the course, the students will be able to	
CO1	Expertise in Viscosity and Boundary Layer Behavior.
CO2	Competence in Solving Boundary Layer Equations.
CO3	Understanding of Thermal Boundary Layer and Heat Transfer Analogy.
CO4	Ability to Analyze Unsteady Boundary Layer Phenomena.
CO5	Skills in Boundary Layer Control for Aerodynamic Optimization.

Text Books	
1	**H. Schlichting** "Boundary Layer Theory" springer, 9th edition,2017, **ISBN-13: 978-3662529195**
2	**John D. Anderson** "Fundamental of Aerodynamics" McGraw-Hill Education,6th edition,2016, **ISBN-13: 978-1259129919**

Reference Books	
1	**Frank M. White** "Viscous Fluid Flow" McGraw-Hill Education,3rd edition,2006, **ISBN-13: 978-0071244930**

Web links and Video Lectures (e – Resources)	
1	https://nptel.ac.in/courses/112106190
2	https://archive.nptel.ac.in/content/storage2/courses/112104118/ui/Course_home-9.htm

CO - PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	3	-	-	-	-	-	2
CO2	3	3	2	2	3	-	-	-	2	-	2
CO3	3	3	3	3	3	-	-	-	2	-	2
CO4	3	3	3	3	3	-	-	-	2	-	2
CO5	3	3	2	2	3	-	-	-	2	-	2

Semester: VII						
Space Rover Design						
Course Code	**:**	BAS724B		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40		**SEE**	**:**	50 Marks
Course Type	**:**	PEC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Introduction to Aviation Management
Knowledge on Fundamental Concepts	Transportation Economics, Environmental Science Fundamentals
Knowledge on Connected Tools (If any)	----------

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the History and Development of Planetary Exploration and Rovers.
CLO2	Learn Rover Systems Architecture and Design.
CLO3	Master Static Force and Dynamic Force Analysis.
CLO4	Understand Power, Communication, and Thermal Control for Rovers.
CLO5	Study Indian Space Initiatives and Advanced Research Directions.

Module – 1	**08Hrs**
Introduction to Planetary Exploration & Rovers: Historical overview: Apollo, Lunokhod, Mars rovers (Sojourner, Spirit, Opportunity, Curiosity, Perseverance), Pragyan Types of rovers: Micro-rovers, Mini-rovers, Heavy rovers, hoppers, and climbers, Mission **Rover Systems Architecture & Design, Systems engineering approach**, Mechanical design: Mobility (wheels vs. tracks), Rocker-Bogie and other suspension systems, Structural design for lunar, Martian, and asteroid surfaces, Payload integration and modularity. **Textbook 1: Ch-7 & 12**	
Module – 2	**08Hrs**
Static Force Analysis: Static force analysis: Introduction: Static equilibrium. Equilibrium of two and three force members. Members with two forces and torque, Free body diagrams, principle of virtual work. Static force analysis of four bar mechanism and slider-crank mechanism with and without friction. **Textbook 1: Ch-7 & 12**	
Module – 3	**08Hrs**
Dynamic Force Analysis: D'Alembert's principle, Inertia force, inertia torque, Dynamic force analysis of four-bar mechanism and slider crank mechanism. Dynamically equivalent systems. Turning moment diagrams and flywheels, Fluctuation of Energy. Determination of size of flywheels. **Textbook 1: Ch-7 & 12**	
Module – 4	**08Hrs**
Power, Communication & Thermal Control Solar arrays, rechargeable batteries, RTGs Data relay systems: antennas, UHF/X-band, deep space networks Thermal environment modeling and control: heaters, radiators, MLI	

Systems Integration & Testing: Design validation: CAD, FEA, dynamic simulation Hardware-in-the-loop simulation Environmental testing: vibration, shock, thermal vacuum Rover software architecture and real-time systems (ROS/ROS2) **Textbook 1: Ch-7 & 12**

Module – 5	**08Hrs**
Indian Initiatives & Advanced Research Chandrayaan-3 Pragyan rover: structure, sensors, mobility, Future Indian missions: LUPEX, Gaganyaan support robotics, Research directions: swarm robotics, microgravity mobility, ISRU-enabled rovers **Textbook 1: Ch-7 & 12**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Explain planetary rover missions and analyze rover system architecture using a systems engineering approach
CO2	Apply static force analysis to rover mechanisms (four-bar, slider-crank) under equilibrium conditions.
CO3	Perform dynamic force analysis of rover mechanisms using D'Alembert's principle and determine flywheel parameters.
CO4	Design rover subsystems including power, communication, and thermal control with validation using CAD/FEA/simulation tools.
CO5	Evaluate Indian planetary rover missions and propose advanced research solutions in swarm robotics and ISRU-enabled systems.

Text Books	
1	Wertz et al., Space Mission Engineering, Microcosm Press.
2	Uicker et al., Theory of Machines and Mechanisms, Oxford.

Reference Books	
1	Fortescue et al., Spacecraft Systems Engineering, Wiley. Norton, Design of Machinery, McGraw Hill.
2	Gilmore (Ed.), Spacecraft Thermal Control Handbook, Aerospace Press. ISRO Mission Reports (Chandrayaan-3, LUPEX).

Web links and Video Lectures (e – Resources)	
1	https://wizape.com/English/Spacecraft-Design-and-Systems?utm_source=chatgpt.com
2	https://www.jpl.nasa.gov/edu/resources/collection/mission-to-mars-student-challenge/education-plan-design-your-spacecraft/?utm_source=chatgpt.com

CO – PO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	2	1	1	1			1		2
CO2	3	3	2	2							1
CO3	3	3	2	2							2
CO4	3	2	3	2	3	2	1	1	2	2	2
CO5	3	2	3	3	2	3	2	2	2	1	2

Semester: VII						
Theory of Vibrations						
Course Code	:	BAS724C		**Credits**	:	3
Hours/Week(L:T:P)	:	3:0:0		**CIE**	:	50 Marks
Total Hours	:	40		**SEE**	:	50 Marks
Course Type	:	PEC		**SEE Duration**	:	3 Hours

Prerequisites:	
Courses	Structures, Kinematics and dynamics
Knowledge on Fundamental Concepts	SHM, Laplace transforms.
Knowledge on Connected Tools (If any)	Equilibrium Equations and Free Body Diagrams

Course Learning Objectives: This course will enable the students to	
CLO1	Remember the basic concepts of vibrations.
CLO2	Understand the working principle of vibration measuring instruments..
CLO3	Acquire the knowledge of numerical methods for multi-degree freedom systems.
CLO4	Explain Mechanical and Aerospace systems for different types of Vibrations.
CLO5	Analyze different frequency of vibrations for Undammed, Damped, free and forced Vibrations.

Module – 1	**08Hrs**
Introduction: Types of vibrations, S.H.M, principle of super position applied to Simple Harmonic Motions. Beats, Fourier theorem and simple problems (Graphical and Theoretical) **Text Book 01: Ch 1**	
Module – 2	**08Hrs**
Undamped Free Vibrations: Single degree of freedom systems. Undamped free vibration, natural frequency of free vibration, Spring and Mass elements, effect of mass of spring, Compound Pendulum. **Damped Free Vibrations:** Single degree of freedom systems, different types of damping, concept of critical damping and its importance, study of response of viscous damped systems for cases of under damping, critical and over damping, Logarithmic decrement. **Text Book 01: Ch 2 & 3**	
Module – 3	**08Hrs**
Forced Vibration: Single degree of freedom systems, steady state solution with viscous damping due to harmonic force. Solution by Complex algebra, reciprocating and rotating unbalance, vibration isolation, transmissibility ratio due to harmonic excitation and support motion. **Vibration Measuring Instruments & Whirling of Shafts**: Vibration of elastic bodies – Vibration of strings – Longitudinal, lateral and torsional Vibrations. **Text Book 01: Ch 4 & 5**	
Module – 4	**08Hrs**
Systems with Two Degrees of Freedom: Introduction, principle modes and Normal modes of vibration, co-ordinate coupling, generalized and principal co-ordinates, Free vibration in terms of initial conditions. Geared systems. Forced Oscillations-Harmonic excitation. **Applications:** Vehicle suspension, Dynamic vibration absorber, Dynamics of reciprocating Engines.	

Continuous Systems: Introduction, vibration of string, longitudinal vibration of rods, Torsional vibration of rods, Euler's equation for beams **Text Book 01: Ch 6 & 7**

Module – 5	**08Hrs**
Numerical Methods for Multi-Degree Freedom Systems: Introduction, Holzer's method, Stodola method, Influence coefficients, Maxwell reciprocal theorem, Dunkerley's equation. Orthogonality of principal modes, Method of matrix iteration-Method of determination of all the natural frequencies using sweeping matrix and Orthogonality principle. **Text Book 01: Ch 8**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the principle of super position to Simple Harmonic Motions.
CO2	Apply the Free and Forced Vibrations for Aerospace Applications.
CO3	Determine the vibrations using vibration instruments.
CO4	Analyze Systems with Two Degrees of Freedom.
CO5	Evaluate the numerical methods for multi-Degree freedom systems.

Text Books	
1	Mechanical Vibrations by Dr. J B K Das, P L Srinivasa Murthy, Sapna Book House – Bangalore, 2008, ISBN-10 : 8128003712.

Reference Books	
1	S.S. Rao, Mechanical Vibrations, Pearson Education Inc, 4th Edition,2003,ISBN-13: 978- 8177588743
2	S. Graham Kelly, Mechanical Vibrations- Schaum's Outline Series, Tata McGraw Hill, Special Indian edition, 2007.
3	V.P. Singh ,Mechanical Vibrations, Dhanpat Rai& Company Pvt. Ltd.,2016,ISBN-13: 978- 8177004014
4	W.T. Thomson and Marie Dillon Dahleh, Theory of Vibration with Applications, Pearson Education 5th edition, 2008,ISBN-13: 978-8131704820.

Web links and Video Lectures (e – Resources)	
1	https://youtube.com/playlist?list=PLAC668A0566953FB5&si=vPkV4EG8Qyi5dr7G
2	https://youtube.com/playlist?list=PLp6ek2hDcoNBihD_JCzIvc-t_gApqMGKd&si=msq9yCvn3ifappb_

CO – PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	1	2	-	-	-	-	-	2
CO2	3	3	3	2	-	-	-	-	-	-	2
CO3	3	3	2	2	-	-	-	-	-	-	-
CO4	3	3	2	1	1	-	-	-	-	-	-
CO5	3	3	2	2	1	-	-	-	-	-	-

Semester: VII						
Space Mechanics						
Course Code	:	BAS724D		**Credits**	:	3
Hours/Week(L:T:P)	:	3:0:0		**CIE**	:	50 Marks
Total Hours	:	40		**SEE**	:	50 Marks
Course Type	:	PEC		**SEE Duration**	:	3 Hours

Prerequisites:	
Courses	Introduction to aerospace engineering, Propulsion and Fluid Mechanics
Knowledge on Fundamental Concepts	Engineering mechanics & Physics.
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Understand fundamental concepts of astronomy, celestial coordinate systems, time measurement systems, and Earth's physical characteristics.
CLO2	Develop knowledge of orbital mechanics including Kepler's laws, Newton's law of gravitation, and two-body problem formulation.
CLO3	Analyse satellite injection techniques and orbital perturbation methods.
CLO4	Explain the principles of interplanetary trajectory design including sphere of influence and Lambert's theorem.
CLO5	Learn the fundamentals of low-thrust propulsion and trajectory performance analysis.

Module – 1	**08 Hrs**
Understanding Astronomy: The solar system, Reference Frame & Coordinate System: Position of the Earth's Surface, The Celestial Sphere, The Ecliptic, Geocentric Reference Frames, Heliocentric Reference Frames, Vernal Equinox Motion, Velocity Vector, Time & Calendar: Sidereal Time, Solar Time, Mean Solar Time, Standard Time, Ephemeris Time & Atomic Time, The Year, The Julian Date, The Earth and its Shape, The Earth's Atmosphere. **Textbook 1: Ch 1 & 2**	
Module – 2	**08 Hrs**
Basic Concepts and Two body Problem: Kepler's laws of planetary motion and proof of the laws, Newton's universal law of gravitation, motion of body under central force field, N Body problem and Two body problem, Trajectory Equation, relations between position and time, orbital elements, orbit types and characteristics. **Textbook 1: Ch 3**	
Module – 3	**08 Hrs**
Satellite Injection and Satellite Perturbations: General aspects of satellite injection, satellite orbit transfer, various cases, orbit deviations due to injection errors, special and general perturbations, Cowell's method and Encke's method, method of variations of orbital elements, general perturbations approach. **Textbook 1: Ch 4 & 5**	
Module – 4	**08 Hrs**

Interplanetary Trajectories: Two-dimensional interplanetary trajectories, fast interplanetary Trajectories, three-dimensional interplanetary trajectories, launch of interplanetary spacecraft, trajectory estimation about the target planet, concept of sphere of influence, Lambert's theorem.

Textbook 1: Ch 6

Module – 5	**08 Hrs**

Low thrust trajectories: Equation of motion, constant radial thrust acceleration, constant tangential thrust-characteristics of the motion, linearization of the equations of motion, Performance analysis.

Textbook 1: Ch 7

Course Outcomes: After completing the course, the students will be able to	
CO1	Explain astronomical reference frames, time systems, Earth models, and celestial coordinate systems.
CO2	Apply Kepler's laws and Newtonian mechanics to determine two-body orbital motion and orbital elements.
CO3	Analyse satellite injection processes and orbital perturbations using standard methods.
CO4	Design interplanetary trajectories using sphere of influence and Lambert's theorem.
CO5	Evaluate low-thrust trajectory motion and performance analysis of propulsion systems.

Text Books	
1	Cornelisse, J.W., Rocket Propulsion and Space Dynamics, W.H. Freeman&co,1984.
2	Thomson, Introduction to Space Dynamics, Dover Publications, Revised edition,2012.

Reference Books	
1	VandeKamP P. "Elements of Astromechanics", Pitman,1979.
2	Willian E. Wiesel, Space Flight Dynamics, Create Space Independent Publishing Platform, 3rd Edition ,2010, ISBN-13: 978-1452879598.

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/watch?v=bLXDyNbkp08
2	https://freevideolectures.com/course/3121/space-flight-mechanics

CO - PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	1	-	-	-	-	-	1
CO2	3	3	2	1	2	-	-	-	-	-	1
CO3	3	3	3	2	2	-	-	-	-	-	2
CO4	3	3	3	2	2	-	-	-	-	-	2
CO5	3	3	2	2	2	-	-	-	-	-	2

Semester: VII						
Unmanned Aerial Vehicles						
Course Code	:	BAS745A		**Credits**	:	3
Hours/Week(L:T:P)	:	3:0:0		**CIE**	:	50 Marks
Total Hours	:	40		**SEE**	:	50 Marks
Course Type	:	OEC		**SEE Duration**	:	3 Hours

Prerequisites:	
Courses	Engineering Mathematics, Classical Control Systems, Flight Mechanics/Aerodynamics
Knowledge on Fundamental Concepts	Linear Algebra and Differential Equations, Signals and Systems
Knowledge on Connected Tools (If any)	MATLAB Programming Fundamentals

Course Learning Objectives: This course will enable the students to	
CLO1	Introduce mathematical modeling and dynamics of UAV systems
CLO2	Develop understanding of UAV sensors, navigation and estimation methods
CLO3	Study classical and modern UAV control strategies
CLO4	Introduce guidance, path planning and collision avoidance algorithms
CLO5	Explore autonomous UAV technologies and swarm intelligence applications

Module – 1	**08Hrs**
Introduction: History and evolution of Unmanned Aerial Vehicles (UAVs), classification of UAVs, applications and mission profiles, basics of drone operations, UAV components and subsystems, coordinate frames, vectors, coordinate transformations, rigid body transformations, kinematics and dynamic modelling of multirotor UAVs, forces and moments acting on UAVs, performance measures and operational considerations. **Textbook 01: Ch. 1, 2, 3 & 4** **Textbook 02: Ch. 1 & 2**	
Module – 2	**08Hrs**
Sensors, Navigation and Estimation: UAV sensors and instrumentation, inertial measurement unit (IMU), accelerometers, gyroscopes, GPS, magnetometers and altitude sensors, sensor fusion, basics of estimation theory, Kalman filtering, Extended Kalman Filter (EKF), navigation and localization techniques, MATLAB implementation of estimation algorithms. **Textbook 01: Ch. 7 & 8** **Textbook 02: Ch. 5 & 6**	
Module – 3	**08Hrs**
Control Systems and Autopilot Design: Introduction to control systems, Laplace transforms, transfer function representation, transient response analysis, state-space representation, state transition matrix, controllability and observability, pole placement techniques, PID controller design, UAV autopilot architecture, stabilization and trajectory tracking, MATLAB demonstrations of controller design. **Textbook 01: Ch. 5 & 6** **Textbook 02: Ch. 7 & 8**	
Module – 4	**08Hrs**

Guidance, Path Planning and Collision Avoidance: Global path planning, waypoint navigation, A* algorithm, RRT and RRT* algorithms, sense-and-avoid systems, trajectory prediction, decision making, Artificial Potential Field (APF) methods, Control Barrier Functions (CBF), trajectory tracking and guidance algorithms for autonomous UAV operation. **Textbook 01: Ch. 10 & 11** **Textbook 02: Ch. 9 & 10**

Module – 5	**08Hrs**
Autonomous UAV Systems and Emerging Technologies: Scenario generation and mission planning, autonomous drones, aerial perception using neural networks, Recurrent Neural Networks (RNN), Memory Neural Networks (MNN) for trajectory prediction, UAV swarms, cooperative multi-swarm operations, forest fire monitoring applications, variable pitch quad copters, emerging trends in drone technology and future research directions. **Textbook 02: Ch. 11, 12 & 13**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Explain UAV architectures, coordinate systems and dynamic models of aerial vehicles.
CO2	Apply estimation and sensor fusion techniques for UAV localization and navigation
CO3	Design feedback control systems and autopilot architectures for UAV stabilization and trajectory tracking.
CO4	Develop path planning and collision avoidance algorithms for autonomous UAV missions
CO5	Analyze and evaluate emerging UAV technologies including AI-enabled drones and cooperative swarm systems.

Text Books	
1	Randal W. Beard and Timothy W. McLain, Small Unmanned Aircraft: Theory and Practice, Princeton University Press, 2012.
2	Kimon P. Valavanis, Advances in Unmanned Aerial Vehicles: State of the Art and the Road to Autonomy, Springer, 2007.

Reference Books	
1	Stevens, B. L. and Lewis, F. L., Aircraft Control and Simulation, Wiley.
2	Bouabdallah, S., Design and Control of Quadrotors with Application to Autonomous Flying.

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/playlist?list=PLgMDNELGJ1CYU7vfun-Q7HXsldD-RsocG

CO - PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	2						1
CO2	3	3	1	3	3						1
CO3	3	3	3	2	3				1		1
CO4	2	3	3	3	3	1			1		2
CO5	2	2	2	3	3	1	1		2	1	3

Semester: VII						
Operations Research						
Course Code	:	BAS745B		**Credits**	:	3
Hours/Week(L:T:P)	:	3:0:0		**CIE**	:	50 Marks
Total Hours	:	40		**SEE**	:	50 Marks
Course Type	:	OEC		**SEE Duration**	:	3 Hours

Prerequisites:	
Courses	Mathematics Foundations Basic Computer Science / Programming Engineering / Management Basics
Knowledge on Fundamental Concepts	Mathematical Modeling, Optimization Techniques, Probability & Statistics, Matrix Operations, Basic Operations Research Concepts
Knowledge on Connected Tools (If any)	MATLAB, Octave, or Python (NumPy, SciPy, PuLP for linear programming). MS Excel (Solver add-in for LP, transportation, assignment problems). Arena, Simul8, or similar for queuing and scheduling problems. MS Project or Primavera for PERT/CPM techniques. Specialized OR Packages

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the Basics of Linear Programming and Operations Research.
CLO2	Study the Simplex Method and Duality in Linear Programming.
CLO3	Explore Transportation and Assignment Problems.
CLO4	Learn Sequencing and Queuing Theory.
CLO5	Master Project Scheduling, Game Theory, and Integer Programming.

Module – 1	**08Hrs**
Introduction: Linear programming, Definition, scope of Operations Research (O.R) approach and limitations of OR Models, Characteristics and phases of OR Mathematical formulation of L.P. Problems. Graphical solution methods**.** **Linear:** The simplex method - slack, surplus and artificial variables. **Programming Problems** Concept of duality, two phase method, dual simplex method, degeneracy, and procedure for resolving degenerate cases**.** **Textbook 1: Ch 1, 2, 3, 4, 5**	
Module – 2	**08Hrs**
Transportation Problem: Formulation of transportation model, Basic feasible solution using different methods, Optimality Methods, Unbalanced transportation problem, Degeneracy in transportation problems, Applications of Transportation problems. Assignment Problem: Formulation, unbalanced assignment problem, Traveling salesman problem. **Textbook 1: Ch 5, 11**	
Module – 3	**08Hrs**
Sequencing: Johnson's algorithm, n - jobs to 2 machines, n jobs 3 machines, n jobs m machines without passing sequence. 2 jobs n machines with passing. Graphical solutions	

priority rules.
Queuing Theory: Queuing system and their characteristics. The M/M/1 Queuing system, Steady state performance analyzing of M/M/ 1 and M/M/C queuing model.

Textbook 1: Ch 18

Module – 4	**08Hrs**

Pert-Cpm Techniques: Network construction, determining critical path, floats, scheduling by network, project duration, variance under probabilistic models, prediction of date of completion, crashing of simple networks.

Textbook 1: Ch 2, 7

Module – 5	**08Hrs**

Game Theory: Formulation of games, Two Person-Zero sum game, games with and without saddle point, Graphical solution (2x n, m x 2 game), dominance property.
Integer Programming: Gommory's technique, branch and bound algorithm for integer programming problems, zero one algorithm.

Textbook 1: Ch 18, 9

Course Outcomes: After completing the course, the students will be able to	
CO1	Proficiency in Linear Programming and Operations Research Models.
CO2	Competence in Duality and Resolving Degeneracy in Linear Programming.
CO3	Expertise in Solving Transportation and Assignment Problems.
CO4	Mastery of Sequencing and Queuing Theory.
CO5	Skill in Project Scheduling, Game Theory, and Integer Programming.

Text Books	
1	Operations Research and Introduction, Taha H. A. – Pearson Education edition
2	Operations Research, S. D. Sharma –Kedarnath Ramnath & Co 2002.

Reference Books	
1	"Operation Research" AM Natarajan, P. Balasubramani, A Tamilaravari Pearson 2005
2	Introduction to operation research, Hiller and liberman, Mc Graw Hill. 5th edition 2001.

Web links and Video Lectures (e – Resources)	
1	https://cursa.app/en/free-course/supply-chain-digitization-edbb
2	https://cursa.app/en/free-course/supply-chain-digitization-edbb

CO - PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	2	2	1	1	-	1	1	1
CO2	3	3	3	2	2	2	2	-	1	1	2
CO3	3	3	2	2	2	2	-	-	1	1	2
CO4	3	3	3	3	2	2	1	-	2	2	3
CO5	3	3	3	2	2	1	-	-	1	1	-

Semester: VII						
Basics of Rockets and Missiles						
Course Code	:	BAS745C		**Credits**	:	3
Hours/Week(L:T:P)	:	3:0:0		**CIE**	:	50 Marks
Total Hours	:	40		**SEE**	:	50 Marks
Course Type	:	OEC		**SEE Duration**	:	3 Hours

Prerequisites:	
Courses	Physics, Chemistry and Mathematics,
Knowledge on Fundamental Concepts	Equilibrium Equations and Free Body Diagrams
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students to	
CLO1	Provide fundamental understanding of space launch vehicles and military missile systems.
CLO2	Develop knowledge of solid and liquid propellant rocket motor systems.
CLO3	Introduce aerodynamic principles applicable to rockets and missiles.
CLO4	understand launch vehicle dynamics including rocket motion, trajectory analysis, gravity turn, multi-staging, and thrust vector control.
CLO5	Familiarize with rocket testing procedures, material selection criteria, thermal protection systems, safety practices, and environmental considerations.

Module – 1	**08Hrs**
Introduction: Space launch Vehicles and military missiles, function, types, role, mission, mission profile, thrust profile, propulsion system, payload, staging, control and guidance requirements, performance measures, design, construction, operation, similarities and differences. Some famous space launch vehicles and strategic missiles. **Textbook 02: Ch 1 & 2** **Textbook 01: Ch 1**	
Module – 2	**08Hrs**
Solid Propellant Rocket Motor Systems: Solid Propellant rocket motors, principal features, applications. Solid propellants, types, composition, properties, performance. Propellant grain, desirable properties, grain configuration, preparation, loading, structural design of grain. Liners, insulators and inhibitors, function, requirements, materials. Rocket motor casing – materials. Nozzles, types, design, construction, thermal protection. Igniters, types, construction. Description of modern solid boosters I) Space Shuttle SRB, II) the Arienne SRB **Liquid Propellant Rocket Motor Systems:** Liquid propellants, types, composition, properties, performance. Propellant tanks, feed systems, pressurization, turbo-pumps, valves and feed lines, injectors, starting and ignition. Engine cooling, support structure. Control of engine starting and thrust build up, system calibration, integration and optimization – safety and environmental concerns. Description of the space shuttle main engine. Propellant slosh, propellant hammer, geysering effect in cryogenic rocket engines**.** **Textbook 01: Ch 3 & 4**	
Module – 3	**08Hrs**

Aerodynamics of Rockets and Missiles: Classification of missiles. Airframe components of rockets and missiles, Forces acting on a missile while passing through atmosphere, method of describing aerodynamic forces and moments, lateral aerodynamic moment, lateral damping moment, longitudinal moment of a rocket, lift and drag forces, drag estimation, body upwash and downwash in missiles. Rocket dispersion, re-entry body design considerations.

Textbook 03: Ch 1,4 & 6

Module – 4	**08Hrs**

Launch Vehicle Dynamics: Tsiolskovsky's rocket equation, range in the absence of gravity, vertical motion in the earth's gravitational field, inclined motion, flight path at constant pitch angle, motion in the atmosphere, the gravity turn – the culmination altitude, multi staging. Earth launch trajectories – vertical segment, the gravity turn, constant pitch trajectory, orbital injection. Actual launch vehicle trajectories, types. Examples, the Mu 3-S-II, Ariane, Pegasus launchers. Reusable launch vehicles, future launchers, launch assist technologies.

Attitude Control of Rockets and Missiles: Rocket Thrust Vector Control – Methods of Thrusts Vector Control for solid and liquid propulsion systems, thrust magnitude control, thrust termination; stage separation dynamics, separation techniques.

Textbook 01: Ch 1.2 & Ch 5
Textbook 02: Ch 16

Module – 5	**08Hrs**

Rocket Testing: Ground Testing and Flight Testing, Types of Tests facilities and safeguards, monitoring and control of toxic materials, instrumentation and data management. Ground Testing, Flight Testing, Trajectory monitoring, post -accident procedures. Description of a typical space launch vehicle launch procedure.

Materials: Criteria for selection of materials for rockets and missiles, requirements for choice of materials for propellant tanks, liners, insulators, inhibitors, at cryogenic temperatures, requirements of materials at extremely high temperatures, requirements of materials for thermal protection and for pressure vessels.

Textbook 02: Ch 17 & 20

Course Outcomes: After completing the course, the students will be able to	
CO1	Explain the working principles, mission profiles, and differences between space launch vehicles and military missiles.
CO2	Analyse and Evaluate the performance of solid and liquid rocket propulsion systems
CO3	Apply aerodynamic concepts to determine forces, moments, drag, stability, and dispersion characteristics of rockets and missiles.
CO4	Apply rocket dynamics and trajectory principles to solve problems involving rocket motion, gravity turn, multi-staging, and thrust vector control.
CO5	Demonstrate understanding of rocket testing methods, material selection

Text Books	
1	Turner, M.J.L., Rocket and Spacecraft propulsion, Springer,3rd edition, 2010, ISBN-13: 978- 3642088698
2	George P Sutton and Oscar Biblarz, 'Rocket Propulsion Element', John Wiley and Sons Inc,7th Edition, 2010, ISBN-13: 978-8126525775.
3	Jack N Neilson, 'Missile Aerodynamics', AIAA,1st edition, 1988, ISBN-13: 978-0962062902.

Reference Books	
1	SS. Chin, 'Missile Configuration Design', McGraw Hill, 1961.
2	Cornelisse, J.W, Schoyer H.F.R. and Wakker, K.F., Rocket Propulsion and Space-Flight Dynamics, Pitman, 1979,ISBN-13: 978-0273011415
3	Ball, K.J., Osborne, G.F., Space Vehicle Dynamics, Oxford University Press, 1967,ISBN-13:978- 0198561071
4	Parker, E.R., Materials for Missiles and Spacecraft, McGraw Hill, 1982.

Web links and Video Lectures (e – Resources)	
1	https://onlinecourses.nptel.ac.in/noc22_ae03/preview
2	https://archive.nptel.ac.in/courses/101/108/101108054/

CO – PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	-	-	-	-	-	-	-	3
CO2	3	2	2	2	-	-	-	-	-	-	2
CO3	3	2	2	2	-	-	-	-	-	-	2
CO4	3	2	2	2	-	-	-	-	-	-	2
CO5	3	2	2	2	1	-	-	-	-	-	2

Semester: VII						
Supply Chain Management						
Course Code	:	BAS745D		**Credits**	:	3
Hours/Week(L:T:P)	:	3:0:0		**CIE**	:	50 Marks
Total Hours	:	40		**SEE**	:	50 Marks
Course Type	:	OEC		**SEE Duration**	:	3 Hours

Prerequisites:	
Courses	
Knowledge on Fundamental Concepts	
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the Fundamentals of Supply Chain Management.
CLO2	Explore Strategic Sourcing and Outsourcing Decisions.
CLO3	explain Warehouse and Stores Management.
CLO4	Analyze Supply Chain Network Optimization Models.
CLO5	Examine Current Trends and Future of Supply Chain Management.

Module – 1	**08Hrs**
Introduction: Supply Chain – Fundamentals –Evolution- Role in Economy - Importance - Decision Phases – Supplier Manufacturer-Customer chain. - Enablers/ Drivers of Supply Chain Performance. Supply chain strategy - Supply Chain Performance Measures. **Textbook 1: Ch 1, 2**	
Module – 2	**08Hrs**
Strategic Sourcing Outsourcing: Make Vs buy - Identifying core processes - Market Vs Hierarchy - Make Vs buy continuum - Sourcing strategy - Supplier Selection and Contract Negotiation. Creating a world class supply base- Supplier Development - World Wide Sourcing. **Textbook 1: Ch 3**	
Module – 3	**08Hrs**
Warehouse Management Stores management: stores systems and procedures-incoming materials controlstores accounting and stock verification Obsolete, surplus and scrap-value analysis-material handlingtransportation and traffic management -operational efficiency-productivity-cost effectiveness-performance measurement. Supply Chain Network Distribution Network Design – Role - Factors Influencing Options, Value Addition – Distribution Strategies - Models for Facility Location and Capacity allocation. Distribution Center Location Models. **Text book 1: Ch 5, 6**	
Module – 4	**08Hrs**
Supply Chain Network optimization models: Supply Chain Network optimization models. Impact of uncertainty on Network Design-Network Design decisions using Decision trees. Planning Demand, -multiple item -multiple	

location inventory management. Pricing and Revenue Management.

Text book 2: Ch 6, 7, 10, 11, 15

Module – 5	**08Hrs**

Current Trends:
Supply Chain Integration - Building partnership and trust in Supply chain Value of Information: Bullwhip Effect - Effective forecasting - Coordinating the supply chain. Supply Chain restructuring, Supply Chain Mapping - Supply Chain process restructuring, Postpone the point of differentiation – IT in Supply Chain - Agile Supply Chains -Reverse Supply chain. Future of IT in supply chain- EBusiness in supply chain.

Text book 2: Ch 16, 17

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand in Supply Chain Fundamentals and Strategy.
CO2	Expertise in Strategic Sourcing and Outsourcing.
CO3	Explain Warehouse and Stores Management.
CO4	Knowledge of Supply Chain Network Optimization and Decision-Making Models.
CO5	Analyze Current Trends and Future Directions in Supply Chain Management.

Text Books	
1	Supply Chain Management– Text and Cases Janat Shah Pearson Education 2009
2	Supply Chain Management Strategy Planning and Operation Sunil Chopra and Peter Meindl PHI Learning / Pearson Education 2007

Reference Books	
1	Business Logistics and Supply Chain Management Ballou Ronald H Pearson Education 5th Edition, 2007
2	Designing and Managing the Supply Chain: Concepts, Strategies, and Cases David Simchi-Levi, Philip Kaminsky, Edith Simchi-Levi Tata McGraw-Hill 2005

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/playlist?list=PL040D2F9406691BE6
2	https://onlinecourses.nptel.ac.in/noc25_hs205/preview

CO - PO Mapping:

CO \ PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	2	1	1	1	1	-	1	1	2
CO2	2	3	3	2	1	2	2	2	2	2	3
CO3	3	3	3	3	2	2	2	1	2	2	3
CO4	3	3	3	3	3	1	1	-	2	2	3
CO5	2	3	2	3	3	2	3	2	2	2	3

Semester: VII						
Career Readiness & Industry Integration **Stream: CSE/ECE/CV/ME**						
Course Code	:	BCR737		**Credits**	:	0
Hours/Week(L:T:P)	:	4:0:0		**CIE**	:	100 Marks
Total Hours	:	60		**SEE**	:	-
Course Type	:	NCMC		**SEE Duration**	:	-

Prerequisites:	
Courses	Competency Enhancement Course-1,2,3&4
Knowledge on Fundamental Concepts	-
Knowledge on Connected Tools	NA

Course Learning Objectives: This course will enable the students to	
CLO1	Strengthen core aptitude and reasoning skills
CLO2	Build confidence and competence for interviews and group activities
CLO3	Develop foundational and advanced problem-solving using Data Structures and Algorithms (DSA)
CLO4	Enable algorithmic thinking through pseudocode
CLO5	Apply clean coding practices in high-pressure environments

Module – 1	**12 Hrs**

Company-Specific Aptitude Practice

Solve previous year question papers from major campus recruiters. These detailed solutions help candidates familiarize themselves with the patterns, difficulty levels, and frequently asked question types of leading companies.

Textbook1, Ch 1-7
Textbook 2, Ch 1-5

Module – 2	**12 Hrs**

Group Discussion Mastery

Revisiting key principles of effective GDs, Abstract, current affairs, and case-based topics, Role of initiator, moderator, and conclusion leads, Multiple GD rounds with evaluation rubrics, How to stand out without dominating

Resume Writing and Linked Profiling

Effective resume writing involves a clear, results-focused format tailored to the job, highlighting key skills and quantified achievements. A strong LinkedIn profile complements this by showcasing your professional story, skills, endorsements, and active engagement to boost visibility and credibility.

Interview Skills

Quick recap of HR & Technical Interview structures, Smart resume revision techniques
Rebuilding your personal pitch for 2025 placements, Mock Q&A: Handling common & tricky questions, Feedback loops for voice tone, articulation & clarity

Mock Interviews (Technical + HR) Practice Rounds

Individual interview rounds in real-time simulation, Panel-style questioning and cross-

questioning, Focused feedback on confidence, grooming, and articulation, Personalized correction pointers for improvement

Textbook -3: Page-1-112

Module-3	**12 Hrs**

Importance of Competitive Coding for interviews and placements

Problem decomposition & edge case identification, Basics of time and space complexity, Story-based introduction to problem-solving, Brainstorm real-world scenarios & translate to problems, Identify edge cases via mini-quizzes, Live walkthroughs (e.g., parking fee calculator),

Coding warm-up challenge

Arrays, Linked Lists, Stacks, Queues, Hashing, Trees, Graphs, Mapping DS to real-life systems (e.g., ticket booking, social feeds), Trade-offs in DS selection, Implement DS in hands-on coding labs, Real-life simulation: Airline or hospital queue system, Use case discussions, Group exercises with efficiency comparisons, Greedy, Divide & Conquer, DP, Backtracking, Practical applications with real-world stories, Efficiency and trade-offs, Debugging complex logic, Group challenge: Route optimization using Dijkstra, Hands-on: Knapsack, Fibonacci DP, Game simulations, Compare multiple approaches for the same problem, Debugging hackathons

Reference Book 1: Ch 1-12

Module-4	**12 Hrs**

Importance of pseudocode in problem-solving and interview prep

Structure and syntax of pseudocode (input/output, conditionals, loops), Translating problem statements into structured pseudocode, Converting pseudocode to actual code (dry run), Common logical mistakes in pseudocode, Aligning pseudocode with data structure & algorithm design, Write pseudocode for classic problems (e.g., factorial, palindrome, searching/sorting), Group activity: Convert real-world scenarios into pseudocode (e.g., ATM simulation, elevator logic), Peer reviews and correction of pseudocode, Dry-run pseudocode vs actual code, Challenge: Write pseudocode for unseen story-based problems.

Reference Book 2: Ch 1-5

Module-5	**12 Hrs**

Real-time coding practice under pressure

Clean code and edge case handling, Explaining solutions during interviews, Final review of optimization strategies, Mock interviews with peer & trainer feedback, Solve end-to-end coding case studies, Debugging marathons, Individual reflection + feedback loop.

Reference Book 3: Ch 1-6

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply foundational aptitude concepts to solve quantitative, verbal and logical reasoning problems with accuracy and efficiency.
CO2	Demonstrate professional communication skills and interview readiness through mock interviews, personal pitch delivery and group discussions.
CO3	Solve coding problems using appropriate data structures and algorithms, recognizing edge cases and optimizing for time/space complexity.
CO4	Interpret real-world problems into structured pseudocode and implement clean, logical solutions in code.
CO5	Perform under interview-like coding conditions, explain approaches and apply

	debugging techniques to deliver optimal solutions.

Text Books	
1	Quantitative Aptitude for Competitive Examinations, R.S. Aggarwal Chand Publishing. – 2023.
2	Objective English, S.P. Bakshi, 3rd Edition, Arihant Publications – 2021, ISBN- 978-9325791718
3	Cracking the Code to a Successful Interview, Evan Pellett, Blackstone Pub- 2016, ISBN- 978-1441700537

Reference Books	
1	Data Structures and Algorithms, Narasimha Karumanchi, 5th Edition, Careermonk Publications – 2016, ISBN- 978-8193245279
2	Algorithm Design Manual, Steven Skiena, 1st Edition, SPRINGER NP EXCLUSIVE(CBS)-2017, ISBN- 978-1849967204
3	Cracking the Coding Interview, Gayle Laakmann McDowell, 6th Edition, CareerCup-2015, ISBN- 978-0984782857

Web links and Video Lectures (e – Resources)	
1	https://www.placementpreparation.io/quantitative-aptitude/
2	https://www.examsnet.com/quantitative-aptitude
3	https://www.testmocks.com/blog/reasoning-mock-test/
4	https://www.practice4me.com/verbal-ability-test/
5	https://codersdaily.in/start/verbal-aptitude-test
6	https://grow.google/certificates/interview-warmup/
7	https://course.flourish.careers/interview-essentials-toolkit
8	https://gdpiwat.com/gd-concepts/
9	https://timespro.com/online-courses/certificate-program-in-professional-grooming-and-workplace-behaviour
10	https://www.edstellar.com/course/grooming-etiquette-training
11	https://www.hackerrank.com/
12	https://www.codechef.com/practice
13	https://codeforces.com/blog/entry/23054
14	https://algocademy.com/blog/how-to-write-pseudocode-that-impresses-interviewers/
15	https://algocademy.com/blog/how-to-use-pseudocode-effectively-in-technical-interviews-a-comprehensive-guide/
16	https://codeforces.com/
17	https://leetcode.com/

CO – PO Mapping:

CO \ PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	-	-	-	-	-	-	-	-	2
CO2	-	-	-	-	-	-	-	3	3	-	2
CO3	3	2	3	3	2	-	-	-	-	-	3
CO4	3	2	3	3	2	-	-	-	-	-	2
CO5	2	2	3	-	-	-	-	2	2	-	3

SJC INSTITUTE OF TECHNOLOGY, CHIKKABALLAPURA

An Autonomous institution Under VTU from 2024 – 2025

AICTE Approved, Accredited by NBA(CSE, ISE, ECE, ME, CV, AE) and NAAC with 'A+' grade, QS – I Gauge Gold Rated

SCHEME OF TEACHING AND EXAMINATION – B.E. – Aerospace Engineering

(Applicable for students admitted from the Academic Year 2024-25 and onwards)

8th Semester

Aerospace Engineering

Sl. No.	Course Code	Course Title	Course Type	TD/ PSB	Teaching Hours / Week			Examination				
					L	T	P	SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks	Credits
1	BAS821x	Professional Elective Course - IV (Online Course) only through NPTEL / VTU MOOC / Centre Of Excellence of the concerned department	PEC		3	0	0	**3**	**50**	**50**	**100**	**3**
2	BAS842x	Open Elective Course - III (Online Course) only through NPTEL / VTU MOOC / Centre Of Excellence of the concerned department	OEC		3	0	0	**3**	**50**	**50**	**100**	**3**
3	BAS833	Internship (Industry / Research / Rural) (14 – 20 weeks)	INT		0	0	12	**3**	**100**	**100**	**200**	**8**
									200	**200**	**400**	**14**

PEC: Professional Elective Course, OEC: Open Elective Course, INT: Industry Internship / Research Internship, L: Lecture, T: Tutorial, P: Practical, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation.

Professional Elective Course – IV (Online Course – only through NPTEL, suggested by BoS)

Course Code	Course Name	Course Code	Course Name
BAS821A	NPTEL / VTU MOOC	BAS821C	NPTEL / VTU MOOC
BAS821B	NPTEL / VTU MOOC	BAS821D	NPTEL / VTU MOOC

Open Elective Course – III (Online Course – only through NPTEL, suggested by BoS)

Course Code	Course Name	Course Code	Course Name
BAS842A	NPTEL / VTU MOOC	BAS842C	NPTEL / VTU MOOC
BAS842B	NPTEL / VTU MOOC	BAS842D	NPTEL / VTU MOOC

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the

selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

Open Elective Courses: Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.

Elucidation: At the beginning of IV years of the program i.e., after VI semester, VII semester classwork and VIII semester Research Internship /Industrial Internship / Rural Internship shall be permitted to be operated simultaneously by the University so that students have ample opportunity for an internship. In other words, a good percentage of the class shall attend VII semester classwork and a similar percentage of others shall attend to Research Internship or Industrial Internship or Rural Internship.

Research/Industrial /Rural Internship shall be carried out at an Industry, NGO, MSME, Innovation center, Incubation center, Start-up, center of Excellence (CoE), Study Centre established in the parent institute and /or at reputed research organizations/institutes.

The mandatory Research internship /Industry internship / Rural Internship is for 14 to 20 Weeks. The internship shall be considered as a head of passing and shall be considered for the award of a Degree. Those, who do not take up/complete the internship shall be declared to fail and shall have to complete it during the subsequent University examination after satisfying the internship requirements.

Research internship: A research internship is intended to offer the flavor of current research going on in the research field. It helps students get familiarized with the field and imparts the skill required for carrying out research.

Industry internship: Is an extended period of work experience undertaken by students to supplement their Degree for professional development. It also helps them learn to overcome unexpected obstacles and successfully navigate organizations, perspectives, and cultures. Dealing with contingencies helps students recognize, appreciate, and adapt to organizational realities by tempering their knowledge with practical constraints.

Rural Internship: Rural development internship is an initiative of Unnat Bharat Abhiyan Cell, RGIT in association with AICTE to involve students of all departments studying in different academic years for exploring various opportunities in techno-social fields, to connect and work with Rural India for their upliftment.

Credit Definition

1-hour Lecture (L) per week=1Credit	04-Credits courses are to be designed for 50 hours of Teaching-Learning Session
2-hoursTutorial(T) per week=1Credit	04-Credits (IC) are to be designed for 40 hours' theory and 12-14 hours of practical sessions
2-hours Practical / Drawing (P) per week=1Credit	03-Credits courses are to be designed for 40 hours of Teaching-Learning Session
2-hous Skill Development Actives (SDA) per week = 1 Credit	02- Credits courses are to be designed for 25 hours of Teaching-Learning Session
	01-Credit courses are to be designed for 12-15 hours of Teaching-Learning sessions

Institute Vision

Preparing Competent Engineering and Management Professionals to Serve the Society

Institute Mission

- Providing Students with a Sound Knowledge in Fundamentals of their branch of Study.
- Promoting Excellence in Teaching, Training, Research and Consultancy.
- Exposing Students to Emerging Frontiers in various domains enabling Continuous Learning.
- Developing Entrepreneurial acumen to venture into Innovative areas.
- Imparting Value based Professional Education with a sense of Social Responsibility.

Department Vision

Building Competent Aerospace Engineers with a blend of Research, Innovation and Entrepreneurship Centre for the Real world

Department Mission

- Imparting knowledge in basic and applied areas of Aerospace Engineering.
- Providing hands on training on state-of-the-art technologies related to Aerospace Engineering.
- Creating a learning atmosphere for higher studies and research blossom both amongst the students and the faculty.
- Developing teamwork, interdisciplinary research, internship and entrepreneur skills through industry-institute interface.
- Inculcating Technical, leadership skills and life-long learning embedded with ethical values and social relevance.

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P.B. No.20, B.B Road,

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