Scheme and Syllabus

for

B.Sc. (Aviation)

(for the students admitted in session2024-2025 onwards)

Guru Jambheshwar University of Science & Technology,Hisar-125001

Introduction

Education plays a significant role in the holistic development of the student. A robust, flexible, multidisciplinary education framework with "Learner Centric Pedagogy" could effectively transform a student into a global citizen of tomorrow to catalyze nation's growth and development. The National Education Policy 2020 (NEP 2020) outlines the goals, objectives, and policies for the development and improvement of education across all levels. The NEP 2020 is a comprehensive and ambitious policy that aims to transform the Indian education system and makes it more student-centric, holistic and to align with the needs of the 21st century. Some of the key features of the NEP 2020 include:

- Multidisciplinary, flexible and equitable education framework for the holistic
- development of learners
- Emphasis on skill-based education, vocational education and
- apprenticeship/internship
- Encourage critical thinking, creativity and problem-solving skills
- Increase the Gross Enrollment Ratio (GER) in higher education to 50% by 2035
- Promotion of Indian languages, art, culture and heritage
- Emphasis on Multidisciplinary, Interdisciplinary, and Transdisciplinary research to
- develop innovative solutions to overcome societal issues

Aviation Industry is poised for substantial growth in India and this will go a long way for the country's overall development to be maintained at a high rate. The country has already witnessed the Open skies policy which led to significant increase in Air services which in turn required parallel growth in infra-structure.

About the Programme

B.Sc. (Aviation) is a very specialized course unlike any other courses in sciences. It has classroom teaching as well as practical on the aircraft and its related systems. The systematic and planned curriculum from first year to the fourth year is aimed at focusing attention to the skills required for practicing in the field of Aircraft industry. B.Sc. Aviationprogramme have the following objectives.

- To familiarize students with current and recent technological developments in aviation industry.
- To provide in-depth knowledge of technological aspects of aviation industry
- To train students in skills related to aviation industry and market.
- To develop analytical abilities towards real aviation problems.
- To help students build-up a progressive and successful career in Aviation Industry.

B.Sc. (Aviation)Programme

1st-Semester

Sr. No.	Course Code	Course Area	Course Title	Hours per week			Course Credits	Maximum Marks		
				L	T	P		Internal	External	Total
1.	24BAV0101T	Discipline specified course	Aviation Physics (Mechanics)	3	1	0	4	30	70	100
2.	24BAV0102T	Discipline specified course	Basics of Aerodynamics	3	1	0	4	30	70	100
3.	24MIN0123T	Minor Course	Electrical and Electronics Fundamentals	4	0	0	4	30	70	100
4.	24MDC0121T	Multidisciplinary course	To be opted from pool	3	0	0	3	25	50	75
5.	24AEC0102T	Ability Enhancement Course	हिंदीभाषाकाव्याकरणिकज्ञान	2	0	0	2	15	35	50
6.	24SEC0121T	Skill enhancement course	Workshop Technology	2	0	0	2	15	35	50
7.	24SEC0121P	Skill enhancement course	Workshop Technology Lab	0	0	2	1	10	15	25
8.	24VAC0115T	Value added course	Yoga and Human Values	2	0	0	2	15	35	50
	Total			19	2	2	22	170	380	550

B.Sc. (Aviation) Programme

2nd-Semester

Sr. No.	Course Code	Course Area	Course Title	Hours per week			Course Credits	Maximum Marks		
				L	T	P		Internal	External	Total
1.	24BAV0201T	Discipline specified course	Familiarization of Aircraft	3	1	0	4	30	70	100
2.	24BAV0202T	Discipline specified course	Aviation Science (Mechanical)	3	1	0	4	30	70	100
3.	24MIN0223T	Minor Course	Analog Electronics	4	0	0	4	30	70	100
4.	24MDC0	Multidisciplinary course	To be opted from pool	3	0	0	3	25	50	75
5.	24AEC0101T	Ability Enhancement Course	English for Effective Communication-I	2	0	0	2	15	35	50
6.	24SEC0221T	Skill enhancement course	Employability Skills and Practices	2	0	0	2	15	35	50
7.	24SEC0221P	Skill enhancement course	Employability Skills and Practices Lab	0	0	2	1	10	15	25
8.	24VAC0101T	Value added course	Environmental Studies-I	2	0	0	2	15	35	50
	Total			19	2	2	22	170	380	550

B.Sc. (Aviation) Programme

3rd-Semester

Sr. No.	Course Code	Course Area	Course Title	Hours per week			Course Credits	Maximum Marks		
				L	T	P		Internal	External	Total
1.	24BAV0301T	Discipline specified course	Aviation Legislation	3	1	0	4	30	70	100
2.	24BAV0302T	Discipline specified course	Thermodynamics	3	1	0	4	30	70	100
3.	24MIN0323T	Minor Course	Digital Electronics	4	0	0	4	30	70	100
4.	24MDC0	Multidisciplinary course	To be opted from pool	3	0	0	3	25	50	75
5.	24AEC0	Ability Enhancement Course	To be opted from pool	2	0	0	2	15	35	50
6.	24SEC0321T	Skill enhancement course	Computer Aided Design	2	0	0	2	15	35	50
7.	24SEC0321P	Skill enhancement course	Computer Aided DesignLab	0	0	2	1	10	15	25
8.	24VAC0	Value added course	To be opted from pool	2	0	0	2	15	35	50
	Total			19	2	2	22	170	380	550

B.Sc. (Aviation) Programme

4th-Semester

Sr. No.	Course Code	Course Area	Course Title	Hours per week			Course Credits	Maximum Marks		
				L	T	P		Internal	External	Total
1.	24BAV0401T	Discipline specified course	HumanFactor	3	1	0	4	30	70	100
2.	24BAV0402T	Discipline specified course	Aircraft Ground Handling	3	1	0	4	30	70	100
3.	24BAV0403T	Discipline specified course	Propulsion	3	0	0	3	20	50	70
4.	24BAV0403P	Discipline specified course	Propulsion Lab	0	0	2	1	10	20	30
5.	24BAV0404T	Discipline specified course	Aircraft Material Science	4	0	0	4	30	70	100
6.	24VOC0423T	Vocational Course	Basic Radar and Radio System	2	0	0	2	15	35	50
7.	24VOC0423P	Vocational Course	Basic Radar and Radio System Lab	0	0	4	2	15	35	50
8.	24AEC0	Ability Enhancement Course	To be opted from pool	2	0	0	2	15	35	50
9.	24VAC0	Value added course	To be opted from pool	2	0	0	2	15	35	50
	Total			19	2	6	24	180	420	600

First Semester

Aviation Physics (Mechanics)

Course Code	Course Credits	Course Content/Syllabus Units	Internal Marks	External Marks	Total Marks	Examination Hours
24BAV0101T	4	4	30	70	100	3

The examiner is required to set ninequestions in all.The first questionwill be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions will be set consisting of two questions from each unit.
The student/candidate is required to attempt five questions in all selecting one question from each unit in addition to compulsory question No. 1. All questions will carry equal marks.

CourseOutcomes

Sr.No.	CourseOutcomes	RBT Level
CO1	Students will be able to describe force systems, centroid, moment of inertia, projectiles, laws of motion, relative velocity etc.	L1
CO2	Students will be able to solve the problems related to centroid, moment of inertia, projectile etc.	L2
CO3	Students will be able to interpret the given dynamic problems.	L3
CO4	Students will be able to examine the physical significance of moment of inertia and relative velocity	L4
CO5	Students will be able tosolve complex aerodynamics problems by applying principles of engineering, science, and mathematics.	L5

CourseContents

UNIT-I

Review of Basic Force System: Laws of mechanics, Vector algebra review, Moment of a force about a point and axis,Couple and couple moment, Addition and subtraction of couples, Moment of a couple about a line, Resultant of a forcesystem. Problems

Equilibrium of forces: Introduction, Lami's theorem, Methods for the equilibrium of coplanar forces, Analyticalmethod for the equilibrium of coplanar forces, free body diagram, general equations of equilibrium, Tension in a string,Tension in a string carrying point loads, Tension in a string carrying uniformly distributed load. Problems

UNIT-II

Centroidandcentreofgravity: Definition,Centroidofregularshapes,Symmetricalsections,Unsymmetricalsections,Referenceaxis,Centreofgravityofsolid bodies, Centroid and centre ofgravityofhollowsections. Problems

Moment of Inertia: Introduction and significance, Parallel axis theorem, Perpendicular axis theorem, Mass moment ofinertia,Areamomentofinertiaofregularshapes:L-sections,T-sections,I-sections,Momentofinertiaofunsymmetrical sections, hollowsections, Productofinertia, Propertiesofproductofinertia,Principalaxis.Problems

UNIT-III

Laws of Motion: Introduction, Important Terms, Rigid Body, Newton's Laws of Motion, Newton's First Law of Motion, Newton's Second Law of Motion, Newton's Third Law of Motion, Recoil of Gun, Motion of a Boat, Motion on an Inclined Planes.

Relative Velocity: Introduction, Methods for Relative Velocity, Relative velocity of Rain and Man, Relative Velocity of Two Bodies Moving Along Inclined Directions, Least Distance Between Two Bodies Moving Along Inclined Directions

UNIT-IV

Projectile: Introduction,Important Terms,Motion of a Body Thrown Horizontally into the Air,Motion of a Projectile,Equation of the Path of a Projectile,Time of Flight of a Projectile on a Horizontal Plane,Horizontal Range of a Projectile,Maximum Height of a Projectile on a Horizontal Plane,Time of Flight of a Projectile on an Inclined Plane,Range of a Projectile on an Inclined Plane.

Collision of Elastic Bodies: Introduction, Phenomenon of Collision, Law of Conservation of Momentum, Newton's law of Collision of Elastic Bodies, Coefficient of Restitution, Types of Collisions, Loss of Kinetic Energy During Collision.

TextandReferenceBooks

1. IrvingH.Shames (2006), EngineeringMechanics, 4thEdition, PrenticeHall
2. R.C.Hibbler(2017),EngineeringMechanics:StaticsandDynamics,PearsonPress.
3. Hibler andGupta(2010),EngineeringMechanics(Statics, Dynamics) byPearsonEducation
4. ReddyVijaykumarK.and K. SureshKumar (2010),Singer'sEngineeringMechanics
5. BansalR.K.(2015), ATextBookofEngineeringMechanics,Revisedeighthedition,LaxmiPublications
6. KhurmiR.S.,EngineeringMechanics,20threvisededition,S. Chand&Co.
7. TayalA.K. (2010),EngineeringMechanics,UmeshPublications

Basics of Aerodynamics

Course Code	Course Credits	Course Content/Syllabus Units	Internal Marks	External Marks	Total Marks	Examination Hours
24BAV0102T	4	4	30	70	100	3
The examiner is required to set ninequestions in all.The first questionwill be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions will be set consisting of two questions from each unit. The student/candidate is required to attempt five questions in all selecting one question from each unit in addition to compulsory question No. 1. All questions will carry equal marks.						

CourseOutcomes

Sr.No.	CourseOutcomes	RBT Level
CO1	Students will be able to understand the physics of atmosphere and aerodynamics	L1
CO2	Students will be able to describe the shape of airfoils and wing	L2
CO3	Students will be able to determine aerodynamic lift, drag and pitching moment generated from the pressure and stress distributions on aerofoils.	L3
CO4	Students will be able to calculate basic performance in steady, straight, climbing, turning, gliding and diving flight.	L4
CO5	Students will be able todescribe the concept of compressible flow, flight stability and control.	L5

CourseContents

UNIT-I

Physics of the Atmosphere: Pressure, Density, Humidity, Temperature and Altitude, Pascal's Law, Hydrostatic law, Absolute, Gauge, Atmospheric and vacuum pressure, Measurement of pressure- Barometer, Simple and differential manometers, Mechanical Gauges, International standard atmosphere, Numericals

Kinematics and dynamics of flow: Steady and Unsteady flow**;** Uniform and non-uniform flow,laminar and turbulent flow, Compressible and Incompressible flow, Inviscid and Viscous flow, Conservation of mass principle, Velocity and acceleration, Bernoulli's principle and its application, free stream flow, Boundary layer and its characteristics.

UNIT-II

Aerodynamics: The terms: camber, chord, mean aerodynamic chord, profile (parasite) drag, induced drag, centre of pressure, angle of attack, wash in and wash out, fineness ratio, wing shape and aspect ratio; Thrust, Weight, Aerodynamic Resultant;

Lift and Drag: Generation of Lift and Drag: Angle of Attack, Lift coefficient, Drag coefficient, polar curve, stall; Aerofoil contamination including ice, snow, frost.

UNIT-III

Theory of Flight: Relationship between lift, weight, thrust and drag; Glide ratio; Steady state flights, performance; Theory of the turn; Influence of load factor: stall, flight envelope and structural limitations; Lift augmentation

UNIT-IV

Compressible Flow: Introduction, Basic equations of compressible flow,Velocity of sound, Mach Number, Subsonic, sonic and supersonic flow, Propagation of pressure waves in a compressible fluid, Stagnation Properties, Numerical Problems.

Flight Stability and Dynamics: Longitudinal, lateral and directional stability (active and passive)

TextandReferenceBooks

1. John D Anderson Jr., Fundamentals of Aerodynamics, 2nd Ed., McGrawHill
2. Thomas Feronz, Basic Aerodynamics, Aviation Maintenance Technician Certification Series, Module 08
3. J JBertin and M L Smith, Aerodynamics for Engineers, 2nd Ed., Prentice Hall
4. R S Shevell, Fundamentals of Flight, 2nd Ed., Prentice Hall
5. E L Houghton and N B Carruthers, Aerodynamics for Engineering Students, Arnold, 2nd Ed.

Workshop Technology

Course Code	Course Credits	Course Content/Syllabus Units	Internal Marks	External Marks	Total Marks	Examination Hours
24SEC0121T	2	2	15	35	50	2

The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions will be set consisting of two questions from each unit.
The student/candidate is required to attempt three questions in all selecting one question from each unit consisting of 10 marks each in addition to compulsory question No. 1.

CourseOutcomes

Sr.No.	CourseOutcomes	RBT Level
CO1	Students will be able to define manufacturing processes, their types, advantages, and their applications.	L1
CO2	Students will be able to classify the different types of manufacturing methods, tools, which are commonly employed in the industry, to fabricate components using different materials.	L2
CO3	Students will be able to analyze the importance of Advanced manufacturing methods.	L3
CO4	Students will be able to decide the best suitable manufacturing method for the given work/ job.	L4
CO5	Students will be able todevelop a detailed understanding of manufacturing processes used in industry.	L5

CourseContents

UNIT-I

Manufacturing Processes: Primary Shaping processes, machining processes, Joining Processes, Surface finishing Processes.

Forming: Punching, blanking, piercing, forging, hot rolling and cold rolling, extrusion.

Machining: Principle of machining, Lathe, Parts of a lathe machine and operations of Lathe machine, Shaper machine, drilling machine. Comparison between conventional and non-Conventional machining.

UNIT-II

Welding: Introduction,Classification of welding,Arc welding and its principle, Metal arc welding, MIG welding, TIG welding, function of flux, Gas welding, types of flames

Casting: Introduction, Basic steps in moulding and casting, Pattern and its types, Pattern allowances, runner, riser, gates, function of core

CNC machining, Additive manufacturing: Introduction to CNC machining and Additive manufacturing.

TextandReferenceBooks

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, “Manufacturing Engineering and Technology”, 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu,”Manufacturing Technology – I” Pearson Education, 2008.
4. Roy A. Lindberg, “Processes and Materials of Manufacture”, 4th edition, Prentice Hall India, 1998.
5. Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGrawHill House,2017.

Workshop Technology Lab

Course Code	Course Credits	Course Content/Syllabus Units	Internal Marks	External Marks	Total Marks	Examination Hours
24SEC0121P	1	12	10	15	25	3

The internal assessment is based on the level of participation in laboratory sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department.

CourseOutcomes

Sr.No.	CourseOutcomes	RBT Level
CO1	Students will be able to fabricate components using different manufacturing operations and tools.	L1
CO2	Students will be able to apply the theoretical knowledge into practical for completing the given work using various manufacturing processes.	L2
CO3	Students will be able to examine the defects induced in workpiece/ job during different manufacturing processes.	L3
CO4	Students will be able to judge the dimensional accuracy and surface finish of prepared job.	L4
CO5	Students will be able toimprove their manufacturing skills by preparing a variety of jobs in different manufacturing shops	L5

List of Experiments.

1. To study different types of machine tools (lathe, shaper or planer or slotter, milling, drilling machine).
2. To prepare a job on a lathe machine involving facing, outside turning, taper turning, step turning, radius making and parting-off.
3. To prepare a job involving side and face milling on a milling machine.
4. To prepare horizontal surface/ vertical surface/ curved surface/ slots on V- grooves on a shaper.
5. To study different types of measuring tools used in metrology and determine least counts of vernier caliper and micrometer.
6. To study different types of fitting tools and marking tools used in fitting practices.
7. To prepare a layout on a metal sheet by making and prepare rectangular tray, pipe shaped components e.g. funnel.
8. To prepare joints for welding suitable for butt welding and lap welding.
9. To perform pipe welding.
10. To study various types of carpentry tools and prepare simple types of at least two wooden joints.
11. To prepare simple engineering components/ shapes by forging.
12. To prepare mould and core assembly, to put metal in the mould and fettle the casting.

Note:
The actual experiments/assignments will be designed by the course coordinator. One assignment should be designed to be done in groups of two or three students. The assignments must meet the objective of the course and the levels of the given course outcomes. The list of assignments and schedule of submission will be prepared by the course coordinator at the beginning of the semester.

Second Semester

Familiarization of Aircraft

Course Code	Course Credits	Course Content/Syllabus Units	Internal Marks	External Marks	Total Marks	Examination Hours
24BAV0201T	4	4	30	70	100	3

The examiner is required to set ninequestions in all.The first questionwill be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions will be set consisting of two questions from each unit. The student/candidate is required to attempt five questions in all selecting one question from each unit in addition to compulsory question No. 1. All questions will carry equal marks.

CourseOutcomes

Sr.No.	CourseOutcomes	RBT Level
CO1	Students will be able to familiar with various types of aircraft and their classifications.	L1
CO2	Students will be able to learn about the structural components of an aircraft.	L2
CO3	Students will be able to familiar with aircraft controls	L3
CO4	Students will be able to explain about aircraft engines and their components.	L4
CO5	Students will be able toexplore current trends and advancements in aircraft technology.	L5

CourseContents

UNIT-I

Introduction to Aircraft: Types of Aircraft- Fixed-wing, rotary-wing, and unmanned aerial vehicles (UAVs), Civil vs. military aircraft, Key historical developments in Aviation

Aircraft Structure, Componentsand systems: Basic components of an aircraft,Fuselage, Types of Fuselages, Wings, Various Wing Structures-Rectangular, Elliptical, Swept back, Swept forward, Anhedral, Dihedral;Control Surfaces, Primary control surface, Secondary controlSurface, Working of Aileron, Elevator, Rudder, Flaperons; Airframe, fuel system,Cooling System.

UNIT-II

Landing Gear, Wheel brakes: Purpose of landing gear, Types of Landing Gear- Retractable and Non-Retractablelanding gear, Tri cycle type, Tail Dragger Landing Gear, Main Landing Gears anddifferent types of Shock Strut- Rigid struts, Spring Steel Struts, Bungee cords,Shock struts, oleo struts; Brake System.

UNIT-III

Aircraft Engine (Piston): Piston engine components: Crankcase, Crankshaft, Camshaft, Bearings, Connecting Rod, Piston, Piston Rings, carburetor, Four-Stroke engine cycle, Engine Handling, Normally aspirated, Turbo charging, Supercharging

UNIT-IV

Aircraft Engine (Jet): Basic understanding of Jet engines, Propeller, Parts of Propeller, Difference between jet engine and piston engine, Types of Compressors: Axial, Centrifugal, Fuel injection, Types of Combustion Chambers, gas turbine engine**.**

TextandReferenceBooks

1. Airframe and power plant mechanics – power plant hand FAA
2. Aircraft piston engines – by Herschel smit
3. Oxford – Aircraft General Knowledge 1(Airframe and systems)
4. Oxford – Aircraft General Knowledge 3(power plant)
5. Aero plane Technical by Trevor Thom

Aviation Science (Mechanical)

Course Code	Course Credits	Course Content/Syllabus Units	Internal Marks	External Marks	Total Marks	Examination Hours
24BAV0202T	4	4	30	70	100	3

The examiner is required to set ninequestions in all.The first questionwill be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions will be set consisting of two questions from each unit.
The student/candidate is required to attempt five questions in all selecting one question from each unit in addition to compulsory question No. 1. All questions will carry equal marks.

CourseOutcomes

Sr.No.	CourseOutcomes	RBT Level
CO1	Students will be able todefine and tell about basic working of power transmission devices, gyroscope and simple lifting machines.	L1
CO2	Students will be able to understand the concepts of stress, strain, shear force diagrams and bending moment diagrams.	L2
CO3	Students will be able to examine the physical significance of work, power and energy	L3
CO4	Students will be able to apply principles of friction in aviation problems.	L4
CO5	Students will be able to solvecomplex problems using basic principles	L5

CourseContents

UNIT-I

Power Transmission Methods and Devices: Introduction to Power transmission, Belt drive, Rope drive, Chain drive, Pulley, Gear drive, Types of gears, Gear train, function of brakes, Clutches

Gyroscope: Introduction, Angular velocity, Angular acceleration, Gyroscopic Couple, Effect of gyroscopic couple on an aeroplane.

UNIT-II

Simple Lifting Machines: Definition of machine, Velocity ratio, Mechanical advantage, Efficiency, Laws of machines, Reversibility of machine, Wheel and axle, worm and worm wheel, Single and double purchase winch crabs, Simple and compound screw jacks. Problems.

Stresses and Strains: Introduction, Concept & types of Stresses and strains,Poison's ratio, stresses and strains in simple and compound bars under axialloading, Stress-strain diagrams, Hooks law, Elastic constants & their relationships,Numerical problems.

UNIT-III

Bending Moment & Shear Force: Definitions, SF and BM diagrams for cantilever and simply supported beam. Calculation of maximum SF, BM and point of contra- flexure under (i) concentrated load (ii) uniformly distributed load (iii) combination of concentrated and uniformly distributed loads. Problems.

Work, Power and Energy: Introduction. Units of Work, Graphical Representation of Work, Power- Units of Power, Types of Engine Powers, Indicated Power, Brake Power,and Efficiency of an Engine, Measurement of Brake Power, Rope Brake Dynamometer,Proney Brake Dynamometer, Energy- Units of

Energy,Mechanical Energy, Potential Energy, Kinetic Energy, Transformation of Energy, Law of Conservation of Energy.

UNIT-IV

Friction: Introduction, Types of friction, Laws of friction, Equilibrium of a body on a rough horizontal plane and inclined plane, Equilibrium of a body on a rough inclined plane subjected to a force acting along the inclined plane, Equilibrium of a body on a rough inclined plane subjected to a force acting horizontally. Problems

TextandReferenceBooks

1. Elements of Mechanical Engineering – Mahesh Kumar, I.K. International, 2013
2. Elements of Mechanical Engineering- R.K. Rajput
3. Basics of Mechanical Engineering - MridualSingal and R. K. Singal
4. Basics of Mechanical Engineering- D.S. Kumar, Pub. – Kataria& Sons, New Delhi.
5. Basics of Mechanical Engineering – Sadhu Singh
6. EngineeringMechanics,KhurmiR.S.,20th revisededition,S. Chand&Co.
7. Theory of Machines,SS, Rattan, , Tata McGraw Hill Publishers, Edition, 2017.
8. Theory of Machines, R.S Khurmi, J.K. Gupta, S.Chand and Company Ltd., 2022

Employability Skills and Practices

Course Code	Course Credits	Course Content/Syllabus Units	Internal Marks	External Marks	Total Marks	Examination Hours
24SEC0221T	2	2	15	35	50	2

The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions will be set consisting of two questions from each unit.
The student/candidate is required to attempt three questions in all selecting one question from each unit consisting of 10 marks each in addition to compulsory question No. 1.

CourseOutcomes

Sr.No.	CourseOutcomes	RBT Level
CO1	Students will be able to understand the fundamental concepts and importance of measurement along with linear and angular measurement devices.	L1
CO2	Students will be able to identify the functions and applications of various hand tools and power tools.	L2
CO3	Students will be able to explore diverse applications of 3D printing and other prototyping technologies.	L3
CO4	Students will be able to operate CNC routers, laser cutters, and 3D printers effectively.	L4

CourseContents

UNIT-I

Measurement Techniques: Definition and importance of measurement, Linear and angular measurement devices- Tape measure, Vernier caliper, Micrometer and Gauges, Combination Set, Comparator, Sine bar, Spirit level, AutoCollimator

Introduction to basic hand tools and Power tools – Function and uses of various hand tools and power tools- Files, Types of files, Try square, Hammers, Pliers, Saws, Chisels, Grinder, Rotary Tools Belt Sander, Vice and clamps.

UNIT-II

Prototyping technology and Digital Manufacturing – Basics of 3D Printing, Classification, Working Principles, Steps in 3D printing, materials and their selection, advantages, limitations and applications of 3D printing. Introduction to CNC router: Major components and their functions, Overview of operations performed on CNC router, Laser cutter: Working principles of a laser cutter and its components, Major operations and application.

Text and Reference Books

1. N.V. Raghavendra, L. Krishnamurthy, Engineering Metrology and Measurements, Oxford University Press 2013
2. DK Singh, Fundamentals of Manufacturing Technology, 2nd Edition, Ane Books Pvt Ltd., 2009
3. Venuvinod, PK., MA. W., Rapid Prototyping – Laser Based and Other Technologies, Kluwer, 2004.
4. Ian Gibson, David W Rosen, Brent Stucker., "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2014
5. Chapman W.A.J, "Workshop Technology", Volume I, II, III, CBS Publishers and distributors, 5th Edition,2002.
6. Fundamentals of CNC Machining, A Practical Guide for Beginners, Autodesk 2014.

Employability Skills and Practices Lab

Course Code	Course Credits	Course Content/Syllabus Units	Internal Marks	External Marks	Total Marks	Examination Hours
24SEC0221P	1	9	10	15	25	3

The internal assessment is based on the level of participation in laboratory sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department.

CourseOutcomes

Sr.No.	CourseOutcomes	RBT Level
CO1	Students will be able to perform experimental work and gain technical knowledge of general purpose tools,mechanical tools, electrical tools, electronic instruments, and prototyping processes along with safety measures.	L1
CO2	Students will be able to utilize the knowledge of tools, instruments and equipment to construct models using 3D printing, laser cutting, vinyl cutting, wood routing etc.	L2
CO3	Students will be able to assess the design requirements and select appropriate tools, instruments, and equipment for effective development of models	L3
CO4	Students will be able to evaluate the quality, functionality, and performance of various models developed using equipment/tools	L4
CO5	Students will be able todesign a complete solution from idea to a prototype in presentable form.	L5

List of Experiments

1. To familiarize with the functioning, operation and application of General Mechanical Tools in Idea Lab.
2. To perform 3D Scanning and Post-processing on the component / objectfor prototype development.
3. To design and fabricate the scanned component / objectusing 3D Printer.
4. To create and cut digital designs using Vinyl Cutter.
5. To design and carve / fabricate a given job usingCNC Wood Router Machine.
6. To design and cut / engravea given job using CO_2 Laser Cutter Machine.
7. To program the Robotic Arm for performing various operations such as 3D printing, cutting, engraving, long distance writing, drawing, etc.
8. To develop a program for implementing pick and place functionality using Robotic Arm.
9. To familiarize with the functioning and applications of Electronic / Electrical instruments and tools in Idea Lab.

Note: The above list is only indicative and actual experiments will be designed by the Course Co-ordinator. At the end of the course, it is desirable for every student to design a project/prototype in presentable form using design thinking process (empathize, define, ideate, test and implement) through maximum utilization of all IDEA Lab machines/tools.

Third Semester

Aviation Legislation

Course Code	Course Credits	Course Content/Syllabus Units	Internal Marks	External Marks	Total Marks	Examination Hours
24BAV0301T	4	4	30	70	100	3

The examiner is required to set ninequestions in all.The first questionwill be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions will be set consisting of two questions from each unit.
The student/candidate is required to attempt five questions in all selecting one question from each unit in addition to compulsory question No. 1. All questions will carry equal marks.

CourseOutcomes

Sr.No.	CourseOutcomes	RBT Level
CO1	Students will be able to understand the regulatory framework governing aviation at national and international levels.	L1
CO2	Students will be able to learn about Aircraft Act, Rules, and Civil Aviation Requirements (CARs).	L2
CO3	Students will be able to familiar with aircraft operations, airworthiness requirements, and maintenance regulations.	L3
CO4	Students will be able to explain the applicable national and international aviation requirements for regulatory compliance	L4

CourseContents

UNIT-I

Regulatory Framework: International Aviation Regulatory Bodies: Role of the International Civil Aviation Organization (ICAO). National Regulatory Framework: Overview of the Aircraft Act, 1934, and Aircraft Rules, 1937. Directorate General of Civil Aviation (DGCA): Structure, functions, and responsibilities.Aircraft Rules & Regulations: Key provisions applicable to aircraft maintenance. Aeronautical Information Circulars (AICs): Their role in aircraft maintenance and operations.

UNIT-II

Civil Aviation Requirements (CARs): Relationship between CAR-21, CAR-M, CAR- 145, CAR-66, and CAR-147.CAR Section 1: General regulations and procedural requirements.CAR Section 2: Airworthiness, operational standards, and maintenance procedures.

UNIT-III

Aircraft Operations: Commercial Air Transport Operations: Definitions and classifications. Air Operator Certificates (AOC): Requirements and approval process. Operator Responsibilities: Ensuring continuing airworthiness and maintenance. Mandatory On board Documents: Flight manual, technical logbook, MEL, and otheressential documents.Aircraft placarding and Markings: Requirements and regulations.

UNIT-IV

National and International Requirements: Aircraft Maintenance Programmes: Maintenance checks and inspections. Minimum Equipment Lists (MELs) & Dispatch Deviation Lists (DDLs): Purpose andregulations. Airworthiness Directives & Service Bulletins: Compliance and

implementation.Maintenance Documentation: Structure and use of maintenance manuals, structuralrepair manuals (SRMs), and illustrated parts catalogs (IPCs).

Text and Reference Books

1. The Aircraft Act, 1934
2. The Aircraft Rules, 1937 VOL 1
3. The Aircraft Rules, 1937 VOL 3
4. Aeronautical Information Circular
5. CAR - Section - 1, 2, & 8 SMS
6. CAR - 21, M, 145, 66 & 147
7. Special Federal Aviation Regulations (SFARs) - 14 CFR, SFAR 88 & JAA TGL 47
8. Airworthiness Procedure Manual

Thermodynamics

Course Code	Course Credits	Course Content/Syllabus Units	Internal Marks	External Marks	Total Marks	Examination Hours
24BAV0302T	4	4	30	70	100	3

The examiner is required to set ninequestions in all.The first questionwill be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions will be set consisting of two questions from each unit.
The student/candidate is required to attempt five questions in all selecting one question from each unit in addition to compulsory question No. 1. All questions will carry equal marks.

CourseOutcomes

Sr.No.	CourseOutcomes	RBT Level
CO1	Students will be able to explain the basic concepts, laws, and principles of thermodynamics and their relevance in aviation systems.	L1
CO2	Students will be able to evaluate the thermodynamic performance of aircraft engines, including gas turbines and jet engines, using concepts like efficiency, work, and heat transfer.	L2
CO3	Students will be able to solve real-world problems related to aircraft propulsion, energy management, and thermal systems using appropriate thermodynamic models and equations.	L3
CO4	Students will be able to analyze and compare different gas power cycles to assess their applicability in aviation propulsion systems.	L4
CO5	Students will be able to develop the ability to analyze real-world thermodynamic problems in aviation industry.	L5

CourseContents

UNIT-I

Basic Concepts: Introduction to Thermodynamics, Definition, scope, and significance in aviation, Concepts of system, boundary, and surroundings, Types of systems (open, closed, isolated).

Properties of Thermodynamics: Thermodynamic Properties, Properties of substances: pressure, temperature, volume, Intensive and extensive properties, State, path, process, and cycle.

UNIT-II

Zeroth Law of Thermodynamics: Introduction, Concept of temperature and thermal equilibrium, Temperature scales and calibration.

First Law of Thermodynamics: Introduction, Energy conservation principle, Laws pertaining to Ideal Gas, Specific Heats, Various Reversible processes (Constant Pressure, Temperature, Volume, adiabatic and Polytropic), Evaluation of work transfer, heat transfer, Applications in aviation industry.

UNIT-III

Second Law of Thermodynamics: Introduction, Kelvin-Plank and Clausius statements of Second Law, Concept of entropy and its physical significance, Carnot cycle and Carnot theorem, Efficiency of aviation engines.

Entropy and Energy Analysis: Introduction, Entropy change in systems, Reversible and irreversible processes, Clausius inequality and entropy change.

UNIT-IV

Thermodynamic Cycles: Gas Power Cycles, Otto, Diesel, Dual and Brayton cycles, Applications in aircraft engines and gas turbines.

Applications of thermodynamic systems: Aircraft Propulsion and Thermodynamic Analysis, Jet propulsion cycle, Turbojet, turbofan, and ramjet engines.

Text and Reference Books:

1.Thermal Science and Engineering – Dr. D.S. Kumar, Katson Books, 2021.
2.Essentials of Engineering Thermodynamics- Clement Kleinstreuer, McGraw Hill, 2021.
3.Introduction to Flight: John D. Anderson Jr., Tata McGraw Hill, 8th edition.
4.Fundamentals of Engineering Thermodynamics - Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner and Margaret B. Bailey, Wiley, 9th edition. 2018.
5.Engineering Thermodynamics - P K Nag, Tata McGraw Hill, 6th edition. 2017.

COMPUTER AIDED DESIGN

Course Code	Course Credits	Course Content/Syllabus Units	Internal Marks	External Marks	Total Marks	Examination Hours
24SEC0321T	2	2	15	35	50	2

The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions will be set consisting of two questions from each unit.
The student/candidate is required to attempt three questions in all selecting one question from each unit consisting of 10 marks each in addition to compulsory question No. 1.

CourseOutcomes

Sr.No.	CourseOutcomes	RBT Level
CO1	Students will be able to explain the fundamental concepts of CAD.	L1
CO2	Students will be able to understand and apply different types of geometric modeling techniques.	L2
CO3	Students will be able to gain knowledge of basic 2D and 3D transformations, and understand their applications in design modifications.	L3
CO4	Students will be able to use 2D and 3D modeling tools to create simple and complex models.	L4
CO5	Students will be able toapply principles of geometric dimensioning and tolerancing to create precise technical drawings.	L5

CourseContents

UNIT-I

Introduction: Overview of CAD, History of CAD, Scope of CAD, Configurations for CAD workstations, CAD Softwares, File Standards, Types of Modeling – feature based, parametric, and form modeling, Types of Geometric Modeling.

Geometry: Coordinate System – origin, axes, and planes, Types of Views – orthographic, isometric, and perspective views, Introduction to Transformations, Transformation of Point and Line, 2D Transformations – translation, rotation, reflection, and scaling, 3D Transformations Translation– rotation, reflection, and scaling, Combined Transformations.

UNIT-II

2-D Modeling: CAD Sketching, Sketch Entities, Sketch Editing Tools – fillet, chamfer, trim, extend, break, offset, pattern, mirror, and constraints, Geometric Dimensioning and Tolerancing.

3-D Modeling: 3-D Modeling Tools – extrude, revolve, cut, sweep, loft, helix, hole, and thread, 3D Editing Tools – fillet, chamfer, draft, pattern, mirror, combine, and split, Assembly Modeling - assembly modeling, type of joints, and motion analysis.

Text and Reference Books

1. Rao P.N. “CAD/CAM Principles and Applications” Eighth edition, 2013. Tata McGraw Hill India.
2. Zeid, I., “CAD/CAM”, McGraw Hill, 2008.
3. Groover and Zimmer, “CAD/ CAM”, Prantice Hall.
4. Krishnamoorathy, C. S. and Rajeev, J. S., “Computer Aided Design (Software and Analysis Tools)”, Narosa Publication House, 2nd edition, 2005.

COMPUTER AIDED DESIGN LAB

Course Code	Course Credits	Course Content/Syllabus Units	Internal Marks	External Marks	Total Marks	Examination Hours
24SEC0321P	1	16	10	15	25	3

The internal assessment is based on the level of participation in laboratory sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.
The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department.

CourseOutcomes

Sr.No.	CourseOutcomes	RBT Level
CO1	Students will be able to apply the basic principles of projections in 2D drawings.	L1
CO2	Students will be able to create detailed sketches for simple aviation components using appropriate dimensions and constraints.	L2
CO3	Students will be able to construct and develop 3D models of aviation parts.	L3
CO4	Students will be able to create assemblies of rigid aviation components in CAD software.	L4

LIST OF EXPERIMENTS:

1. Types of lines, lettering, dimensioning of simple orthographic view
2. Projection of points, lines, planes, and solids
3. Orthographic projection, Sectional orthographic projection
4. Isometric views
5. Introduction of AutoCAD software (simple object)
6. To draw a 2D part into CAD software and export to different CAD files.
7. To create a sketch for a simple aviation component.
8. To create a sketch for a simple aviation component using proper dimensions and constraints.
9. To create a sketch of a complex aviation component using proper dimensions and tolerances.
10. To create a 3D model of an aviation part based on extrusion features.
11. To create a 3D model of an aviation part based on revolve features.
12. To create a 3D model of an aviation part based on sweep and loft features.
13. To create a 3D model of an aviation part based on parametric design approach.
14. To create an assembly of simple rigid parts.
15. To create an assembly of moving components with proper constraints.
16. To create an engineering drawing of 3D modeled part.

Note: The above list is only indicative and actual experiments will be designed by the Course Co-ordinator.

Fourth Semester

Human Factor

Course Code	Course Credits	Course Content/Syllabus Units	Internal Marks	External Marks	Total Marks	Examination Hours
24BAV0401T	4	4	30	70	100	3

The examiner is required to set ninequestions in all.The first questionwill be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions will be set consisting of two questions from each unit.
The student/candidate is required to attempt five questions in all selecting one question from each unit in addition to compulsory question No. 1. All questions will carry equal marks.

CourseOutcomes

Sr.No.	CourseOutcomes	RBT Level
CO1	Students will be able to understand the concepts of human behavior and error in aviation field.	L1
CO2	Students will be able to analyze various factors affecting human performance and identify the requirements in aviation industry.	L2
CO3	Students will be able to examine the importance and impact of physical environment on working conditions.	L3
CO4	Students will be able to developeffective communication skills.	L4
CO5	Students will be able toidentifythe hazards in the workplace, causes and various medical measures.	L5

CourseContents

UNIT-I

Human Factors and Errors: General - The need to take human factors into account; Incidents attributable to humanfactors/human error; 'Murphy's' law.

Human Performance and Limitations - Vision; Hearing; Information processing; Attention andperception; Memory; Claustrophobia and physical access, decompression sickness, fatigue management, impact of long-duration flights on health

UNIT-II

Social Psychology: Responsibility: individual and group; Motivation and de-motivation; Peerpressure; 'Culture' issues; Team working; Management, supervision and leadership.

Factors Affecting Performance: Fitness/health; Stress: domestic and work related; Timepressure and deadlines; Workload: overload and under load; Sleep and fatigue, shift work;Alcohol, medication, drug abuse, techniques to improve focus and attention in aviation operations.

UNIT-III

Physical Environment: Noise and fumes; Illumination; climate and temperature; motion andvibration; working environment, aviation industry's role in climate change, carbon emissions, sustainability efforts, aviation strategies for extreme weather conditions.

Communication: Within and between teams; Work logging and recording; Keeping up to date,currency; Dissemination of information.

UNIT-IV

Human Error - Error models and theories; types of error in maintenance tasks; Implications oferrors i.e accidents / incidents; Avoiding and managing errors.

Hazards in the Workplace - Recognizing and avoiding hazards; dealing with emergencies, impact of emerging technologies on aviation risk management.

TextandReferenceBooks

1. 9A_Human_Factors, by Nancey Gold.
2. Civil Aviation Inspection Procedures 715, by Civil Aviation Authority U.K.
3. Civil Aviation Inspection Procedures 716, by Civil Aviation Authority U.K.
4. Civil Aviation Inspection Procedures 717, by Civil Aviation Authority U.K.
5. Aircraft Safety. Accident Investigations, Analyses & Applications by Shari Stanford Krause.McGraw Hill
6. Wiener, Earl L., Kanki, Barbara G., Helmreich, Robert L. (Eds.). Human Factors in Aviation, Academic Press, 2010
7. Lester, Peter F. Aviation Weather, Jeppesen Sanderson Inc., 2013
8. Davis, Jeffrey R., Johnson, Robert, Stepanek, Jan. Fundamentals of Aerospace Medicine, Lippincott Williams & Wilkins, 2008

Aircraft Ground Handling

Course Code	Course Credits	Course Content/Syllabus Units	Internal Marks	External Marks	Total Marks	Examination Hours
24BAV0402T	4	4	30	70	100	3

The examiner is required to set ninequestions in all.The first questionwill be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions will be set consisting of two questions from each unit.
The student/candidate is required to attempt five questions in all selecting one question from each unit in addition to compulsory question No. 1. All questions will carry equal marks.

CourseOutcomes

Sr.No.	CourseOutcomes	RBT Level
CO1	Students will be able to understand the fundamental principles of airport handling and regulations.	L1
CO2	Students will be able to learn about the various equipment and systems used in ground handling.	L2
CO3	Students will be able to comprehend the importance of safety and security in ground handling.	L3
CO4	Students will be able to develop an understanding of the regulatory framework governing ground handling.	L4
CO5	Students will be able toanalyze and apply best practices in ground handling operations.	L5

CourseContents

UNIT-I

Introduction to Airport Handling: Airport: Introduction, Significance of Airport, Physical Structure of an Airport, IATA: Introduction, Functions and Roles of IATA, Relevance of IATA in Aviation Sector, ICAO: Introduction, Strategic Objectives of ICAO, Functions and Roles of ICAO, and Airport Authority of India (AAI): Mission and Vision of AAI, Relevance of AAI in the Aviation Sector, Services of AAI

UNIT-II

Ground Support Equipment (GSE): Introduction to GSE: Classification and Functions, Passenger Handling Equipment: Passenger Steps, Ambulift, and Buses, Baggage Handling Equipment: Baggage Tractors, Conveyor Belts, and Loaders, Aircraft Servicing Equipment: Pushback Tractors, Towbars, and Aircraft Jacks, Cargo Handling Equipment: Cargo Loaders, Dollies, and ULDs, Specialized GSE: De-icing Equipment, GPU, and ASU.

UNIT-III

Ground Handling Procedures: Aircraft Arrival and Departure Procedures: Marshalling, Parking, and Pushback, Passenger Handling Procedures: Check-in, Boarding, and Disembarkation, Baggage Handling Procedures: Loading, Unloading, and Sorting, Cargo Handling Procedures: Loading, Unloading, and Documentation, Aircraft Servicing Procedures: Refuelling, Cleaning, and Maintenance.

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UNIT-IV

Safety and Security in Ground Handling: Safety Management Systems (SMS) in Ground Handling, Hazard Identification and Risk Assessment, Foreign Object Debris (FOD) Prevention and Control, Ground Handling Accidents, and Incidents, Security Procedures: Access Control, Screening, and Surveillance, Emergency Response and Contingency Planning.

TextandReferenceBooks

1. Airport Operations by Norman Ashford.
2. Aircraft Ground Handling, by Subash S Narayanan
3. IATA Airport Handling Manual (AHM) (Latest Edition).
4. ICAO Annex 14: Aerodromes (Latest Edition)
5. IATA Ground Operations Manual (IGOM) (Latest Edition)
6. Aviation Ground Operation Safety Handbook by National Safety Council.
7. Airport Engineering: Planning, Design, and Development of 21st Century Airports by Norman J. Ashford, Saleh A. Mumayiz, and Paul H. Wright.
8. Airport Systems: Planning, Design, and Management, 2nd Edition, by Dr. Richard de Neufville, McGraw Hill.

Propulsion

Course Code	Course Credits	Course Content/Syllabus Units	Internal Marks	External Marks	Total Marks	Examination Hours
24BAV0403T	3	3	20	50	70	2.5

The examiner is required to set seven questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to this, six more questions will be set consisting of two questions from each unit.
The student/candidate is required to attempt four questions in all selecting one question from each unit in addition to compulsory question No. 1. All questions will carry equal marks.

Course Outcomes

Sr. No.	Course Outcomes	RBT Level
CO1	Students will be able to define the fundamentals, components and working principle of propulsion.	L1
CO2	Students will be able to describe, explain and compare the various mechanism of propulsion systems.	L2
CO3	Students will be able to examine different propulsion systems.	L3
CO4	Students will be able to evaluate the thermal performance of various components of propulsion system.	L4
CO5	Students will be able to select a better propulsion system under given conditions.	L5

CourseContents

UNIT-I

Air compressor: Construction and working of reciprocating and rotary air compressors, classifications of air compressors, compression processes: isentropic, polytropic and isothermal.
Gas turbines: Classifications of gas turbines, Brayton cycle, Advantages and disadvantages of gas turbines, methods of improving the performance of gas turbines – regeneration, reheating and intercooling, Applications of gas turbines.

UNIT-II

Introduction to propulsion systems: Types of propulsion used in aircrafts and spacecraft's, turbo-prop, turbo-shaft comparison, efficiency, advantages, disadvantages and applications, rocket and hybrid propulsion.
Introduction to Heat Transfer: Basic laws of heat transfer, modes of heat transfer, free and forced convection.

UNIT III

Introduction to aircraft piston engines: S.I and C.I engines, four stroke and two stroke engines, air standard cycles, I.H.P., B.H.P. and efficiency, supercharging, multi-cylinder configuration in aircraft engines.
Propellers: Performance of propellers, selection of propellers, fixed, variable and constant speed propellers.

Text and Reference Books

1. Cengel, Y. A., & Boles, M. A. (2002). Thermodynamics: an engineering approach. McGraw Hill Education. ISBN: 9339221656.
2. Farokhi, S. (2014). Aircraft propulsion. John Wiley & Sons. ISBN: 9781118806777.
3. Houghton, E. L., & Carpenter, P. W. (2003). Aerodynamics for engineering students. Elsevier.

4. Kerrebrock, J. L. (1992). Aircraft engines and gas turbines. MIT press.
5. Mattingly, J. D. (1996). Elements of gas turbine propulsion (Vol. 1). New York: McGraw-Hill Education.
6. Mishra, D. P. (2007). Fundamentals of combustion. PHI Learning Pvt. Ltd..
7. Rolls Royce, P. (2015). The jet engine. John Wiley & Sons.
8. Saravanamuttoo, H. I., Rogers, G. F. C., & Cohen, H. (2001). Gas turbine theory. Pearson education.
9. Sutton, G. P., &Biblarz, O. (2011). Rocket propulsion elements. John Wiley & Sons.

Propulsion Lab

Course Code	Course Credits	Course Content/Syllabus Units	Internal Marks	External Marks	Total Marks	Examination Hours
24BAV0403P	1	11	10	20	30	3

The internal assessment is based on the level of participation in laboratory sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department.

Course Outcomes

Sr. No.	Course Outcomes	RBT Level
CO1	Students will be able to learn the basics of propulsion systems.	L1
CO2	Students will be able to define and demonstrate the working of propulsion systems and their components.	L2
CO3	Students will be able to memorize the construction details of internal combustion engines and gas turbines.	L3
CO4	Students will be able to correlate different types of internal combustion engines, gas turbines on the basis of their utilization.	L4
CO5	Students will be able to apply the basic principles of heat transfer in propulsion systems.	L5

List of Experiments

1. To study the performance characteristics of an air compressor including volumetric and isothermal efficiencies.
2. To study an aircraft piston engine and its components.
3. To study a gas turbine engine, its components and working cycles.
4. Determination of convective heat transfer coefficient over a vertical tube by natural convection.
5. Determination of convective heat transfer coefficient over a horizontal cylinder by forced convection.
6. To study the constructional and working details of an aircraft propeller and ramjet engine.
7. To study the constructional details & working principles of two-stroke/ four stroke petrol engines.
8. To study the constructional detail & working of two-stroke/ four stroke diesel engine.
9. Determination of brake power (BP) and friction power (FP) of a four stroke four cylinder petrol engine with hydraulic dynamometer.
10. Determination of brake power (BP) and friction power (FP) of a single-cylinder two stroke single cylinder petrol engine with rope brake dynamometer.
11. To find the indicated horse power (IHP) on multi-cylinder petrol engine/diesel engine by Morse test.

Note: The above list is only indicative and actual experiments will be designed by the Course Co-ordinator.

Aircraft Material Science

Course Code	Course Credits	Course Content/Syllabus Units	Internal Marks	External Marks	Total Marks	Examination Hours
24BAV0404T	4	4	30	70	100	3

The examiner is required to set ninequestions in all.The first questionwill be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to this, eight more questions will be set consisting of two questions from each unit. The student/candidate is required to attempt five questions in all selecting one question from each unit in addition to compulsory question No. 1. All questions will carry equal marks.

CourseOutcomes

Sr.No.	CourseOutcomes	RBT Level
CO1	Students will be able to define crystals, its basic concepts, imperfection in crystals, equilibrium diagrams and their objectives.	L1
CO2	Students will be able to understand different types of ferrous, non-ferrous,composite and non- metallic materials used in aircraft.	L2
CO3	Students will be able to describe characteristic and application of aircraft materials.	L3
CO4	Students will be able to examine phase diagram, and heat treatment of materials	L4
CO5	Students will be able toknow importance of creep and corrosion and its prevention in aviation.	L5

CourseContents

UNIT-I

Crystallography: Reviewofcrystalstructure,spacelattice,crystalplanesandcrystaldirections,co-ordinationnumber,numberofatomsperunitcell,atomic packingfactor,Numericalsrelatedto crystallography.

Imperfection in metal crystals: Crystal imperfections and their classifications, point defects, line defects, edge &screwdislocations,surfacedefects, volumedefects&effectsofimperfectionsonmetalproperties.

UNIT-II

Aircraft Materials- Ferrous and Non Ferrous: Characteristics, properties and selection of common ferrous and non-ferrous materials used in aircraft;Testing of ferrous and non-ferrous materials for hardness, tensile strength, fatigue strength and impact resistance.

Aircraft Materials - Composite and Non- Metallic: Characteristics and properties of common and selectionof composite and non- metallic materials used in aircraft; Sealant and bonding agents.

UNIT-III

Phase Diagram: Importance and objectives of phase diagram,iron carbon equilibrium diagram,Time, temperature and Transformation (TTT) diagram.

Heat Treatment: Principles, purpose, classification of heat treatment processes, annealing, normalizing, stress relieving, hardening, tempering, carburizing, nitriding, cyaniding, flame and induction hardening,

UNIT-IV

Creep: Definition and concept, creep curve, mechanism of creep, impact of time and temperature on creep, creep fracture, creep testing and prevention against creep

Corrosion: Introduction, Phenomenon of Corrosion,Types of corrosion and their identification; Causes of corrosion; Introduction to CPCP (Corrosion Protection and Corrosion Prevention).

TextandReferenceBooks

1. Elements of Material Science and Engineering: VanVlack, Wesley Pub. Comp.
2. Material Science - Narula, Narula and Gupta. New Age Publishers
3. Material Science & Engineering –V. Raghvan, Prentice Hall of India Pvt. Ltd, New Delhi
4. A Text Book of Material Science & Metallurgy – O.P. Khanna, Dhanpat Rai & Sons
5. Material Science and Engineering-An Introduction - Callister; W.D., John Wiley & Sons., Delhi.
6. Engineering Materials: Kenneth G. Budinski, Prentice Hall of India, New Delhi