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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

III 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

INSTITUTION'S INNOVATION COUNCIL (Ministry of HRD Initiative) 4-Star Rating

SJC INSTITUTE OF TECHNOLOGY, CHIKKABALLAPURA

An Autonomous institution Under VTU from 2024 – 2025

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

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

3rd 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	BMATM301	Mathematics-III for ME Stream	ASC	MAT	3	2	0	**3**	**50**	**50**	**100**	**4**
2	BAS302	Aero Thermodynamics	IPCC	AS	3	0	2	**3**	**50**	**50**	**100**	**4**
3	BAS303	Mechanics of Fluid	IPCC	AS	3	0	2	**3**	**50**	**50**	**100**	
4	BAS304	Introduction to Aerospace Engineering	PCC	AS	3	0	0	**3**	**50**	**50**	**100**	
5	BASL305	Computer Aided Aircraft Drawing	PCCL	AS	0	0	2	**3**	**50**	**50**	**100**	
6	BAS306x	ESC/ETC/PLC	ESC	AS	If the course is a Theory 3 0 0 If the course is a Laboratory 2 0 2			**3**	**50**	**50**	**100**	
7	BSC307	Social Connect and Responsibility	UHV	ANY DEPT	0	0	2	**-**	**100**	**-**	**100**	
8	BAS308x	Ability Enhancement Course/Skill Enhancement Course – III	AEC/ SEC	AS	If the course is a Theory 1 0 0 If the course is a Laboratory 0 0 2			**1** **2**	**50**	**50**	**100**	**1**
9	BES309	Environmental Studies	MC	Civil	1	0	0	**1**	**50**	**50**	**100**	**1**

10	BNS310	National Service Scheme (NSS)	NCMC	NSS Coordinator	0	0	2	-	**100**	-	**100**	
	BPE310	Physical Education (PE) (Sports and Athletics)		Physical Education Director								
	BYO310	Yoga		Yoga Teacher								
	BMU310	Music		Music Teacher								
11	BCE311	Competency Enhancement Course-1	NCMC	CDCAC		2		-	**100**	-	**100**	**0**
									700	**400**	**1100**	**22**

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.

Engineering Science Course (ESC/ETC/PLC) (Note- Student should opt for the course which should not be similar to the course opted in 1st Year)

Course Code	Course Name	Course Code	Course Name
BAS306A	Manufacturing Technology	BAS306C	Aerospace Materials and Processes
BAS306B	Introduction to Drone Technology	BAS306D	Introduction to Automation and Robotics

Ability Enhancement Course/Skill Enhancement Course – III

Course Code	Course Name	Course Code	Course Name
BAS308A	Technical writing using LATEX (Lab) (0:0:2)	BAS308C	Fundamentals of Digitalization
BAS308B	Spread Sheet for Engineers	BAS308D	Aerospace Measurements Laboratory

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.

National Service Scheme /Physical Education/Yoga/Music: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE) (Sports and Athletics), Yoga and Music with the concerned coordinator / teacher of the course during the first week of 3rd semester. Activities shall be carried out between 3rd semesters to the 6th semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, Yoga and Music activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Semester: III					
Mathematics-III for Mechanical Stream Stream: ME					
Course Code	**:**	BMATM301	**Credits**	**:**	4
Hours/Week (L: T:P)	**:**	3:2:0	**CIE**	**:**	50Marks
Total Hours	**:**	50 Hrs	**SEE**	**:**	50Marks
Course Type	**:**	ASC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Basic Mathematics
Knowledge on Fundamental Concepts	Basic Differentiation, Integration
Knowledge on Connected Tools (If any)	Basic computer knowledge

Course Objectives: This course will enable the students to	
CLO1	Introduce integral transforms such as Laplace, Fourier, and Z-transforms, and apply them to solve engineering problems related to dynamics, control systems, and heat conduction.
CLO2	Develop the ability to model and analyze dynamic systems such as mass-spring-damper and aircraft transfer functions using Laplace transforms.
CLO3	Apply probability theory and statistical methods for modelling uncertainty in aerospace systems, including turbulence simulation and reliability assessment.
CLO4	Enable students to perform statistical inference and hypothesis testing for data analysis, supporting decision-making in experimental and simulation-based aerospace research
CLO5	Equip students with numerical techniques for solving partial differential equations, especially those relevant to heat and wave propagation in aerospace structures.

Module - 1	**10 Hrs**
Curve fitting and Statistical Analysis: Curve fitting by method of least squares: y = ax+b, y = ax^2 +bx+c and $y=ax^b$. Correlation– Karl Pearson's coefficient of correlation, Rank correlation, Regression analysis – lines of regression (without proof)- problems. **Applications**: Vibrational Modal Analysis, Machining and Manufacturing. **Self-Study:** Angle between regression lines. **Text book 3: Ch 11: 11.1 - 11.3, Ch 12**	
Module - 2	**10 Hrs**
Probability Distributions: Random Variables (Discrete and Continuous). Probability mass and density functions. Mathematical expectation, Mean and variance. Discrete probability distributions: Binomial, Poisson, Normal distributions (derivations for mean and standard deviation for Binomial and Poisson distributions only)-Illustrative examples. **Applications**: Quality control and Manufacturing. **Self-Study:** Exponential Mean-problems. **Text Book 1: Ch 26: 26.7,26.8, 26.9,26.13,26.14,26.15,26.16,26.18.**	
Module -3	**10 Hrs**
Introduction to Laplace Transform: Definition, basic properties and simple problems. Laplace transforms of Periodic functions (statement only), Inverse Laplace transform, Problems using partial fractions, Solving ODEs using Laplace transform. **Applications**: Modelling mass-spring-damper systems**,** Transient response of mechanical systems. **Self-Study:** Unit step function. **Text Book 1: Ch 21: 21.1, 21.2, 21.3, 21.4, 21.5,21.7, 21.8, 21.9, 21.10, 21.11,**	

21.12, 21.15 **Text Book 2: Ch 4: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.9, 4.10, 4.13**	
Module - 4	**10 Hrs**
Fourier series and practical harmonic analysis: Fourier series expansion of functions Periodic functions, Dirichlet's condition. Fourier series expansion of functions with period 2π and with arbitrary period: Half-range Fourier series. Practical harmonic analysis. **Applications**: Aircraft autopilot sampling systems. **Self-Study:** periodic rectangular wave, Half-wave rectifier, rectangular pulse, Saw tooth wave. **Text Book 1: Ch 10: 10.2,10.3,10.5,10.6,10.7,10.11** **Text Book 2: Ch 5: 5.2,5.3,5.4,5.5,5.6,5.7,5.9,5.11,5.12,5.15**	
Module - 5	**10 Hrs**
Applications of Partial Differential Equations: Classifications of second-order partial differential equations, finite difference approximations to derivatives, Solution of Laplace's equation using standard five-point formula. Solution of heat equation by Schmidt explicit formula and Crank- Nicholson method. **Applications:** Vibration analysis (wave equation) – in structures like aircraft fuselage and turbine blades. **Self-Study:** Solution of the Wave equation Problems. **Text Book 1: Ch 18: 18.1,18.2,18.3,18.4,18.9,18.** **Text Book 2: Ch 6: 6.6,6.7,6.8,6.9,6.11,6.12**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply the principles of least squares to perform curve fitting and Analyze data using correlation and regression techniques.
CO2	Solve problems involving uncertainties in engineering systems by utilizing probability distributions and random variable concepts.
CO3	Apply Laplace transform techniques to solve ordinary differential equations and model dynamic systems such as mass-spring-damper and heat conduction problems relevant to aerospace and mechanical engineering.
CO4	Analyze signals using Fourier and Z-transforms to interpret frequency-domain behaviour in structural vibrations, heat transfer, and sampled control systems in aircraft.
CO5	Solve partial differential equations numerically using finite difference methods to analyze physical phenomena such as heat conduction and wave propagation in aerospace structures.

Text Books	
1	Higher Engineering Mathematics, B. S. Grewal,43rd Edition,2015, Khanna Publishers, ISBN:978-81-933284-9-1.
2	Advanced Engineering Mathematics, E. Kreyszig, 10th Ed, 2018, John Wiley & Sons.
3	Probability and Statistics for Engineers and Scientists" – Ronald E. Walpole et al. (9th edition) 2010

Reference Books	
1	Higher Engineering Mathematics, B. V. Ramana, 11th Ed., 2017, McGraw-Hill Education
2	A Textbook of Engineering Mathematics, N.P Bali and Manish Goyal, 10th Ed, 2022, Laxmi Publications.

Web links and Video Lectures (e – Resources)	
1	http://nptel.ac.in/courses.php?disciplineID=111
2	http://www.class-central.com/subject/math(MOOCs)

CO – PO MAPPING

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

Semester: III					
Aero Thermodynamics					
Course Code	**:**	BAS302	**Credits**	**:**	4
Hours/Week (L: T:P)	**:**	3:0:2	**CIE**	**:**	50 Marks
Total Hours	**:**	40+10 Hrs	**SEE**	**:**	50 Marks
Course Type	**:**	IPCC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Applied Physics, Applied Chemistry and Engineering Mathematics
Knowledge on Fundamental Concepts	Energy, work, heat, temperature, and basic chemical principles
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Understand various concepts and definitions of Basic of thermodynamics.
CLO2	Comprehend the I-law and II-law of thermodynamics
CLO3	Acquire the knowledge of various types of gas cycles.
CLO4	Analyze the thermodynamic properties of pure substance
CLO5	Analysis of various Air conditioning processes

Module – 1	**08 Hrs**

Fundamental Concepts and Definitions:

Thermodynamics definition and scope, Microscopic and Macroscopic approaches. Some practical applications of engineering thermodynamic Systems, Characteristics of system boundary and control surface, examples. Thermodynamic properties; definition and Modules, intensive and extensive properties. Thermodynamic state, state point, state diagram, path and process, quasi-static process, cyclic and non-cyclic processes; Thermodynamic equilibrium; definition, mechanical equilibrium; diathermic wall, thermal equilibrium, chemical equilibrium. Zeroth law of thermodynamics,

Work and Heat:

Mechanics-definition of work and its limitations. Thermodynamic definition of work; examples, sign convention. Displacement work; as a part of a system boundary, as a whole of a system boundary, expressions for displacement work in various processes through p-v diagrams. Shaft work; Electrical work. Other types of work. Heat.

Text book 1: Ch 1- 1.1-1.11 and Ch 3- 3.1-3.10

Module – 2	**08 Hrs**

First Law of Thermodynamics:

Joules experiments, equivalence of heat and work. Statement of the First law of thermodynamics, extension of the First law to non - cyclic processes, energy, energy as a property, modes of energy, pure substance; definition, two-property rule, Specific heat at constant volume, enthalpy, specific heat at constant pressure. Extension of the First law to control volume; steady state- steady flow energy equation, important applications, analysis of unsteady processes such as film and evacuation of vessels with and without heat transfer.

Text book 1: Ch 4- 4.1-4.10, 5.1-5.8

Module – 3	**08 Hrs**

Second Law of Thermodynamics:

Devices converting heat to work; (a) in a thermodynamic cycle, (b) in a mechanical cycle. Thermal reservoir. Direct heat engine; schematic representation and efficiency. Devices converting work to heat in a thermodynamic cycle; reversed heat engine, schematic representation, coefficients of performance. Kelvin - Planck statement of the Second law of Thermodynamics; PMM I and PMM II, Clausius statement of Second law of

Thermodynamics, Equivalence of the two statements; Reversible and Irreversible processes; factors that make a process irreversible, reversible heat engine, Carnot cycle, Carnot principles. **Entropy:** Clausius theorem, entropy a property of system, clausius inequality, principle of increase of entropy, change in entropy of ideal gas, problems **Text book 1: 6.1-6.18,7.1-7.12** **Text book 2: 4.1-4.20, 5.1-5.13**
Module – 4 **08 Hrs**
Pure Substances & Ideal Gases: Mixture of ideal gases and real gases, ideal gas equation, compressibility factor use of charts. P-T and P-V diagrams, triple point and critical points. Sub- cooled liquid, Saturated liquid, mixture of saturated liquid and vapour, saturated vapour and superheated vapour states of pure substance with water as example. Enthalpy of change of phase (Latent heat). Dryness fraction (quality), T-S and H-S diagrams, representation of various processes on these diagrams. **Text book:** 9.1-9.9,10.1-10.4 **Text book 2:** 6.1-6.23
Module – 5 **08 Hrs**
Gas Power Cycles: Efficiency of air standard cycles, Carnot, Otto, Diesel and Dual cycles, P-V & T-S diagram, calculation of efficiency. Comparison of Otto, Diesel and Dual cycle. **Text book 1:** Chapter 13.1-13.8

Practical Component of IPCC	
Sl. No	**Experiments**
1	Determination of Flash point and Fire point of lubricating oil using Martin Pensky (closed) Apparatus.
2	Determination of Flash point and Fire point of lubricating oil using Abel Pensky Apparatus.
3	Determination of Viscosity of lubricating oil using Redwood and Saybolt Viscometers.
4	Determination of Calorific value of solid, liquid and gaseous fuels.
5	Valve Timing diagram of an I.C. Engine.
6	Performance Tests on I.C. Engines, Calculations of IP, BP, Thermal efficiencies, Volumetric efficiency, Mechanical efficiency, SFC, FP. Four stroke Petrol Engine
7	Performance Tests on I.C. Engines, Calculations of IP, BP, Thermal efficiencies, Volumetric efficiency, Mechanical efficiency, SFC, FP. Four stroke Diesel Engine
8	Determination of Thermal Conductivity of Metal Rod
9	Determination of Heat Transfer Coefficient in a Forced Convention Flow through a Pipe.
10	Determination of Heat Transfer Coefficient in a free Convection on a vertical tube.

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand and remember the basic concepts and definition of thermodynamics
CO2	Empathize the first law of thermodynamics and evaluate change in internal energy, enthalpy and work output.
CO3	Apply second law of thermodynamics to heat engine, heat pump and evaluate change in entropy.
CO4	Analyze the thermodynamic properties of pure substances.
CO5	Evaluate the principles and power output of various gas power cycles.

Text Books	
1	Basic and Applied Thermodynamics P.K.Nag, 2nd Edition., 2002, Tata McGraw Hill Pub, ISBN-13: 978- 0070151314.
2	Basic Thermodynamics by M.K.Muralidhar, 3rd edition Subhas stores, Bangalore

Reference Books	
1	Fundamentals of Classical Thermodynamics, G.J.Van Wylen and R.E.Sonntag, 3rd Edition, 1986, Wiley Eastern, ISBN-13: 978-0-471-61075-5
2	Thermodynamics: An Engineering Approach, Yunus A.Cengal and Michael A.Boles, 8th Edition, 2016, Tata McGraw Hill publications, ISBN: 9780070495036

Web links and Video Lectures (e – Resources)	
1	https://archive.nptel.ac.in/courses/112/105/112105123/
2	https://archive.nptel.ac.in/courses/112/105/112105266/

CO-PO Mapping

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

Semester: III					
Mechanics of Fluid					
Course Code	**:**	BAS303	**Credits**	**:**	4
Hours/Week (L: T:P)	**:**	3:0:2	**CIE**	**:**	50 Marks
Total Hours	**:**	40 +12 Hrs	**SEE**	**:**	50 Marks
Course Type	**:**	IPCC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Engineering Mathematics, Physics (Mechanics).
Knowledge on Fundamental Concepts	Units and Dimensions, Basic Fluid Properties, Newton's Laws of Motion, Calculus and Differential Equations.
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Recall the basics fluid and its properties.
CLO2	Understand the governing laws of fluid flow.
CLO3	Acquire the knowledge of types of fluid flows.
CLO4	Analyze the governing equations of fluid flows
CLO5	Apply the fluid flows in various applications.

Module – 1	**08 Hrs**
Fluid Statics: Pascal's law, Pressure variation with depth, manometers, hydrostatic thrust on submerged plane and curved surfaces, centre of pressure, buoyancy, stability of submerged and floating bodies, Metacenter and Meta centric height. **Fluid Kinematics:** Introduction, Lagrangian & Eulerian Description of Fluids, Types of Fluid Flows, Stream line, streak line and path line, circulation and vorticity, stream function and velocity potential function, continuity equation in Integral form and 3D Cartesian coordinates. **Textbook 1: Ch 1- 2.2- 2.5, 2.7, 2.8, Ch 4- 4.1, 4.2- 4.4 and 4.6**	
Module – 2	**08 Hrs**
Potential Flows: Laplace Equation, Uniform flow, Source flow, Sink flow, Combination of a uniform flow with source and sink, Doublet flow, Non-lifting flow over a circular cylinder, Vortex flow, Lifting flow over a circular cylinder, Kutta-Joukowski theorem and generation of Lift, D'Alembert's paradox. **Textbook 2: Ch 10- 10.2, 10.5- 10.7, Ch 11- 11.1 and 11.4**	
Module – 3	**08 Hrs**
Fluid Dynamics: Basic governing equations of fluid flows, Reynold's Transport theorem, Mass conservation, Momentum Conservation and Energy conservation equations, and Introduction to Navier –Stokes Equations. **Incompressible Inviscid Flow:** Euler's equation of fluid motion (from first principles), Bernoulli's equation, Bernoulli's equation for real fluid flows. **Application of Bernoulli's equation:** Flow measurement: Orifice plate, Venturi meter, Notches: rectangular and V-notch, Pitot and Pitot static tube. **Textbook 1: Ch 3- 3.1- 3.7, Ch4- 4.1- 4.4, Ch 6- 6.4 and 6.12**	
Module – 4	**08 Hrs**
Incompressible Viscous flow: Boundary layer concept, Boundary layer thickness, displacement thickness and momentum thickness; flow separation, Couette flow, Poiseuille flow, kinetic Energy correction factor. **Turbulent Flows:** Mechanism of Transition from Laminar to Turbulent Flows, magnitude, Intensity and scale of Turbulence, Measurement of Turbulence using Hot Wire Anemometer, Velocity distribution in a Turbulent Flow, Head Loss in Pipe due to Friction (Darcy's Equation).	

Textbook 2: Ch 8- 8.1- 8.5, Ch 9- 9.1, 9.2, Ch 10- 10.1, 10.2 and 10.6	
Module – 5	**08 Hrs**
Dimensional Analysis & Model Studies: Units and Dimensions, Dimensional Homogeneity, Dimensional Analysis-Rayleigh's Method, Buckingham's π-Theorem, Dimensionless numbers. Model Analysis, Types of Similarities and Similitude, Similarity Laws. **Introduction to Compressible Flows:** Stagnation Properties, One- Dimensional Isentropic Flow, Mach number, Mach Cone. **Textbook 1: Ch 5.1-5.7, Ch 9- 9.2- 9.4 and 9.9**	

Practical Component of IPCC	
Sl. No.	**Experiments**
1	Calibration of Venturimeter.
2	Determination of discharge of a given Pipe Flow using Venturimeter/Orifice meter.
3	Determination of Coefficient of discharge for a small orifice by a constant head method.
4	Determination of Coefficient of discharge for a small orifice by a variable head method.
5	Determination of Viscosity of a Fluid.
6	Calibration of contracted Rectangular Notch.
7	Verification of Bernoulli's equation.
8	Pipe friction apparatus with loss of head on pipe fittings.
9	Determination of Coefficient of loss of head in a sudden contraction and friction factor.
10	Estimation of Major loss/Minor losses for a given flow system.
11	Determination of state of flow in a closed conduit using Reynolds Experiment.
12	Impact of Jet over a flat surface.

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the effect of fluid properties
CO2	Apply the governing laws of fluid flow in various flow analysis
CO3	Classify different types of fluid flows and its motion.
CO4	Evaluate governing equations of fluid flows
CO5	Apply the fluid flows in various applications

Text Books	
1	Fluid Mechanics, Frank M White, 8th edition, Publisher- McGraw Hill Publication, 2022, ISBN-10: 9355322046, ISBN-13: 978-9355322043.
2	Fluid Mechanics and Applications- Yunus A. Cengel and John M Cimbala, McGraw Hill Education, 5th edition, Publisher- McGraw Hill Publication, 2024, ISBN-10:1266968369, ISBN-13: 978-1266968365.

Reference Books	
1	Hydraulic Fluid Mechanics and Fluid Machines- Ramamritham. S, Dhanpat Rai& Sons, Delhi- 2018, ISBN-10: 9352161955, ISBN-13: 978-9352161959.
2	Engineering Fluid Mechanics- Kumar. K. L, 7th edition, Eurasia Publishing House (P) Ltd., New Delhi, 2008, ISBN: 8121901006.

Web links and Video Lectures (e – Resources)	
1	https://nptel.ac.in/courses/112/105/112105129/
2	https://nptel.ac.in/courses/101/104/101104063/

CO - PO Mapping

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

Semester: III					
Introduction to Aerospace Engineering					
Course Code	**:**	BAS304	**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40 Hrs	**SEE**	**:**	50 Marks
Course Type	**:**	PCC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Applied Physics (Mechanics and Thermodynamics)
Knowledge on Fundamental Concepts	Algebra, Calculus, and Vectors.
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Classify aircraft and spacecraft types, including UAVs and V/STOL systems, based on historical and modern design features.
CLO2	Analyze aerodynamic forces, lift, and drag using Bernoulli's theorem and airfoil geometry under different flow regimes.
CLO3	Compare the operational principles of piston, turboprop, turbojet, turbofan, and rocket propulsion systems.
CLO4	Evaluate aircraft structural components and material choices, focusing on composite materials and construction methods.
CLO5	Demonstrate the functionality of aircraft instruments (altimeters, Mach meters) and critical systems (fuel, environmental controls).

Module – 1	**08 Hrs**
Introduction to Aircrafts: History of aviation, International Standard atmosphere, Atmosphere and its properties, Temperature, pressure and altitude relationships, Classification of aircrafts, V/STOL machines, and Modern developments in Aviation like UAV. **Introduction to Space Flight**: History of Space Flight and spacecraft technologies Difference between space and atmosphere, upper atmosphere, Introduction to basic orbital mechanics, types of Orbits (LEO, MEO, Geosynchronous and Geostationary, Polar orbits), Kepler's Laws of planetary motion. **Text Book 1: Ch 1- 1.1-1.15, Ch 3- 3.1- 3.4, Ch 5- 5.19, 5.20 and Ch 8.1-8.5**	
Module – 2	**08 Hrs**
Basic principles of flight: Significance of speed of sound, Propagation of sound, Mach number, subsonic, transonic, supersonic, hypersonic flows, Bernoulli's theorem, Aerodynamic forces and moments on an Airfoil, Lift and drag components, lift curve, drag curve, types of drag, factors affecting lift and drag. Centre of pressure and its significance, Aerodynamic center, Aspect ratio, Airfoil nomenclature, Basic characteristics of airfoils, NACA nomenclature, Simple problems on lift and drag. **Text Book 1: Ch 4- 4.1- 4.6, 4.9 and Ch 5.1 - 5.11.**	
Module – 3	**08 Hrs**
Aircraft Propulsion: Introduction, Classification, Piston Engine & its application, Brayton cycle, Principle of operation of Turboprop, turbojet and turbofan engines, Introduction to ramjets and scramjets; performance characteristics. **Elements of rocket propulsion:** launch vehicle dynamics – basic orbital mechanics – satellite applications and orbits, future challenges in aerospace engineering. **Text Book 1: Ch 9- 9.1- 9.9, Ch 8- 8.4, 8.5 and Ch 10- 10.6.**	
Module – 4	**08 Hrs**

Aircraft Structures and Materials: Introduction, General types of construction, Monocoque, Semi-Monocoque and Geodesic structures, Typical wing and fuselage structure. **Aircraft Materials:** Metallic and non-metallic materials for aircraft application, Use of aluminum alloy, titanium, stainless steel and composite materials.

Text Book 2 : Ch 1- 1.1-1.3, Ch 2- 2.2, 2.3, Ch 3- 3.1- 3.3, Ch 4- 4.2- 4.4, and Ch 5.1- 5.4

Module – 5	**08 Hrs**

Aircraft Instruments: Instrument Displays, Introduction to Navigation Instruments, Basic Air data systems & Probes, Mach meter, Air speed indicator, Vertical speed indicator, Altimeter, Gyro based instruments.

Aircraft Systems: Introduction to Hydraulic and pneumatic systems, Air Conditioning and Cockpit pressurization system, Generation and distribution of electricity on board the airplane, Aircraft Fuel System, Fire Protection, Ice and Rain Protection System.

Text Book 3: Ch 3, Ch 4, Ch 5-5.1 - 5.4, Ch 6, Ch 7- 7.1, 7.2, Ch 8- 8.1, 8.3, Ch 9- 9.1, 9.2, Ch 10, Ch 11- 11.1 and 11.2.

Course Outcomes: After completing the course, the students will be able to	
CO1	Trace the historical evolution of aircraft and spacecraft, classify their types, and evaluate modern advancements
CO2	Apply principles of aerodynamics to analyze lift and drag on airfoils.
CO3	Compare various propulsion systems and their working principles
CO4	Identify key structural elements and materials used in aircraft.
CO5	Describe the functioning of basic aircraft instruments and onboard systems.

Text Books	
1	Introduction to Flight, John D. Anderson, 8th edition, McGraw-Hill Education, 2019, ISBN-10: 1260226118, ISBN-13: 978-1260226114
2	Introduction to Aerospace Structures and Materials, Dr. Ir. René Alderliesten, 1st edition, Delft Academic Press / VSSD (Delft University of Technology), 2024, ISBN-10: 9048645124, ISBN-13: 978-9048645123.
3	Aircraft Instrumentation and Systems, S. Nagar, 2nd edition, S.K. Kataria & Sons, 2020, ISBN-10: 8189757843, ISBN-13: 978-8189757842

Reference Books	
1	Flight without Formulae, A.C. Kermode, 5th edition, McGraw-Hill, 2012, ISBN-10: 0071801293, ISBN-13: 978-0071801295.
2	Aircraft Basic Science, Michael J. Kroes & James R. Rardon, 8th edition, McGraw-Hill Education 2013, ISBN-10: 0071799175, ISBN-13: 978-0071799172

Web links and Video Lectures (e – Resources)	
1	https://youtu.be/Ht09AZozTko?si=-poklJYyjtPosv8I

CO – PO MAPPING

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

Semester: III					
Computer Aided Aircraft Drawing					
Course Code	:	BASL305	**Credits**	:	1
Hours/Week(L:T:P)	:	0:0:2	**CIE**	:	50 Marks
Total Hours	:	15 Hrs	**SEE**	:	50 Marks
Course Type	:	PCCL	**SEE Duration**	:	3 Hours

Prerequisites:	
Courses	Computer Aided Engineering Drawing
Knowledge on Fundamental Concepts	Fundamentals of Drawing
Knowledge on Connected Tools (If any)	Solid Edge

Course Learning Objectives: This course will enable the students to	
CLO1	Study the fundamentals of GD&T
CLO2	Understand the Blueprint Reading and Sketching of engineering projects
CLO3	Interpret drawings of machine and aircraft components
CLO4	Prepare assembly drawings either manually or by using standard CAD packages.
CLO5	Familiarize with standard components and their assembly of an aircraft.

PART-A	**05 Hrs**
Introduction to Software. **Geometric Dimensioning and tolerance (GD&T):** Limit System – Tolerances – Fits – Tolerances of Form and Position – Standards followed in Industry. Principles and terminology of GD&T Types of GD&T Symbols, shape, orientation, location, and run out feature control, tolerance, and datum systems. **Orthographic Views:** Conversion of pictorial views into orthographic projections of simple machine parts and aircraft components with or without section. (Bureau of Indian Standards conventions are to be followed for drawing). **Text Book 1 : Chapter 1 & 2**	
PART B	**05 Hrs**
Blueprint Reading and Sketching: Blueprints, Technical Sketching, Projections and Views, Machine Drawings, Piping Systems, Electrical and Electronics Prints. **Riveted Joints:** Single and double riveted lap joints, butt joints with single/double cover straps (Chain and Zigzag, using snap head rivets). Cotter joint (socket and spigot), knuckle joint (pin joint) for two rods. **Text Book 2: Chapter 01 to 07**	
PART C	**05 Hrs**
Assembly Drawing Design of propeller and hub assembly Design of wing assembly Design of Landing Gear Assembly Design of Fuselage Assembly **Demonstration Drawings:** Design of Engine Mounts Fixed Pitch 3-bladed propeller Design of Rockets assembly Design of Satellite assembly Design of UAV assembly	

Course Outcomes: After completing the course, the students will be able to	
CO1	Interpret and apply industry-standard Geometric Dimensioning and Tolerance (GD&T) principles for mechanical and aerospace components.
CO2	Construct orthographic projections from pictorial views and interpret technical drawings as per BIS standards.
CO3	Interpret and draft mechanical, piping, electrical, and aerospace blueprints using proper conventions and projection standards.
CO4	Design and draw common mechanical joints including riveted, cotter, and knuckle joints used in aerospace applications.
CO5	Develop assembly drawings for aerospace subsystems such as propeller, wing, rocket, and satellite assemblies.

Text Books	
1	A Textbook of Computer Aided Machine Drawing, S. Trymbaka Murthy, 3rd edition, CBS Publishers and Distributors, New Delhi, 2022, ISBN-10: 9391383629, ISBN-13: 978-9391383628.
2	Blueprint Reading and Sketching, Navedtra Mrs. Delphine Jackson Mrs. Debra Harrison-Youngs & C. Thomas Olivo, 3rd edition, Navedtra (U.S. Navy Training Command), 2015, NAVEDTRA manuals are typically government-distributed without ISBNs

Reference Books	
1	Engineering Drawing, P.S.Gill, 3rd edition, S K Kataria and Sons (New Delhi), 2023, ISBN-10: 8189757843, ISBN-13: 978-8189757842.
2	Machine Drawing, K.R. Gopala Krishna, 5th edition, Subhash Publications, 2023, ISBN-10: 8196159061, ISBN-13: 978-8196159065.

Web links and Video Lectures (e – Resources)	
1	https://transport.itu.edu.tr/docs/librariesprovider99/dersnotlari/dersnotlarires112e/not/cadd-1.pdf?sfvrsn=4

CO – PO MAPPING

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

Semester: III					
Manufacturing Technology					
Course Code	:	BAS306A	**Credits**	:	3
Hours/Week(L:T:P)	:	3:0:0	**CIE**	:	50 Marks
Total Hours	:	40 Hrs	**SEE**	:	50 Marks
Course Type	:	ESC	**SEE Duration**	:	3 Hours

Prerequisites:	
Courses	Elements of Mechanical Engineering
Knowledge on Fundamental Concepts	Joining Process, Engineering Materials
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Identify basic materials, pattern designs, moulding methods, and core-making techniques used in casting.
CLO2	Evaluate melting furnaces, metal mould casting processes, and methods to eliminate defects.
CLO3	Interpret principles of bulk and sheet metal forming operations for industrial use.
CLO4	Differentiate between welding and joining processes based on operation, equipment, and application.
CLO5	Apply advanced manufacturing methods, assess weldability factors, and propose defect-prevention measures.

Module – 1	**08 Hrs**
Introduction& basic materials used in foundry: Introduction: Definition, Classification of manufacturing processes. Metals cast in the foundry-classification, factors that determine the selection of a casting alloy. Introduction to casting process and steps involved (Brief Introduction) **Patterns:** Definition, classification, materials used for pattern, various pattern allowances and their importance. **Sand Moulding:** Types of base sand, requirement of base sand. Binder, Additive's definition, need and types; preparation of sand moulds. Molding machines- Jolt type, squeeze type and Sand slinger. **Moulding process:** Green sand, core sand, dry sand, sweep mould, CO2 mould, shell mould, investment mould. **Cores:** Definition, need, types. Method of making cores, Concept of gating (top, bottom, parting line, horn gate) and risers (open, blind) Functions and types. **Text Book 1: Ch 5,6 & 7**	
Module – 2	**08 Hrs**
Melting furnaces: Classification of furnaces, Gas fired pit furnace, Resistance furnace, Coreless induction furnace, electric arc furnace, constructional features& working principle of cupola furnace. **Casting using metal Moulds:** Gravity die casting, pressure die casting, centrifugal casting, squeeze casting, slush casting, thixo casting, and continuous casting processes. Casting defects, their causes and remedies. **Text Book 1: Ch 8,9 & 10**	
Module – 3	**08 Hrs**
Metal Forming Processes **Introduction of metal forming process:** Mechanical behavior of metals in elastic and plastic deformation, stress-strain relationships, Yield criteria, Application to tensile testing, train rate and temperature in metal working; Hot deformation, Cold working and annealing. **Metal Working Processes:** Fundamentals of metal working, Analysis of bulk forming processes like forging, rolling, extrusion, wire drawing by slab method.	

Other sheet metal processes: Sheet metal forming processes (Die and punch assembly, Blanking, piercing, bending etc., Compound and Progressive die), High Energy rate forming processes. **Text Book 1: Ch 2,11 & 12**
Module – 4 **08 Hrs**
Joining Processes Operating principle, basic equipment, merits and applications of: Fusion welding processes: Gas welding-Types–Flame characteristics; Manual metal arc welding– Gas Tungsten arc welding - Gas metal arc welding – Submerged arc welding. **Text Book 2: Ch 1, 2, 3, 4 & 5.**
Module – 5 **08 Hrs**
Weld ability and Thermal Aspects: Concept of weld ability of materials; Thermal Effects in Welding (Distortion, shrinkage and residual stresses in welded structures); Welding defects and remedies. **Allied processes:** Soldering, Brazing and adhesive bonding. **Advance welding processes:** Resistance welding processes, friction stir welding (FSW). **Text Book 2: Ch 6,7,8,9,10 & 12**

Course Outcomes: After completing the course, the students will be able to	
CO1	Classify materials, patterns, moulding techniques, cores, gating, and riser systems in casting operations.
CO2	Analyze furnace types, metal mould casting techniques, and defect-removal strategies.
CO3	Compare bulk and sheet metal forming processes for various manufacturing applications.
CO4	Distinguish welding and joining processes based on operational principles, merits, and applications.
CO5	Implement advanced welding techniques and assess weldability, thermal effects, and defect-prevention plans.

Text Books	
1	Manufacturing Science, A. Ghosh and A. K. Mallik, 2nd edition, East-West Press 2010, ISBN-10: 8176710636, ISBN-13: 9788176710633.
2	Welding Processes and Technology, R. S. Parmar, 3rd edition, Khanna Publishers, 2011, ISBN-10: 8174091262.

Reference Books	
1	Welding and Welding Technology, R. L. Little, 1st edition, Tata McGraw Hill Publishing Company Limited, 1973, ISBN-10: 0070380953, ISBN-13: 978-0070380950
2	Metallurgical Modeling of Welding, O. Grong, 2nd edition, Institute of Materials, 1997.

Web links and Video Lectures (e – Resources)	
1	https://nptel.ac.in/courses/112105126

CO – PO MAPPING

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

Semester: III					
Introduction to Drone Technology					
Course Code	:	BAS306B	**Credits**	:	3
Hours/Week(L:T:P)	:	3:0:0	**CIE**	:	50 Marks
Total Hours	:	40	**SEE**	:	50 Marks
Course Type	:	ESC	**SEE Duration**	:	3 Hours

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

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the Fundamentals of Drone Technology.
CLO2	Analyze Drone Components and Systems.
CLO3	Learn Airworthiness and Regulations.
CLO4	Design and Select Drone Structures & Propulsion Systems**.**
CLO5	Apply Practical Skills in Drone Construction & Testing.

Module – 1	**08 Hrs**
Basics: Introduction, History, UV types: UGV, UAV, USV, UUWV, Drones in India, Future scope. Introduction to Nano drones and Swarm Drones. Principles, Newton's Laws, Degrees of Freedom, Stick Movements, Flight Modes, Basic Maneuvers, Take-off, Pitch, Roll, Yaw, Landing. **Test Book 2**: **Ch-1,2 & 4**	
Module – 2	**08 Hrs**
Components and Systems: Basic components, Micro controllers, microprocessors, Sensors, Pre-Flight Checks, Flight Planning, Transmitter, Receiver. Introduction to Arduino Sensors, Program Structures, Flight Controllers, Telemetry, Mission Planning, Camera, Binding, etc. **Test Book 1**: **Ch-5,6,7,8 & 9**	
Module – 3	**08 Hrs**
Air Worthiness: DGCA Rules and Regulations, Pilot Licensing requirements, NPNT Compliance. Certifications. **Test Book 1**: **Ch-1 & 2**	
Module – 4	**08 Hrs**
Basics of Structures: Configurations, Payload Configurations, Design Considerations. **Basics of Propulsion:** Batteries, Hybrid Propulsions, IC Engines, Mini Turbines, Solar. **Test Book 1: Ch- 6 & 7** **Test Book 2: Ch- 3**	
Module – 5	**08 Hrs**
Tuning, Testing, Manufacturing Constraints, Simulator Training, Applications **CASE Studies:** Construction and testing of a basic drone. **Test Book 2: Ch-4**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the basic concepts of UAV systems.
CO2	Evaluate the basic aerodynamics, performance, stability and control required for UAV
CO3	Comprehend Regulatory and Certification aspects.
CO4	Analyse the propulsion system and materials for structures.

CO5	Apply Practical Skills in Drone Construction & Testing.

Text Books	
1	Introduction to UAV Systems - Paul Gerin, Fahlstrom, Thomas James Wiley Publication 4th Edition, 2024, ISBN-13: 978-1119978664
2	Handbook of Unmanned Aerial Vehicles Valavanis, K., Vachtsevano S, George J Springer, 1st Edition, 2015, ISBN: 978-90-481-9706-4

Reference Books	
1	Unmanned Aerial Vehicles: U.S DOD's Acquisition Efforts Alpha Editions.

Web links and Video Lectures (e – Resources)	
1	https://onlinecourses.nptel.ac.in/noc22_ae15/preview
2	https://onlinecourses.nptel.ac.in/noc22_ae16/preview

CO – PO MAPPING

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

Semester: III					
Aerospace Materials and Processes					
Course Code	:	BAS306C	**Credits**	:	3
Hours/Week(L:T:P)	:	3:0:0	**CIE**	:	50 Marks
Total Hours	:	40 Hrs	**SEE**	:	50 Marks
Course Type	:	ESC	**SEE Duration**	:	3 Hours

Prerequisites:	
Courses	Elements of Mechanical Engineering
Knowledge on Fundamental Concepts	Engineering Materials, Physics
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Identify basic materials, pattern designs, moulding methods, and core-making techniques used in casting.
CLO2	Evaluate melting furnaces, metal mould casting processes, and methods to eliminate defects.
CLO3	Interpret principles of bulk and sheet metal forming operations for industrial use.
CLO4	Differentiate between welding and joining processes based on operation, equipment, and application.
CLO5	Apply advanced manufacturing methods, assess weldability factors, and propose defect-prevention measures.

Module–1	**08 Hrs**
Mechanical Behavior of Engineering Materials: Introduction to aerospace materials and their classification, Linear and non-linear elastic properties - Stress and Strain Curves - Yielding and strain Hardening, Toughness - Modules of resilience -- Bauschinger's effect - Effect of notches - Testing and flaw detection of materials and components, knowledge of various material testing machines **Text Book 1: Ch 1 and Ch 2**	
Module–2	**08 Hrs**
Non-ferrous Materials in aircraft construction: **Aluminum and its alloys:** Types and identification. Properties-Castings–Heat treatment processes- Surface treatments. **Magnesium and its alloys**: Cast and Wrought Alloys-Aircraft application, features specification, fabrication problems, Special treatments. **Titanium and its alloys**: Applications, machining, forming, welding and heat treatment, Copper Alloys. **Wood and fabric in aircraft construction:** Glues, Use of glass, plastics & rubber in aircraft. **Text Book 1: Ch 4, Ch 5 and Ch 6**	
Module–3	**08 Hrs**
Ferrous Materials in aircraft construction: **Steels**: Plain and low carbon steels, various low alloy steels, aircraft steel specifications, corrosion and heat-resistant steels, structural applications. **Maraging Steels**: Properties and applications; **Super Alloys**: Use-Nickel base-Cobalt Base-Iron base-forging and casting of super alloys-welding, Heat treatment. **Text Book 2: Ch 5**	
Module–4	**08 Hrs**

Ceramics and Composites: Introduction, modern ceramic materials, cermet's, glass ceramic, production of semi-fabricated forms, Carbon/Carbon composites, Fabrication processes involved in metal matrix composites, polymer composites and applications. **Text Book 1: Ch 6 and Ch 7**

Module–5	**08 Hrs**
High Temperature Materials: Materials for space environment: Radiation shielding materials, Atomic oxygen resistant materials, Space suit materials and materials for life support systems. Smart systems for space applications: Elastic memory composites, Smart corrosion protection coatings, Self-healing materials. **Text Book 2: Ch 8 and Ch 9**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Classify materials, patterns, moulding techniques, cores, gating, and riser systems in casting operations.
CO2	Analyze furnace types, metal mould casting techniques, and defect-removal strategies.
CO3	Compare bulk and sheet metal forming processes for various manufacturing applications.
CO4	Distinguish welding and joining processes based on operational principles, merits, and applications.
CO5	Implement advanced welding techniques and assess weldability, thermal effects, and defect-prevention plans.

Text Books	
1	Aircraft material and processes, Titter ton G F, 5th edition, New Delhi, 1998, ISBN-13:978- 8175980136.
2	Advanced Aerospace Materials, H. Buhl, Springer, Berlin, 1992, ISBN-13: 9783540558880.

Reference Books	
1	Aerospace material, Balram Gupta, Volume 4, S Chand and Co 2009, ISBN 13: 978-812192205
2	The Materials of Aircraft Construction by F. T. Hill, 5th edition, I. Pitman & Sons, London, 1941.

Web links and Video Lectures (e–Resources)	
1	https://nptel.ac.in/courses/112107086.

CO – PO MAPPING

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

Semester: III					
Introduction to Automation and Robotics					
Course Code	:	BAS306D	**Credits**	:	3
Hours/Week(L:T:P)	:	3:0:0	**CIE**	:	50 Marks
Total Hours	:	40 Hrs	**SEE**	:	50 Marks
Course Type	:	ESC	**SEE Duration**	:	3 Hours

Prerequisites:	
Courses	Elements of Mechanical Engineering
Knowledge on Fundamental Concepts	Gears, Transmission, Types of Motion and Mechanisms.
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Identify types of automation, robotics systems, and their components.
CLO2	Apply kinematic and dynamic concepts to robotic motion analysis.
CLO3	Develop and simulate robot programs using relevant tools and languages.
CLO4	Compare actuators, sensors, and feedback devices for robotic control.
CLO5	Evaluate robotics applications in space missions and related challenges.

Module – 1	**08 Hrs**
Introduction To Automation and Robotics: Definition and types of automation Need and scope of automation in industries, Overview of robotics – definition, history, and applications, Robot classification based on configuration and control. **Components of Robotic Systems Structure and Subsystems:** manipulators, end-effectors, actuators, and sensors, Power sources: electrical, pneumatic, and hydraulic systems. **Text Book 1: Ch 1, Ch 2, Ch 3, Ch 4 and Ch 5**	
Module – 2	**08 Hrs**
Kinematics and Dynamics: Representation of position and orientation of body, transformation of rigid body, homogenous transformation, the manipulator kinematics, forward and inverse kinematics of 2-DOF and 3-DOF robots, Jacobian matrix and its applications, Introduction to robot dynamics (basic concepts**).** **Text Book 2: Ch 2, Ch 3, Ch 4 and Ch 5**	
Module – 3	**08 Hrs**
Robotic Programming and Simulation: Introduction to robot programming languages (e.g., VAL, RAPID, ROS basics), Offline and online programming concepts, Robotic simulation tools (e.g., RoboDK, V-REP, MATLAB Robotics Toolbox). **Text Book 2: Ch 7**	
Module – 4	**08 Hrs**
Robot Actuators and Feedback Components: Types of actuators: pneumatic, hydraulic, electric, and stepper motors, Comparative analysis of actuator types based on performance and application, Position sensing devices: potentiometers, resolvers, and encoders, Velocity sensing: tachometers and other feedback devices, Proximity sensors, tactile sensors, and their industrial applications, Integration of sensors in robotic control, Applications of robots in manufacturing and assembly. **Text Book 2: Ch 5 and Ch 6**	
Module – 5	**08 Hrs**
Space Robotics: Overview of robotics in space missions: past, present, and future, Design challenges: harsh environments, vacuum, temperature, delay in control, Autonomous navigation and mobility on planetary surfaces, Robotic arms for satellite servicing and docking, Teleportation and supervisory control, NASA's Rovers, Canadarm, DEXTRE, and current ISRO robotics initiatives. **Text Book 3: Selected topics: Case Study based learning**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Classify automation types, robotic configurations, and subsystems for industrial use.
CO2	Solve forward and inverse kinematics problems for simple robotic systems using transformation methods.
CO3	Develop and simulate robotic programs using offline and online programming tools.
CO4	Compare actuator types, sensor technologies, and integrate them for robotic control applications.
CO5	Assess design considerations, navigation, and control strategies in space robotics missions.

Text Books	
1	Robotic Engineering: An Integrated Approach, Richard D. Klafter, Thomas A. Chmielewski, Michael Negin, Prentice Hall India Learning Private Limited, 1993, ISBN-13: 978-8120308428.
2	Robotics: Control, Sensing, Vision, and Intelligence, S. Fu, R.C. Gonzalez, and C.S.G. Lee, ISE edition, McGraw-Hill Education, 1987, ISBN-13: 978-0071004213.
3	Robot Modeling and Control, Mark W. Spong, Seth Hutchinson, and M. Vidyasagar, John Wiley and Sons, 2006, ISBN: 978-0-471-64990-8.

Reference Books	
1	Introduction to Autonomous Mobile Robots, Roland Siegwart, Illah Nourbakhsh, and Davide Scaramuzza, 2nd edition, The MIT Press, 2011, ISBN-13:978-0262015356

Web links and Video Lectures (e – Resources)	
1	https://youtu.be/rYWJdZ5qg6M?si=8IsGkfYXvWvESGGt

CO – PO MAPPING

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

Semester: III					
Social Connect & Responsibility **Stream: CSE/ECE/CV/ME**					
Course Code	:	BSC307	**Credits**	:	01
Hours/Week(L:T:P)	:	0:0:2	**CIE**	:	100 Marks
Total Hours	:	15	**SEE**	:	-
Course Type	:	UHV	**SEE Duration**	:	-

Course Objectives: This course will enable the students to	
CLO1	Understand and appreciate the importance of environmental sustainability, cultural heritage and traditional practices
CLO2	Apply experiential learning through field visits, case studies and community interaction
CLO3	Develop skills in documentation, reporting and creative presentation through photo blogs or documentaries
CLO4	Demonstrate awareness of organic farming, waste management, water conservation and their implementation in campus or community settings
CLO5	Recognize the significance of indigenous crafts, culinary traditions and their socio-cultural value

Module 1	**3Hrs**
Plantation and adoption of a tree Plantation of a tree that will be adopted for four years by a group of BE / B.Tech students. (ONE STUDENT ONE TREE) They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, its appearance in folklore and literature - – Objectives, Visit, case study, report, outcomes. **Text Book1**	
Module 2	**3Hrs**
Heritage walk and crafts corner Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms - – Objectives, Visit, case study, report, outcomes. **Text Book2**	
Module 3	**3Hrs**
Organic farming and waste management Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus – Objectives, Visit, case study, report, outcomes. **Text Book3**	
Module 4	**3Hrs**
Water conservation Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photoblog presenting the current practices – Objectives, Visit, case study, report, outcomes. **Text Book4**	
Module 5	**3Hrs**
Food walk City's culinary practices, food lore, and indigenous materials of the region used in cooking – Objectives, Visit, case study, report, outcomes. **Text Book5**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Elucidate the significance of tree plantation, cultural heritage, organic farming, waste management, water conservation and traditional food practices
CO2	Demonstrate the ability to plan and execute community-focused environmental and cultural activities
CO3	Prepare and present photo blogs or documentaries to document and communicate findings.
CO4	Apply sustainable practices learned from field visits in campus or community projects
CO5	Appreciate and promote indigenous knowledge, crafts and culinary traditions as part of cultural preservation

Text Books	
1	Environmental Studies – Erach Bharucha, University Grants Commission, New Delhi.
2	Cultural Heritage of India – Haridas Bhattacharyya, Volumes 1–6, The Ramakrishna Mission Institute of Culture.
3	Organic Farming: Principles and Practices – P. Bhattacharyya & D. Chakraborty, Scientific Publishers.
4	Water Resource Engineering – Larry Mays, Wiley.
5	Indian Food: A Historical Companion – K. T. Achaya, Oxford University Press

CO – PO MAPPING

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

Semester: III					
Technical Writing Using Latex (Lab)					
Course Code	**:**	BAS308A	**Credits**	**:**	1
Hours/Week(L:T:P)	**:**	0:0:2	**CIE**	**:**	50 Marks
Total Hours	**:**	15 Hrs	**SEE**	**:**	50 Marks
Course Type	**:**	AEC	**SEE Duration**	**:**	2 Hours

Prerequisites:	
Courses	-
Knowledge on Fundamental Concepts	Basic knowledge of text editing and document preparation in Computer, Familiarity with file handling and typesetting concepts
Knowledge on Connected Tools (If any)	MS Word

Course Learning Objectives: This course will enable the students to	
CLO1	Introduce the basic syntax and semantics of the LaTeX scripting language
CLO2	Understand the presentation of tables and figures in the document
CLO3	Illustrate the LaTeX syntax to represent the theorems and mathematical equations
CLO4	Make use of the libraries (Tikz, algorithm) to design the diagram and algorithms in the document

Sl.No	**Experiments**
1	Develop a LaTeX script to create a simple document that consists of 2 sections [Section1, Section2], and a paragraph with dummy text in each section. And also include header [title of document] and footer [institute name, page number] in the document.
2	Develop a LaTeX script to create a document that displays the sample Abstract/Summary
3	Develop a LaTeX script to create a simple title page of the VTU project Report [Use suitable Logos and text formatting]
4	Develop a LaTeX script to create the Certificate Page of the Report [Use suitable commands to leave the blank spaces for user entry
5	Develop a LaTeX script to create a document that contains the following table with proper labels.
6	Develop a LaTeX script to include the side-by-side graphics/pictures/figures in the document by using the sub graph concept
7	Develop a LaTeX script to create a document that consists of the following two mathematical equations.

S.No	**USN**	**Student Name**	**Marks**		
			Subject1	**Subject2**	**Subject3**
1	4XX22XX001	Name 1	89	60	90
2	4XX22XX002	Name 2	78	45	98
3	4XX22XX003	Name 3	67	55	59

	$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ $\varphi_\sigma^\lambda A_t = \sum_{\pi \in C_t} \mathrm{sgn}(\pi)\varphi_\sigma^\lambda \varphi_\pi^\lambda$ $= \frac{-2 \pm \sqrt{2^2-4*(1)*(-8)}}{2*1}$ $= \sum_{\tau \in C_{\sigma t}} \mathrm{sgn}(\sigma^{-1}\tau\sigma)\varphi_\sigma^\lambda \varphi_{\sigma^{-1}\tau\sigma}^\lambda$ $= \frac{-2 \pm \sqrt{4+32}}{2}$ $= A_{\sigma t}\varphi_\sigma^\lambda$
8	Develop a LaTeX script to demonstrate the presentation of Numbered theorems, definitions, corollaries, and lemmas in the document
9	Develop a LaTeX script to create a document that consists of two paragraphs with a minimum of 10 citations in it and display the reference in the section
10	Develop a LaTeX script to design a simple tree diagram or hierarchical structure in the document with appropriate labels using the Tikz library
11	Develop a LaTeX script to present an algorithm in the document using algorithm/algorithmic/algorithm2e library
12	Develop a LaTeX script to create a simple report and article by using suitable commands and formats of user choice.

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply basic LaTeX command to develop simple document
CO2	Develop LaTeX script to present the tables and figures in the document
CO3	Illustrate LaTeX script to present theorems and mathematical equations in the document
CO4	Develop programs to generate the complete report with citations and a bibliography
CO5	Illustrate the use of Tikz and algorithm libraries to design graphics and algorithms in the document

Text Books	
1	A Short Introduction to LaTeX BY FIRUZA KARMALI (AIBARA), A book for beginners, 2019

Reference Books	
1	Formatting Information: A Beginner's Introduction to Typesetting with LaTeX, BY PETER FLYNN, Comprehensive TeX Archive Network (2005)

Web links and Video Lectures (e – Resources)	
1	LaTeX TUTORIAL: [https://latex-tutorial.com/tutorials/]
2	LaTeX TUTORIAL: [https://www.javatpoint.com/latex]

CO – PO MAPPING

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

Semester: III					
Spread Sheet for Engineers					
Course Code	:	BAS308B	**Credits**	:	1
Hours/Week (L: T:P)	:	0:0:2	**CIE**	:	50 Marks
Total Hours	:	15 Hrs	**SEE**	:	50 Marks
Course Type	:	AEC	**SEE Duration**	:	2 Hours

Prerequisites:	
Courses	Basic computer knowledge, fundamental mathematics
Knowledge on Fundamental Concepts	Logical thinking
Knowledge on Connected Tools (If any)	MS Excel

Course Learning Objectives: This course will enable the students to	
CLO1	Learn to make and read professional charts for engineering data.
CLO2	Use Excel functions to do calculations and unit conversions.
CLO3	Build models to analyze, predict, and optimize results.
CLO4	Solve engineering problems using numerical methods in Excel.
CLO5	Automate tasks with VBA macros and custom functions.

Sl. No	**Experiments**
1	Charting: Create an XY scatter graph, XY chart with two Y-Axes, add error bars to your plot, and create a combination chart.
2	Functions: Computing Sum, Average, Count, Max and Min, Computing Weighted Average, Trigonometric Functions, Exponential Functions, Using the CONVERT Function to Convert Units.
3	Conditional Functions: Logical Expressions, Boolean Functions, IF Function, Creating a Quadratic Equation Solver, Table VLOOKUP Function, AND, OR and XOR functions.
4	Regression Analysis: Trend line, Slope and Intercept, Interpolation and Forecast, The LINEST Function, Multi linear Regression, Polynomial Fit Functions, Residuals Plot, Slope and Tangent, Analysis Tool Pack.
5	Iterative Solutions Using Excel: Using Goal Seek in Excel, Using the Solver to Find Roots, Finding Multiple Roots, Optimization Using the Solver, Minimization Analysis, Non-Linear Regression Analysis
6	Matrix Operations Using Excel: Adding Two Matrices, multiplying a Matrix by a Scalar, Multiplying Two Matrices, transposing a Matrix, inverting a Matrix and Solving System of Linear Equations.
7	VBA User-Defined Functions (UDF): The Visual Basic Editor (VBE), The IF Structure, The Select Case Structure, The for Next Structure, The Do Loop Structure, Declaring Variables and Data Types, An Array Function the Excel Object Model, For Each Next Structure.
8	VBA Subroutines or Macros: Recording a Macro, coding a Macro Finding Roots by Bisection, Using Arrays, adding a Control and Creating User Forms
Demonstration Experiments (For CIE)	
9	Numerical Integration Using Excel: The Rectangle Rule, The Trapezoid Rule, The Simpson's Rule, creating a User-Defined Function Using the Simpson's Rule.
10	Differential Equations: Euler's Method, Modified Euler's Method, The Runge, Kutta Method, Solving a Second Order Differential Equation

Course Outcomes: After completing the course, the students will be able to	
CO1	Create different plots and charts
CO2	Compute different functions, conditional functions and make regression analysis
CO3	Carryout iterative solutions for roots, multiple roots, optimization and nonlinear regression analysis.
CO4	Understand VBA and UDF, VBA subroutines and Macros and Carryout matrix operations
CO5	Carryout numerical integration and solving differential equations using different methods

Suggested Learning Resources:	
1	Excel Resources - 600+ Self Study Guides, Articles & Tools (wallstreetmojo.com).
2	Mc Fedries Paul Microsoft Excel 2019 Formulas and Functions Microsoft Press, U.S, 2019 Edition

Web links and Video Lectures (e – Resources)	
1	https://www.ictlounge.com/html/year_7/esafety_part7.htm.

CO – PO MAPPING

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

Semester: III					
Fundamentals of Digitalization					
Course Code	**:**	BAS308C	**Credits**	**:**	1
Hours/Week (L: T:P)	**:**	1:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	15 Hrs	**SEE**	**:**	50 Marks
Course Type	**:**	AEC	**SEE Duration**	**:**	2 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 how digitalization is transforming aerospace production, maintenance, and design.
CLO2	Learn the impact of Industry 4.0 and human factors on aerospace teams and organizations.
CLO3	Apply digital tools for maintenance, repair, overhaul, and aircraft testing.
CLO4	Explore digital avionics networks, standards, and simulation models in aerospace systems.
CLO5	Use parametric modeling techniques to improve structural analysis efficiency.

Module – 1	**03 Hrs**
Digitalization and the Future of the Aerospace Industry, Digitization in Production, Human Factors 4.0: Requirements and challenges for humans, teams and organizations. **Textbook 1: Ch 2.1 - 2.3**	
Module – 2	**03 Hrs**
Managing Maintenance, Repair and Overhaul for Civil Aircraft, The psycho-social implications of digitalization, Collaborative Aircraft Design. **Textbook 2: Ch 3.1 - 3.3**	
Module – 3	**03 Hrs**
The Significance of Testing concerning Maintenance of Aircraft, Maintenance in the Age of Digitalization. **Textbook 2: Ch 3.2, 3.4**	
Module – 4	**03 Hrs**
Digital Avionics Networks, Mil-STD, Modeling and Simulation of Aerospace Systems, Digital Models. **Textbook 3: Ch 4.1 - 4.4**	
Module – 5	**03 Hrs**
Efficient Order Reduction of Parametric Models, Parametric Model Order Reduction for Structural Analysis. **Textbook 3: Ch 5.1, 5.2**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the impact of digitalization on aerospace production, maintenance, and design.
CO2	Analyze human factors (Industry 4.0) in digitalized aerospace environments, including psychosocial challenges.
CO3	Explore digital avionics, modeling, simulation, and parametric model reduction techniques
CO4	Evaluate collaborative aircraft design and MRO (Maintenance, Repair, Overhaul) strategies in a digital era

CO5	Apply Mil-STD standards and digital twin concepts to aerospace systems

Text Books	
1	Aerospace and Digitalization: A Transformation Through Key Industry 4.0 Technologies, Diego Carou, 1st edition, Springer (Springer Briefs in Applied Sciences and Technology series), ISBN- 3030678482, ISBN-13: 978-3-030-67848-7.
2	Handbook of Aviation Human Factors (Human Factors in Transportation series), John A. Wise, V. David Hopkin, Daniel **J.** Garland, 2nd edition, CRC Press (Taylor & Francis Group), ISBN-10: 0805859063, ISBN-13: 978-0-8058-5906-5.
3	Digital Avionics Handbook, Cary Spitzer, Uma D. Ferrell, Thomas K. Ferrell, 3rd edition, CRC Press (Taylor & Francis), ISBN-10: 1439868611, ISBN-13: 978-1-4398-6861-4.

Reference Books	
1	Mastering The Digital World: A Guide to Understanding, Using and Exploiting Digital Media by Peter Cope.

Web links and Video Lectures (e – Resources)	
1	https://www.lll.tum.de/certificate/digitalisation-in-aeronautics-and-space/
2	https://www.repository.cam.ac.uk/bitstream/handle/1810/278896/CDBB_REP_002_Lamb_Final.pdf

CO – PO MAPPING

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

Semester: III					
Aerospace Measurements Laboratory					
Course Code	:	BAS308D	**Credits**	:	1
Hours/Week(L:T:P)	:	0:0:2	**CIE**	:	50 Marks
Total Hours	:	15 Hrs	**SEE**	:	50 Marks
Course Type	:	AEC	**SEE Duration**	:	2 Hours

Prerequisites:	
Courses	Measurements and Metrology
Knowledge on Fundamental Concepts	Measurements, Calibration of Instruments
Knowledge on Connected Tools (If any)	Basic Calipers like tapes

Course Learning Objectives: This course will enable the students to	
CLO1	Learn to calibrate instruments like pressure gauges, thermocouples, LVDTs, and load cells.
CLO2	Use strain gauges to find material properties like elasticity.
CLO3	Measure accurately using tools like optical projectors, sine bars, protractors, and autocollimators.
CLO4	Check machining forces and surface finish with dynamometers and roughness testers.
CLO5	Inspect sizes and shapes of parts, including threads and gears, using proper instruments.

Sl. No.	**Experiments**
	Measurements:
1	Calibration of Pressure Gauge
2	Calibration of Thermocouple
3	Calibration of LVDT
4	Calibration of Load cell
5	Determination of modulus of elasticity of a mild steel specimen using strain gauges.
	Metrology:
6	Measurements using Optical Projector/Toolmaker Microscope.
7	Measurement of angle using Sine Center/Sine bar/bevel protractor
8	Measurement of alignment using Autocollimator/Roller set
	Demonstration Experiments (For CIE)
9	Measurement of cutting tool forces using a) Lathe tool Dynamometer OR b) Drill tool Dynamometer.
10	Measurements of Screw thread Parameters using two wire or Three-wire methods.
11	Measurements of Surface roughness, Using Tally Surf/ Mechanical Comparator
12	Measurement of gear tooth profile using gear tooth Vernier /Gear tooth micrometer

Course Outcomes: After completing the course, the students will be able to	
CO1	Calibrate instruments like pressure gauges, thermocouples, LVDTs, and load cells, and check their accuracy.
CO2	Find mechanical properties of materials using strain gauges.
CO3	Take precise angular, linear, and shape measurements with sine bars, bevel protractors, and optical comparators.
CO4	Measure machining forces and assess cutting tool performance using dynamometers.
CO5	Measure threads, surface finish, and gear tooth profiles using metrology tools.

Text Books	
1	Engineering Metrology, R K Jain, 22nd edition, Khanna Publishers,2022, ISBN-13: 978-81-7409-153-6, ISBN-10 / ASIN: 81-7409-153-X
2	Engineering Metrology, I C Gupta, Dhanpat Rai Publishing Co. Pvt. Ltd., 2013, ISBN-10: 8189928457, ISBN-13: 978-8189928452

Reference Books	
1	Industrial Instrumentation, Jerry Faulk and Al Sutko, Delmar Cengage Learning Publisher, 1996, ISBN-10: 0827361254, ISBN-13: 978-0827361256
Web links and Video Lectures (e – Resources)	
1	https://youtu.be/1KHEfi7aZDc?si=Om5l2ZXw7GiS4aBU

CO – PO MAPPING

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

Semester: III						
Environmental Studies **Stream: CSE/ECE/CV/ME**						
Course Code	:	BES309		**Credits**	:	1
Hours/Week(L:T:P)	:	1:0:0		**CIE**	:	50Marks
Total Hours	:	15		**SEE**	:	50Marks
Course Type	:	MC		**SEE Duration**	:	1 Hr

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

Course Learning Objectives: This course will enable the students to	
CLO1	Create environmental and sustainability awareness among the students.
CLO2	Creating knowledge of relationship between the biotic and abiotic component
CLO3	Apply their ecological knowledge to illustrate and grasp the problem and describe the realities that managers face when dealing with complex issues.
CLO4	Develop skills, critical thinking and demonstrate socio-economic skills for Environmental protection
CLO5	Gain knowledge on different types of pollution in the environment, waste management and Environmental legislation

Module – 1	**03Hrs**
Ecosystem and Sustainability: Ecology and Ecosystem: Structure of Ecosystem, components, Types: Forest, Desert, Wetlands, River, Oceanic ecosystems. **Sustainability:** 17SDG targets and possible actions. **Biodiversity:** Types, Value; Hot-spots; Threats and Conservation of biodiversity, Forest Wealth, and Deforestation. **Textbook1 – Ch. 1, 2 & 3**	
Module – 2	**03Hrs**
Natural Resource Management **Advances in Energy Systems** (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind. **Natural Resource Management** (Concept and case-studies): Disaster Management, Sustainable Mining - case studies and Carbon Trading **Textbook2 – Ch. 3 & 4**	
Module – 3	**03Hrs**
Environmental Pollution & Waste Management **Environmental Pollution** (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution. **Waste Management:** Bio-medical Wastes; Solid waste; Hazardous wastes; E-wastes; Industrial and Municipal Sludge. **Textbook2 – Ch. 5 & 16**	
Module – 4	**03 Hrs**
Global Environmental Issues Global Environmental Concerns (Concept, policies and case-studies): Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology.	

Textbook3 – Ch. 9 & 10	
Module – 5	**03 Hrs**
Environmental Legislation: Solid Waste Management Rules 2016, Biomedical Waste Management Rules, 2016. BBMP, BWSSB Norms **Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications):** GIS & Remote Sensing, Environment Impact Assessment, Environmental Management Systems, ISO14001; Environmental Stewardship- NGOs. **Textbook1 – Ch. 10, 11 & 12**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the principles of ecology and environmental issues that apply to air, land and water issues
CO2	Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components
CO3	Conduct survey to describe the realities of waste management system.
CO4	Identify the major challenges of environmental issues on a global scale
CO5	Apply their environmental legislation to illustrate problems and describe the realities that managers face when dealing with complex issues.

Text Books	
1	Environmental Studies, Benny Joseph, 2005,Tata McGraw – Hill Publishing Company Limited.
2	Environmental Studies, S.M. Prakash, 2007, Elite Publishers Mangalore.
3.	Environmental Studies – From Crisis to Cure, R Rajagopalan, 2005, Oxford University Press.

Reference Books	
1	Environmental Studies ,R.J.Ranjit Daniels and Jagadish Krishnaswamy, 2009 , Wiley India Private Ltd., New Delhi
2	Environmental Science – working with the Earth ,G.Tyler Miller Jr., 10th Edition ,2004, Thomson Brooks /Cole,
3	Elements of Environmental Science and Engineering ,P. Meenakshi, 2006 , Prentice Hall of India Private Limited, New Delhi,

Web links and Video Lectures (e – Resources)	
1	https://sdgs.un.org/goals
2	https://archive.nptel.ac.in/courses/109/105/109105190/
3	https://kspcb.karnataka.gov.in/waste-management/biomedical-waste

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**
CO1	3	1	1				1				
CO2	2	3		3		1	1				
CO3	2	2	3	2	1	1	1				
CO4		3	1			1	1				1
CO5	3	2	3	2	1	1	3				1

Semester: III						
National Service Scheme **Stream: CSE/ECE/CV/ME**						
Course Code	**:**	BNS310		**Credits**	**:**	0
Hours/Week(L:T:P)	**:**	0:0:2		**CIE**	**:**	100 Marks
Total Hours	**:**	24		**SEE**	**:**	-
Course Type	**:**	NCMC		**SEE Duration**	**:**	-

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the community in general in which they work
CLO2	Identify the needs and problems of the community and involve them in problem – solving
CLO3	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions
CLO4	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.
CLO5	Appraise the importance of ethical issues and team working abilities pertaining to the social services.

Activity– 1	**08 Hrs**
Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing.	
Activity – 2	**08 Hrs**
Waste management– Public, Private and Govt. organization, 5 R's	
Activity – 3	**08 Hrs**
Setting of the information imparting club for women leading to contribution in social and economic issues	

Pedagogy – Guidelines, it may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution

Sl.	**Topic**	**Group Size**	**Location**	**Activity Execution**	**Reporting**	**Evaluation of the Topic**
1.	Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing.	May be individual or team	Farmers land/Villages/ roadside / community area/ College campus etc.	Site selection /proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
2	Waste	May be	Villages/ City	Site selection	Report	Evaluation as

.	management– Public, Private and Govt organization, 5 R's.	individual or team	Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc.	/proper consultation/ Continuous monitoring/ Information board	should be submitted by individual to the concerned evaluation authority	per the rubrics Of scheme and syllabus by NSS officer
3.	Setting of the information imparting club for women leading to contribution in social and economic issues.	May be individual or team	Women empowerment groups/ Consulting NGOs & Govt. Teams / College campus etc.	Group selection/proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer

Plan of Action (Execution of Activities for 3rd Semester)

Sl. No.	Practice Session Description
1.	Lecture session by NSS Officer
2.	Selection of topic, Commencement of activity and its progress
3.	Execution of Activity
4.	Case study based Assessment, Individual performance
5.	Sector wise study and its consolidation
6.	Video based seminar for 10 minutes by each student At the end of semester with Report.

In the 3rd semester, each student should do activities according to the scheme and syllabus.
At the end of the semester student performance has to be evaluated by the NSS Officer for the assigned activity progress and its completion.
At the end of the 3rd semester, consolidated report of all activities compiled report should be submitted as per the instructions.

Course Outcomes: After completing the course, the students will be able to	
CO1	Exploit the importance of his / her responsibilities towards society.
CO2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.
CO3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.
CO4	Implement government or self-driven projects effectively in the field of societal problems.
CO5	Appraise the importance of ethical issues and team working abilities pertaining to the social services.

Assessment Details for CIE (100 Marks)

Weightage	CIE- 100 Marks
Selection of Topic, Commencement of activity and its progress	**40 Marks**
Case study based Assessment	**20 Marks**
Sector wise study and its consolidation	**20 Marks**
Video based seminar for 10 minutes by each student at the end of semester with Report	**20 Marks**
Total Marks for the course in the semester	**100 Marks**

Suggested Learning Resources:	
Books:	
1	NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2	Government of Karnataka, NSS cell, activities reports and its manual.
3	Government of India, NSS cell, Activities reports and its manual.

CO-PO Matrix

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

Semester: III						
Physical Education (PE) (Sports & Athletics) **Stream: CSE/ECE/ME/CV**						
Course Code	:	BPE310		**Credits**	:	0
Hours/Week(L:T:P)	:	0:0:1		**CIE**	:	100 Marks
Total Hours	:	24		**SEE**	:	-
Course Type	:	NCMC		**SEE Duration**	:	-

Course Learning Objectives: This course will enable the students to	
CLO1	Develop awareness about personal health, wellness, and the importance of an active lifestyle through pre-fitness evaluation and orientation.
CLO2	Improve general physical fitness through structured training in strength, speed, and warm-up exercises
CLO3	Acquire sport-specific skills and techniques in traditional games such as Kabaddi or Kho-Kho through practical sessions.

Module – 1	**4 Hrs**
Orientation A. Lifestyle B. Health & Wellness C. Pre-Fitness test.	
Module – 2	**4 Hrs**
General Fitness & Components of Fitness A. Warming up (Free Hand exercises) B. Strength – Push-up / Pull-ups C. Speed – 30 Mtr Dash	
Module-3	**16 Hours**
Specific games (Any one to be selected by the student) A. Kabaddi – Hand touch, Toe Touch, Thigh Hold, Ankle hold and Bonus. B. Kho-Kho – Giving Kho, Single Chain, Pole dive, Pole turning, 3-6 Up.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Elucidate core concepts of physical education, health, nutrition and fitness for personal well-being
CO2	Demonstrate exercises, sports and practices that enhance physical and mental development
CO3	Apply foundational skills for careers in physical education, sports and fitness
CO4	Participate in sports competitions with discipline, teamwork and sportsmanship
CO5	Promote healthy lifestyles through wellness concepts and traditional/indigenous activities

Scheme and Assessment for auditing the course and Grades:

Sl. No.	Activity	Marks
1.	Participation of student in all the modules	20
2.	Quizzes – 2, each of 15 marks	30
3.	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students	50
	Total	**100**

CO – PO MAPPING

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

Semester: III						
Yoga **Stream: CSE/ECE/CV/ME**						
Course Code	:	BYO310		**Credits**	:	-
Hours/Week(L:T:P)	:	0:0:2		**CIE**	:	100 Marks
Total Hours	:	12 Hrs		**SEE**	:	-
Course Type	:	NCMC		**SEE Duration**	:	-

Course Learning Objectives: This course will enable the students to	
CLO1	Explain the history, various schools of yoga along with its aims, objectives and significance in holistic well-being.
CLO2	Demonstrate basic yoga practices and how to do them safely, clearing up common misunderstandings.
CLO3	Apply suryanamaskara with proper understanding of its structure, significance and health benefits.
CLO4	Describe the types, methods and benefits of various Asanas.
CLO5	Utilize the knowledge of specific asanas regularly to improve physical health and mental well-being.

Module - 1	02 Hrs
Introduction to Yoga: Origin, history, and development of Yoga, Meaning and definitions of Yoga, Different schools of Yoga, Aims and objectives of Yoga, Importance of prayer in Yoga practice. **Text Book 1: Ch. 1 (Part 1)**	
Module - 2	02 Hrs
Foundations of Yogic Practice: Yogic practices for a common man to promote positive health, Rules to be followed during yogic practices by the practitioner, Misconceptions about Yoga, Difference between yogic and non-yogic practices. **Text Book 1: Ch. 1 (Part 1)**	
Module - 3	03 Hrs
Suryanamaskara (Sun Salutation): Prayer and its meaning, Need, Importance and benefits of Suryanamaskara, 12-count structure and practice of 2 rounds. **Text Book 1: Ch. 2 (Part 2)**	
Module - 4	02 Hrs
Introduction to Asanas: Asana - Meaning, need, and importance, Classification of Asanas, General technique, precautionary measures, and benefits of each Asana. **Text Book 1: Ch. 1 & 2 (Part 1 & 2)**	
Module - 5	03 Hrs
Types of Asanas and Practice: Sitting Asanas - Padmasana, Vajrasana, Standing Asanas - Vrikshasana, Trikonasana, Prone Lying Asanas - Bhujangasana, Shalabhasana, Supine Lying Asanas - Utthitadvipadasana, Ardhahalasana. **Text Book 1: Ch. 2 (Part 2)**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Summarize the history and major schools of yoga, highlighting their purpose in promoting holistic well-being.

CO2	Demonstrate basic yoga practices with correct techniques, ensuring safety and addressing common misconceptions.
CO3	Apply suryanamaskara sequences with proper understanding of its structure, significance, and health benefits.
CO4	Classify the types, methods, and benefits of various asanas with appropriate examples.
CO5	Adopt the practice of specific asanas into a regular routine to enhance physical health and mental well-being.

Text Book	
1	"The Illustrates Light on Yoga" by BKS Iyengar, HarperCollins Publishers, ISBN-81:7223-606-9

Reference Books	
1	Teaching Methods for Yogic practices by Dr. M L Gharote & Dr. S K Ganguly, 4th Edition, Kaivalyadhama Publishers, ISBN-10 : 9788189485245
2	Yoga Instructor Course hand book published by SVYASA University, Bengaluru
3	Yogapravesha in Kannada by Ajitkumar
4	Yoga for Children –step by step – by Yamini Muthanna

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/playlist?list=PLzF4lOyPf_Z9yQ_Gphjh1wZ5fEhMg6hmP
2	https://www.youtube.com/playlist?list=PLOzRYVm0a65cCcY4qKX5MIyJxBt7hJgQY
3	https://youtu.be/KB-TYlgd1wE
4	https://youtu.be/aa-TG0Wg1Ls

CO – PO MAPPING

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

Semester: III					
Music Stream: CSE/ECE/CV/ME					
Course Code	:	BMU310	**Credits**	:	0
Hours/Week(L:T:P)	:	0:0:2	**CIE**	:	100 Marks
Total Hours	:	26	**SEE**	:	-
Course Type	:	NCMC	**SEE Duration**	:	-

Course Objectives: This course will enable the students to	
1	Understand the foundational concepts of Indian classical music, including the evolution and structure of Shruthi, Nada, Swara, Laya, Raga, Tala and Mela systems.
2	Recognize and describe various types of Carnatic compositions such as Geethe, Jathi, Swara, Swarajathi, Varna, Krithi and Thillana, along with the basics of the notation system.
3	Appreciate the contributions of key composers like Purandaradasa, Thyagaraja and Mysore Vasudevacharya to Indian music and understand their musical legacy.
4	Identify and explain the classification and basic construction of traditional Indian musical instruments, including string, wind, percussion and idiophones, with appropriate examples.
5	Demonstrate basic vocal proficiency through the practice of Sarale Varase exercises, notations for Suladi Sapta Tala in Mayamalavagowla raga and performance of selected compositions such as Geethe, Jathi Swara and Krithi.

Module -I	**03 Hrs**
Preamble Contents of the curriculum intended to promote music as language to develop an analytical, creative and intuitive understanding. For this the student must experience music through study and direct participation in improvisation and composition. Origin of the Indian Music: Evolution of the Indian music system, understanding of Shruthi, Nada, Swara, Laya, Raga, Tala, Mela **Textbook1, V-1 Ch. 1-4**	
Module – II	**03 Hrs**
Compositions Introduction to the types of composition in Carnatic Music – Geethe, Jathi, Swara, Swarajathi, Varna, Krithi and Thillana, Notation System. **Textbook2 – Ch. 4-7**	
Module –III	**03 Hrs**
Composers Biography and contributions of Purandaradasa, Thyagaraja, Mysoro asudevacharya, Kanakadasa **Textbook3 – Ch. 2-5**	
Module –IV	**03 Hrs**
Music Instruments Classification and construction of string instruments, wind instruments, percussion Instruments, Idiophones (Ghana Vaadya), Examples of each class of instruments. **Textbook1,V-4 – Ch. 2-6**	
Module –V	**14 Hrs**
Abhyasa Gana Singing the swara exercises (Sarale Varase Only), Botatio writing for sarale varase and sulafi sapta tala (Only in mayamalavagowla raga), singing 4 geethe in malahari and one jathi swara, oe krithi in a mela raga **Textbook1, V-1&2**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Outline the evolution of Indian music and key concepts like Shruthi, Swara, Raga and Tala.
CO2	Identify and interpret basic Carnatic compositions using standard notation.
CO3	Summarize the contributions of composers.
CO4	Classify Indian musical instruments and describe their construction and use.
CO5	Demonstrate basic Carnatic vocal skills through selected exercises and compositions.

Text Books	
1	South Indian Music – Vol. I to VI, Prof. P. Sambamoorthy, The Indian Music Publishing House, Chennai.
2	A Textbook of Carnatic Music, Dr. S. Bhagyalekshmy, CBH Publications
3	Karnataka Sangeetha Charitre, Dr. V. S. Sampathkumaracharya, Kannada University, Hampi.

Reference Books	
1	Music of India, B. Chaitanya Deva, Munshiram Manoharlal Publishers
2	Essentials of Musicology in South Indian Music, Prof. S. R. Janakiraman, Asian Educational Services

CO – PO MAPPING

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

Semester: III						
Competency Enhancement Course-1 **Stream: CSE/ECE/ME/CV**						
Course Code	:	BCE311		**Credits**	:	0
Hours/Week(L:T:P)	:	2:0:0		**CIE**	:	100 Marks
Total Hours	:	40		**SEE**	:	-
Course Type	:	NCMC		**SEE Duration**	:	-

Prerequisites:	
Courses	Fundamentals of Mathematics & English
Knowledge on Fundamental Concepts	Arithmetic operations, fractions, decimals, and elementary algebra. comprehension of basic English
Knowledge on Connected Tools	**NA**

Course Learning Objectives: This course will enable the students to	
CLO1	Gain a strong foundation in aptitude skills such as number systems, percentages, ratio & proportion and interest calculations to improve quantitative reasoning and problem-solving efficiency.
CLO2	Apply Vedic Mathematics techniques and shortcuts for rapid mental calculations, leading to increased accuracy and speed in aptitude-based assessments.
CLO3	Master logical reasoning topics like syllogisms, blood relations, puzzles and seating arrangements to develop structured thinking and effective decision-making skills.
CLO4	Understand and solve problems involving coding-decoding, visual sequences, clocks, calendars and analogies to enhance pattern recognition and reasoning speed.
CLO5	Utilize aptitude and reasoning skills to perform well in competitive exams, campus placements, and workplace situations, contributing to overall academic and professional success.

Module – 1	**8 Hrs**
Introduction to Aptitude and Vedic Mathematics **Understanding Aptitude** Overview of aptitude skills and their significance in problem-solving and decision-making. Types of aptitude skills commonly assessed in competitive exams and professional settings. **Vedic Mathematics Techniques** Introduction to Vedic Mathematics for faster and more efficient calculations. Key techniques and shortcuts to improve speed and accuracy in quantitative problems. **Importance of Aptitude Skills** The role of aptitude in career development and academic success. How strong aptitude skills enhance analytical thinking, logical reasoning, and performance in assessments. **Number System** Divisibility & Remainder, Multiples & Factors, Integers, LCM & HCF, Complete a number Series, Find the Missing Term and Wrong Term, Simplification, BODMAS Rule, Approximation, Decimals, Fractions, Surds & Indices **Textbook-1,Ch1-11**	
Module – 2	**8 Hrs**

Percentage
Calculation-oriented basic percentage, Successive Selling type, Discount & MP, Dishonest Dealings
Profit and Loss
Cost Price (CP), Selling Price (SP), Marked Price (MP) / List Price, Discount, Profit (Gain), Loss, Profit Percentage, Loss Percentage, Discount Percentage, Relationship between CP, SP, and Profit/Loss Percentage, Successive Profits and Losses, False Weights and Dishonest Dealer Problems
Blood Relation
Basic Family Relationships (Parent, Sibling, Child, etc.), Direct Relationship Questions, Pointing or Introducing Type Questions, Family Tree/Hierarchical Relationship Questions, Coded Blood Relations, Puzzle-Based Blood Relations, Mixed/Complex Blood Relations, Single-Person Blood Relation Problems, Generational Relationships (Grandparent, Great-Grandparent, etc.), Relationships by Marriage (In-laws, Step-relations)
Textbook-3-Ch2,3,4,6,7,10,12

Module-3	**8 Hrs**

Simple and Compound Interest
Definition of Simple Interest (SI), Calculation of Simple Interest, Principal, Rate, and Time, Amount in Simple Interest, Problems on SI (Direct, Inverse and Combined), Definition of Compound Interest (CI), Calculation of Compound Interest (Annual, Half-yearly, Quarterly, etc.), Difference between Simple and Compound Interest, Growth Factor and Compound Amount, Compound Interest for Fractional Years, Comparing SI and CI over Multiple Years, Depreciation and Appreciation Problems, Installment Payments (EMI-based Questions).
Averages
Definition and Formula of Average, Average of Numbers, Average of Consecutive Numbers, Average of Odd/Even Numbers, Weighted Average, Average in Groups (Merging and Replacement), Effect of Addition/Removal/Replacement on Average, Average Speed, Change in Average Due to Error (Wrong Entry), Shortcut Tricks and Applications
Direction Sense Test
Cardinal and intermediate directions, right and left directional movement, reference points and orientation, turns and angle-based movement, distance and displacement calculation, shadow and sun-based direction problems, shortest path and final position, direction sense using maps or diagrams, coded direction sense problems, complex/multiple person direction scenarios, error spotting in direction sense.
Textbook 1-Ch2,5

Module-4	**8 Hrs**

Ratio and Proportion and Variations
Definition of Ratio, Types of Ratio (Simple, Compound, Duplicate, Sub-duplicate, Triplicate), Properties of Ratio, Comparison of Ratios, Definition of Proportion, Types of Proportion (Direct, Inverse, Continued), Properties of Proportion, Mean Proportion, Fourth Proportion, Third Proportion, Relationship between Ratios and Proportions, Componendo and Dividendo Rules, Addendo and Subtrahendo, Applications of Ratio and Proportion in Problem, Direct Variation, Inverse Variation, Joint Variation, Combined Variation, Proportionality Constants, Word Problems on Variation, Application-based Variation Problems, Miscellaneous and Complex Variation Questions
Alligations and Mixtures
Definition of Alligation, Alligation Rule and Formula, Types of Mixtures (Simple and Compound), Problems on Mixing Two or More Quantities, Mean Price Calculation, Replacement of Quantities, Alligation on Solutions with Different Concentrations, Solving Alligation Questions Involving Profit and Loss, Application-Based Mixture Problems.
Series

Arithmetic Series, Geometric Series, Square Series, Cube Series, Fibonacci Series, Prime Number Series, Alternating Series, Factorial Series, Mixed Series, Exponential/Power Series **Textbook-1,Ch12,13&16**
Module-5 **8 Hrs**
Articles and Prepositions Usage of articles (a, an, the), definite and indefinite articles, zero article usage, prepositions of time, place, direction, phrasal verbs, prepositional phrases, and error spotting. **Tenses and Subject-Verb Agreement** Present, past, and future tense forms, auxiliary verbs, rules of agreement with different subjects, and error spotting **Change of Voice and Speech** Active-passive transformations in all tenses, direct and indirect speech conversions, and related pronoun, tense, and time changes **Error Spotting and Sentence Correction** Identifying common grammatical errors such as incorrect word usage, faulty subject-verb agreement, tense errors, sentence fragments, and contextual sentence corrections **Synonyms, Antonyms, and Verbal Analogy** Finding words with similar or opposite meanings, commonly confused words, verbal analogies, and contextual vocabulary usage **Sentence Completion and One-Word Substitution** Choosing appropriate words or phrases to complete sentences, idiomatic expressions, logical sentence completion, and replacing phrases with single-word substitutes
Textbook-1,Ch14,15,17&29

Course Outcomes: After completing the course, the students will be able to	
CO1	Solve numerical problems using Vedic Math and number systems to boost speed and accuracy.
CO2	Apply logical reasoning to puzzles, syllogisms, seating and classification problems.
CO3	Develop letter, number and symbol patterns and solve visual reasoning tasks.
CO4	Accurately solve problems on percentages, profit-loss, interest, ratios and partnerships.
CO5	Utilize aptitude and reasoning skills to excel in competitive exams and improve employability.

Text Books	
1	**Quantitative Aptitude for Competitive Examinations,** R.S. Aggarwal Chand Publishing. – 2023.
2	**Vedic Mathematics,** Bharati Krishna Tirthaji, Sixteenth Reprint, Published by Motilal Banarsidass Publishers, - 1985, (ISBN- 978-8120801639)
3	**Logical and Analytical Reasoning,** A.K. Gupta, 39th Edition, Ramesh Publishing House – 2024, (ISBN- 978-9350127766)

Reference Books	
1	**Puzzle Test & Seating Arrangements,** K. Kundan (ISBN: 9789394666023),1st Edition, BSC Publishing Company Pvt Ltd. - 2023
2	**Logical Reasoning and Data Interpretation for the CAT**, Nishit K. Sinha, 7th Edition, Pearson Education -2020, (ISBN: 978-9353946616)

Web links and Video Lectures (e –Resources)	
1	https://www.youtube.com/watch?v=ZXcULvjpQlM
2	https://www.youtube.com/watch?v=ZXcULvjpQlM
3	https://www.youtube.com/watch?v=OHZ40sOT7mk
4	https://www.youtube.com/watch?v=9UtPPSX_vnk
5	https://www.youtube.com/watch?v=DIbjA3b21ow

CO – PO MAPPING

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

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.

SJC INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU from 2024-25

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