Savitribai Phule Pune University

Three Year B.Sc. Degree Program in Aviation
(Faculty of Science & Technology)

First Year B.Sc. (Aviation)

Choice Based Credit System Syllabus
Proposed to be implemented from Academic Year 2023-2024

Title of the Course: B.Sc. (Aviation)

Preamble of the Syllabus:
The systematic and planed curricula from 1st year to 3rd years shall motivate and encourage the students pursuing the higher education in the aviation field.

Introduction:
At first year of under-graduation: The basic topics related to the workshop practice, Electrical Fundamental and maintenance concepts, building blocks, components, assembly techniques are dealt with. The practical course is designed to emphasize practical skills required for Aircraft Maintenance testing and trouble-shooting.

At second year under-graduation: The level of the theory and practical courses shall be one step ahead of the first year B.Sc. Courses based on content of first year. The course on Environment & Human Factor is introduced to understand its context in aviation. The Language Proficiency course is introduced to build the professional ability of students.

At third year under-graduation: Proportionate number of laboratory exercises will be included in the practical courses. In addition, project course I and II are included in third year at 5th & 6th Semester respectively in which students can independently think and carry out the project work. The list of activities is given in the syllabus. At 6th Semester, the student is expected to complete any 4 activities from the list.

Need for Launching B.Sc. Aviation Degree Course:
a) To provide capable and trained human resource to Aviation Industry.
b) To fulfil the minimum academic qualification requirement so as to enable the graduates to compete for higher studies/ Job Opportunities in the Aviation Industry.

The 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. The need of the future therefore will be felt in much greater requirement of skilled manpower in all streams connected with Aviation like management of increased number of airplanes and their maintenance. The movement of goods and people will have to be quick and safe and this can only be achieved by an efficient, reliable and economic aviation industry. The industry therefore needs more and more aircraft and large workforce to keep them flying safely.

The Syllabus of B.Sc. (Aviation) degree is designed to enable the student to acquire the necessary qualification to enter into the Job market in any of the related fields of Aviation such as Traffic Control, Crew and Man power Scheduling, In-flight service department, Security, Civil Works department and Line and Major maintenance department of Engineering etc. The existing highly qualified work force of AMEs (Aircraft Maintenance Engineers) shouldering huge responsibility in the certification of an Aircraft carrying large number of passengers say 400 to 500 passenger capacity, are denied the higher positions in the Industry merely for not possessing Graduate degree in Aeronautics.

After obtaining B.Sc. degree in Aviation student may start his / her career as Trainee Technician with some stipend and then as Jr. Technician. Further promotional avenues could be Sr. Technician etc, depending on his / her achievements. The undergraduate study will significantly enhance the competency of the student to appear in the AME (Aircraft Maintenance Engineer) license examination conducted by DGCA (Director General of Civil Aviation). After acquiring License qualification, he / she can start his / her career as Aircraft Maintenance Engineer category. However, it is also possible that the graduates B. Sc. (Aviation) enter the field of Non-Technical streams in the Aviation Industry like Commercial Department, In-flight service Department, Ground Support Department and Security Department etc.

It is, therefore, in fitness of things that such a degree course would help the student to make his / her career in Aviation.

Objectives:

The systematic and planned curricula from first year to the third year is aimed at focusing attention to the skills required for practicing in the field of Aircraft Maintenance. This is expected that student become more confident in working and shall motivate and encourage the student for pursuing higher studies in Aviation Maintenance and for becoming self-employed. The B.Sc. Aviation course shall have the following objectives.

- To provide in-depth knowledge of technological aspects of aviation maintenance.
- To familiarize with current and recent technological developments in aviation industry.
- To enrich knowledge through programmes such as industrial visits, hobby projects, market survey, projects etc.
- To train students in skills related to aviation industry and market.
- To create foundation for perfecting practical skills in aircraft maintenance and operation.
- To develop analytical abilities towards real aviation problems.
- To help students build-up a progressive and successful career in Aircraft maintenance and operation.

Course Structure:

B.Sc. (Aviation) Semester-I

Course Code	Title of Course	Credits		Lectures/ Week			Evaluation		
		Th.	Pr.	Th.	Tu.	Pr.	CA	UE	Total
BAV 101	Mathematics-I	4		4			30	70	100
BAV 102	Workshop Technology	4		4			30	70	100
BAV 103	Electrical Fundamentals	4		4			30	70	100
BAV 104	Physics of Aerodynamics	4		4			30	70	100
BAV 105	Lab-I (Electrical Practical)		3			6	30	70	100
BAV 106	Lab-II (Workshop Practices)		3			6	30	70	100
	Total=	16	6	16		12	180	420	600

B.Sc. (Aviation) Semester-II

Course Code	Title of Course	Credits		Lectures/ Week			Evaluation		
		Th.	Pr.	Th.	Tu.	Pr.	CA	UE	Total
BAV 201	Mathematics-II	4		4			30	70	100
BAV 202	Aviation Legislation	4		4			30	70	100
BAV 203	Material Science & Metallurgy	4		4			30	70	100
BAV 204	Analog Electronics	4		4			30	70	100
BAV 205	Lab-I (Electronics Practical)		3			6	30	70	100
BAV 206	Lab-II (Aircraft Maintenance)		3			6	30	70	100
	Total=	16	6	16		12	180	420	600

Course Structure:

B.Sc. (Aviation) Semester-III

Course Code	Title of Course	Credits		Lectures/ Week			Evaluation		
		Th.	Pr.	Th.	Tu.	Pr.	CA	UE	Total
BAV 301	Environment & Human Factor	4		4			30	70	100
BAV 302	Fundamentals of Computer & Programming Languages	3		3			30	70	100
BAV 303	Thermodynamics	3		3			30	70	100
BAV 304	Aircraft Ground Handling	4		4			30	70	100
BAV 305	Aircraft Hardware	3		4			30	70	100
BAV 306	Lab-I (Computer Programming)		3			6	30	70	100
BAV 307	Lab-II (Aircraft Hardware)		2			4	20	30	50
	Total=	17	5	18		10	200	450	650

B.Sc. (Aviation) Semester-IV

Course Code	Title of Course	Credits		Lectures/ Week			Evaluation		
		Th.	Pr.	Th.	Tu.	Pr.	CA	UE	Total
BAV 401	Digital Electronics	4		4			30	70	100
BAV 402	Basic Radar & Radio System	3		3			30	70	100
BAV 403	Communication and Navigation System	4		4			30	70	100
BAV 404	Propulsion-I (Jet Engines)	3		3			30	70	100
BAV 405	Lab-I (Digital Electronics Practical)		3			6	30	70	100
BAV 406	Lab-II (Communication & Navigation)		3			6	30	70	100
BAV 407	Language Proficiency	2		2			20	30	50
	Total=	16	6	16		12	200	450	650

Course Structure:

B.Sc. (Aviation) Semester-V

Course Code	Title of Course	Credits		Lectures/ Week			Evaluation		
		Th.	Pr.	Th.	Tu.	Pr.	CA	UE	Total
BAV 501	Aircraft Structure	4		4			30	70	100
BAV 502	Aircraft System- Electrical & Instruments	3		3			30	70	100
BAV 503	Aircraft Modular Avionics & Digital System	3		3			30	70	100
BAV 504	Engineering Graphics	4		4			30	70	100
BAV 505	Lab-I (Flight Structures)		3			6	30	70	100
BAV 506	Lab-II (Aircraft System- Electrical & Instruments)		3			6	30	70	100
BAV 507	Skill Enhancement Course Project-I		2			4	20	30	50
	Total=	14	8	14		16	200	450	650

B.Sc. (Aviation) Semester-VI

Course Code	Title of Course	Credits		Lectures/ Week			Evaluation		
		Th.	Pr.	Th.	Tu.	Pr.	CA	UE	Total
BAV 601	Aircraft System- Mechanical	4		4			30	70	100
BAV 602	Propulsion-II	3		3			30	70	100
BAV 603	Airport Planning and Operations	3		3			30	70	100
BAV 604	Soft Skills and Organisational Behaviour	4		4			30	70	100
BAV 605	Lab-I (Aircraft Systems- Mechanical)		3			6	30	70	100
BAV 606	Activity		2			4	20	30	50
BAV 607	Skill Enhancement Course Project-II		3			6	30	70	100
	Total=	14	8	14		16	200	450	650

Semester-I

Course Code: BAV 101 **Course Title: Mathematics-I**

Total Contact Hours: 60 hrs **Total Credits: 04** **Total Marks: 100**

Teaching Scheme: Theory – 04 Lectures/ Week

Course Objectives:

1. This course aims to provide students with the mathematical knowledge and skills.
2. It supports their concurrent and subsequent studies.
3. Providing a thorough grounding in mathematics and laying a foundation for further studies in aviation.

Learning Outcomes:

1. Students who successfully complete this course will be able to use tables of derivatives and integrals for simple functions.
2. Students can identify and use appropriate techniques to differentiate and integrate more complicated functions.
3. Students can apply the rules of differentiation and integration to classify stationary points.
4. Also to identify the nature of the function.
5. Apply integration to study Work and Fluid Forces.

Unit-I: Functions: **(15 hrs)**

a. Functions and Their Graphs.
b. Combining Functions; Shifting and scaling Functions and Their Graphs.
c. Combining Functions; Shifting and Exponential Functions, Inverse Functions and Logarithms.

Unit-II: Limits and Continuity: **(15 hrs)**

a. Rates of Change and Tangents to Curves.
b. Limit of a Function and Limit Laws.
c. The Precise Definition of a Limit, One-Sided Limits, Continuity, Limits Involving Infinity, Asymptotes of Graphs.

Unit-III: Derivatives: **(15 hrs)**

a. Tangents and the Derivative at a Point.
b. Derivative as a Function.
c. Differentiation Rules, the Derivative as a Rate of Change.
d. Derivatives of Trigonometric Functions.
e. The Chain Rule, Implicit Differentiation, Linearization and Differentials.

Unit-IV: Applications of Derivatives and Integrals: **(15 hrs)**

a. Extreme Values of Functions.
b. The Mean Value Theorem, Monotonic Functions and the First Derivative Test Concavity and Curve Sketching.
c. Indeterminate Forms and L'Hopital's Rule.
d. The Definite Integral (Only Problems), Indefinite Integrals and the Substitution Method.
e. Work and Fluid Forces.

Reference Books:

1. George B. Thomas, Jr., Thomas'Calculus, Thirteenth Edition, Pearson Education.
2. Shantinarayan and S.K. Mittal, Integral Calculus, S. Chand and Co. Publication.
3. Robert G. Bartle and Donald R. Sherbert, Introduction to Real Analysis, Third Edition, Jhon Wiley and Sons 2002.
4. W. Rudin, Principles of Mathematical analysis, Third Edition, Mc Graw Hill 1976.

Semester-I

Course Code: BAV 102 **Course Title: Workshop Technology**

Total Contact Hours: 60 hrs **Total Credits: 04** **Total Marks: 100**

Teaching Scheme: Theory – 04 Lectures/ Week

Course Objectives:

1. To study workshop safety norms, precaution and Fire safety.
2. To get familiar with Hand tool, Power tool, Precision Measuring equipment's and their use.
3. To understand Aircraft welding, Brazing, Soldering.

Learning Outcome:

Through this course, the students will be able to

1. Understand applications of hand tools and power tools.
2. Select the appropriate tools required for specific operation.
3. Comprehend the safety measures required to be taken while using the tools.
4. Identify and use the precision measuring instruments.
5. Compare welding, brazing, soldering and riveting.

Sl. No.	Description	Allotted hours
Unit-I: Basics of Workshop Practice		
1.	**Safety Precautions-Aircraft and Workshop** Aspects of safe working practices including precautions to take when working with electricity, gases especially oxygen, oils and chemicals. Also, instruction in the remedial action to be taken in the event of a fire or another accident with one or more of these hazards including knowledge on extinguishing agents.	5 hrs
2.	**Workshop Practices** • Care of tools, control of tools, use of workshop materials; • Dimensions, allowances and tolerances, standards of workmanship; • Calibration of tools and equipment, calibration standards.	5 hrs
Unit-II: Basics Tools		
3.	**Tools** • Common hand tool types; • Common power tool types; • Operation and use of precision measuring tools; • Lubrication equipment and methods. • Operation, function and use of electrical general test equipment;	30 hrs
4.	**Avionic General Test Equipment** • Operation, function and use of avionic general test equipment.	5 hrs
Unit-III: Fits and Clearances		
5.	• Drill sizes for bolt holes, classes of fits; • Common system of fits and clearances; • Schedule of fits and clearances for aircraft and engines; • Limits for bow, twist and wear; • Standard methods for checking shafts, bearings and other parts.	5 hrs

Sl. No.	Description	Allotted hours
Unit-IV: Welding, Brazing, Soldering and Bonding		
6.	• Soldering methods; inspection of soldered joints. • Welding and brazing methods; • Inspection of welded and brazed joints; • Bonding methods and inspection of bonded joints.	10 hrs

Reference Books

Sl. No.	Author / Publisher	Nomenclature of Book
1.	Aircraft Tech Book Co	EASA Module-07A Maintenance Practices
2.	CAIP I	Civil Aircraft Inspection Procedure - Part I
3.	CAIP II	Civil Aircraft Inspection Procedure - Part II
4.	Dale Crane	Aviation Maintenance technician Series- General
5.	FAA H 8083-30	Aviation Maintenance Technician Handbook- General
6.	J. A Enderson & Tatro	Shop Theory
7.	Jeppesen	A & P Technician General Text Book
8.	Lalit Gupta	Aircraft General Engineering

Semester-I

Course Code: BAV 103 **Course Title: Electrical Fundamentals**

Total Contact Hours: 60 hrs **Total Credits: 04** **Total Marks: 100**

Teaching Scheme: Theory – 04 Lectures/ Week

Course Objectives:

1. To get familiar with basic electricity, passive components
2. To understand DC and AC circuit theorems and their use in circuit analysis
3. To introduce Electromagnetism and Transformer.
4. To understand the construction of DC, AC Motor and Generator

Learning Outcome:

Through this course, the students will be able to

1. Identify electrical symbols and measuring instruments.
2. Find resistor, capacitor values with a color code and meter.
3. Use an electrical meter to measure voltage, current, Power in the circuit.
4. Simplify electrical circuit using, network theorems.
5. Understand leading/ lagging phase relationship, power factor
6. Understand the DC/ AC Generator and Motor.

Sl. No.	Description	Allotted hours
Unit-I: Passive Components		
1.	**Electron Theory** • Structure and distribution of electrical charges within: atoms, molecules, ions, compounds; • Molecular structure of conductors, semiconductors and insulators.	2 hrs
2.	**Static Electricity and Conduction** • Static electricity and distribution of electrostatic charges; • Electrostatic laws of attraction and repulsion; Units of charge, Coulomb's Law; • Conduction of electricity in solids, liquids, gases and a vacuum.	2 hrs
3.	**Electrical Terminology** • The following terms, their units and factors affecting them: ▪ Potential difference, ▪ electromotive force, ▪ voltage, current, ▪ resistance, conductance, ▪ Charge, conventional current flow, electron flow.	2 hrs
4.	**Generation of Electricity** • Production of electricity by the following methods: ▪ Light, heat, ▪ Friction, pressure, ▪ Chemical action, magnetism and motion.	2 hrs

Sl. No.	Description	Allotted hours
5.	**Resistance/ Resistor** • Resistance and affecting factors; • Specific resistance; • Resistor colour code, values and tolerances, preferred values, wattage ratings • Resistors in series and parallel; • Calculation of total resistance using series, parallel and series parallel combinations; • Operation and use of potentiometers and rheostats; • Operation of Wheatstone bridge. • Positive and negative temperature coefficient conductance; • Fixed resistors, stability, tolerance, limitations, methods of construction • Variable resistors, thermistors, voltage dependent resistors; • Construction of potentiometers and rheostats; • Construction of Wheatstone Bridge	4 hrs
6.	**Power** • Power, work and energy (kinetic and potential); • Dissipation of power by a resistor; • Power formula; • Calculations involving power, work and energy.	2 hrs
7.	**Capacitance/ Capacitor** • Operation and function of a capacitor; • Factors affecting capacitance area of plates, distance between plates, number of plates, dielectric and dielectric constant, working voltage, voltage rating; • Capacitor types, construction and function; • Capacitor colour coding; • Calculations of capacitance and voltage in series and parallel circuits; • Exponential charge and discharge of a capacitor, time constants; • Testing of capacitors.	3 hrs
8.	**Inductance/Inductor** • Faraday's Law; • Action of inducing a voltage in conductor moving in a magnetic field; • Induction principles; • Effects of the following on the magnitude of an induced voltage: magnetic field strength, rate of change of flux, No. of conductor turns; • Mutual induction; • The effect the rate of change of primary current and mutual inductance has on induced voltage; • Factors affecting mutual inductance: number of turns in coil, physical size of coil, permeability of coil, position of coil with respect to each other • Lenz's Law and polarity determining rules; • Back emf, self induction; • Saturation point; • Principle uses of inductors;	3 hrs

Sl. No.	Description	Allotted hours
Unit-II: DC and AC Circuits		
9.	**DC Sources of Electricity** • Construction and basic chemical action of: primary cells, secondary cells, lead acid cells, nickel cadmium cells, other alkaline cells; Cells connected in series and parallel; Internal resistance and its effect on a battery; • Construction, materials and operation of thermocouples; Operation of photo-cells.	5 hrs
10.	**DC Circuits** • Ohms Law, Kirchoff's Voltage and Current Laws; • Calculations using the above laws to find resistance, voltage and current; • Significance of the internal resistance of a supply.	4 hrs
11.	**AC Theory** • Sinusoidal waveform: phase, period, frequency, cycle; Instantaneous, average, root mean square, peak, peak to peak current values and calculations of these values, in relation to voltage, current and power • Triangular/Square waves; • Single/3 phase principles.	3 hrs
12.	**Resistive (R), Capacitive (C) and Inductive (L) Circuits** • Phase relationship of voltage and current in L, C and R circuits, parallel, series and series parallel; concept of Resonance • Power dissipation in L, C and R circuits; • Impedance, phase angle, power factor and current calculations; • True power, apparent power and reactive power calculations.	3 hrs
Unit-III: Magnetism and Transformer		
13.	**Magnetism** • Theory of magnetism including Right Hand Thumb rule Cork Screw Rule • Properties of a magnet • Action of a magnet suspended in the Earth's magnetic field; • Magnetization and demagnetization; • Magnetic shielding; • Various types of magnetic material; • Electromagnets construction and principles of operation; • Hand clasp rules to determine: magnetic field around current carrying conductor. (Fleming's Left Hand Rule, Faraday's Law) • Magneto motive force, field strength, magnetic flux density, permeability, hysteresis loop, retentivity, coercive force reluctance, saturation point, eddy currents; • Precautions for care and storage of magnets.	5 hrs
14.	**Transformers** • Transformer construction principles and operation; • Transformer losses and methods for overcoming them; • Transformer action under load and no-load conditions; • Power transfer, efficiency, polarity markings; • Calculation of line and phase voltages and currents; • Calculation of power in a three phase system; • Primary and Secondary current, voltage, turns ratio, power, efficiency; • Auto transformers.	5 hrs

Sl. No.	Description	Allotted hours
Unit-IV: Electrical Machines		
15.	**DC Motor/ Generator Theory** • Basic motor and generator theory; • Construction and purpose of components in DC generator; • Operation of, and factors affecting output and direction of current flow in DC generators; • Operation of, and factors affecting output power, torque, speed and direction of rotation of DC motors; • Series wound, shunt wound and compound motors; • Starter Generator construction.	5 hrs
16.	**Filters** • Operation, application and uses of the following filters: low pass, high pass, band pass, band stop.	1 hr
17.	**AC Generators** • Rotation of loop in a magnetic field and waveform produced; • Operation and construction of revolving armature and revolving field type AC generators; • Single phase, two phase and three phase alternators; • Three phase star and delta connections advantages and uses; • Permanent Magnet Generators.	5 hrs
18.	**AC Motors** • Construction, principles of operation and characteristics of: AC synchronous and induction motors both single and polyphase; • Methods of speed control and direction of rotation; • Methods of producing a rotating field: capacitor, inductor, shaded or split pole.	4 hrs

Reference Books:

Sl. No.	Author / Publisher	Nomenclature of Book
1	Aircraft Tech Book Co.	EASA Module-03 Electrical Fundamental
2	B. L. Theraja (Vol-I)	Electrical Technology
3	Bernard Grob	Basic Electronics
4	Dale Crane	Basic Electricity for A & P Mechanics
5	E.H.J. Pallett	Aircraft Electrical System
7	FAA H 8083-30	Aviation Maintenance Technician Hand Book-General
9	Thomas K Eismin	Aircraft Electricity & Electronics

Semester-I

Course Code: BAV 104 **Course Title: Physics of Aerodynamics**

Total Contact Hours: 60 hrs **Total Credits: 04** **Total Marks: 100**

Teaching Scheme: Theory – 04 Lectures/ Week

Course Objectives:

1. To understand the physics of Atmosphere.
2. To understand the physics of Aerodynamics, airflow over body of aircraft at low and high speed, forces generated on body.
3. To understand the shape of aerofoils and wing and how they affect lift and drag, effect of boundary layer on flow around the body.
4. To understand the different types of flights and calculate basic performance in steady, straight, climbing, turning, gliding and diving flight.
5. To understand the concept of stability and control.

Learning Outcome:

After learning this course, the students will be able to

1. Understand basic physics of fluid flow and generation of forces on bodies in air in particular.
2. Apply Newton's laws of motion to calculate the flight path under various flight conditions.
3. Determine how aerodynamic lift, drag and pitching moment are generated from the pressure and stress distributions on aerofoils.
4. Understand various devices used in connection with flight to augment or obtain required performance.

Sl. No.	Description	Allotted hours
Unit-I: Physics of the Atmosphere		
1.	• Basic Aerodynamics • Physics of Atmosphere: Pressure, Density, Humidity, Temperature & Altitude • International Standard Atmosphere (ISA)	6 hrs
Unit-II: Physics of Aerodynamics		
2.	• Airflow around a body; • Boundary layer, laminar and turbulent flow, free stream flow, relative airflow, upwash and downwash, vortices, stagnation; • 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; Generation of Lift and Drag: Angle of Attack, Lift coefficient, Drag coefficient, polar curve, stall; Aerofoil contamination including ice, snow, frost.	25 hrs

Sl. No.	Description	Allotted hours
Unit-III: Theory of Flight		
3.	• 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.	20 hrs
Unit-IV: Flight Stability and Dynamics		
4.	• Concept of Static and Dynamic Stability • C G of airplane & neutral point • Longitudinal, lateral and directional stability (active and passive).	6 hrs
Unit-IV: Introduction to Drones		
5.	• Principles of operation • Types of Drones • Classification/ Characteristics	3 hrs

Reference Books

Sl. No.	Author / Publisher	Nomenclature of Book
1.	AC Kermode	Mechanics of Flight
2.	Aircraft Tech Book Co.	EASA Module- 08 Basic Aerodynamics
3.	L. J. Clancy	Aerodynamics
4.	Jeppesen	A & P Technician Airframe Text Book
5.	Garvit Pandya	Basics of Unmanned Aerial Vehicle
6.		

Semester-I

Course Code: BAV 105 **Course Title: Lab I (Electrical Practical)**

Total Contact Hours: 90 hrs **Total Credits: 03** **Total Marks: 100**

Teaching Scheme: Practical – 06/ Week

Learning Outcome:

After successfully completing this laboratory course, the students will be able to:

1. Understand the fundamental of DC/AC circuits.
2. Identify the electrical component
3. Understand the basic use and working of the electrical related components.
4. To understand various types of operation characteristics and applications of Motor/ Generator/ Transformer.

Students have to perform minimum 12 Practical listed below:

Sl. No.	Basic Practical Tasks
1.	To verify the ohm law & Kirchhoff law using resistive network.
2.	Familiarize with construction of primary cells, secondary cells, leads acid cells, nickel cadmium cells. Conduct connections in series and parallel
3.	Identify various types of resisters and make calculations to find the value of resistance, voltage and current. Demonstrate the resisters in series, parallel and in combination. Measure the value of resisters
4.	Operation and use of potentiometers and rheostats
5.	Application of Wheatstone Bridge to find out unknown resistance value
6.	Identify various types of capacitors, color code, and practice the value of capacitor. Connect the capacitors in series, parallel and in combination. Measure the value of capacitors through capacitor meter
7.	Identify the various type of Inductor, Connect the Inductor in series, parallel and in combination. Measure the value of inductor through Inductor meter
8.	Test the armature in Growler and through multimeter/ test lamp
9.	Show the constructional part of DC Generator & perform the inspection and operation of DC Generator
10.	Show the constructional part of DC motor and perform the inspection and operation of DC motor
11.	Compare the behavior with load of the series, shunt and compound DC motor. Perform the direction reversing method and speed control of DC motor
12.	Show the constructional part of various transformers. Check value of input & output. Perform the application of current and voltage transformer by simple circuit
13.	Show the constructional part of single phase, two phase and three phase AC generator
14.	Show the constructional part of single phase and three phase Induction & synchronous motor
15.	Measure the high resistance by megger.
16.	To demonstrate the process of Magnetization & Demagnetization
17.	To demonstrate the Faradays Law of Electromagnetic induction

Semester-I

Course Code: BAV 106 **Course Title: Lab-II (Workshop Practices)**

Total Contact Hours: 90 hrs **Total Credits: 03** **Total Marks: 100**

Teaching Scheme: Practical – 06/ Week

Learning Outcome:

After successfully completing this Workshop course, the students will be able to

1. Use tools and measuring instruments.
2. Perform operation like drilling, welding soldering and brazing, turning.
3. Work in workshop environment while following standard procedure and safety practices.

Students have to perform minimum 12 Practical listed below:

Sl. No.	Basic Practical Tasks
1.	Safe working practices and precautions to be taken when working with electricity, gases especially oxygen, oils and chemicals. Instruction in the remedial action to be taken in the event of a fire
2.	Care of tools, control of tools and use of workshop materials. Use of common tools, tool safety and storage
3.	Cutting practice with Hacksaw. To make a square shape of 48 mm sides for given M.S. piece
4.	Drilling a hole by either hand tool or power tool and threading in 48 mm square MS Piece
5.	External threading practice with Dies and Die – holder. Tapping practice (Internal Threading)
6.	Procedure of taking measurement by using Vernier Caliper. Taking the measurement with external micrometre
7.	Use of torque wrench and measurement of torque value
8.	Use of dial test indicator. Use of callipers, feeler gauge, radius gauge, telescopic gauges
9.	Perform simple soldering tasks and inspect
10.	Perform electric arc welding (Stick Welding)
11.	Perform oxy Acetylene welding (Gas Welding)
12.	Perform tungsten inert gas welding (TIG)
13.	Perform Inspection of welded joints
14.	Perform Bonding and insulation tests
15.	Perform wire splicing methods, use of crimp tools
16.	Identification of wire types, their inspection criteria

Semester-II

Course Code: BAV 201 **Course Title: Mathematics-II**

Total Contact Hours: 60 hrs **Total Credits: 04** **Total Marks: 100**

Teaching Scheme: Theory – 04 Lectures/ Week

Course Objectives:

1. Reflecting the broad nature of the subject and developing mathematical tools for continuing further study in Aviation.
2. Students will develop skill and understanding in the meaning of planes, cones and cylinder.
3. Also able to do the classification of conic sections.
4. Use matrices to represent a system of equations.
5. To solve linear system of equations using matrices.

Learning Outcomes:

Students who successfully complete this course will be able to:

1. Use reflections and rotation to transform the given second degree equation to its standard form and identify the conic section.
2. Determine planes satisfying different conditions.
3. To state equation of cone and cylinder with given vertex.
4. Write given system of equations in matrix form.
5. To find solution of given linear system of equations using matrices.

Unit-I: Analytical Geometry of two dimensions **(15 hrs)**

a. Change of axes, Translation and rotation.
b. General equation of second degree.
c. Centre of conic, Nature of conic, Reduction to standard form.

Unit-II: Planes in 3-Dimension **(15 hrs)**

a. Equations of the first degree in x, y, z.
b. Transformation to the normal form, determination of plane under given conditions.
c. Systems of planes, two sides of a plane.
d. Length of the perpendicular from a point to a plane, bisectors of angles between two planes.

Unit-III: Cones and Cylinders **(15 hrs)**

a. Definition of cone and cylinder.
b. Equation of cone and cylinder with a given vertex.
c. The right circular cone, the equation of a right circular cone.
d. The right circular cylinder, the equation of a right circular cylinder.

Unit-IV: Matrices and System of linear equations **(15 hrs)**

a. Echelon and Reduced echelon form of a matrix, Reduction of matrix to its echelon form.
b. Rank of a matrix, System of linear equations, Matrix form of system of linear equations.
c. Homogeneous and non-homogeneous system of linear equations.
d. Gauss Elimination and Gauss Jordan Methods.
e. Consistency of a system of linear equations, condition of consistency.
f. Eigen values, Eigen vectors, characteristic equation of a matrix of order up to 3x3.
g. Cayley Hamilton theorem and its use to find the inverse of a matrix.

Reference Books:

1. Shantinarayan, Analytical Solid Geometry, S. Chand and Company Ltd.
2. H. Anton and C. Rorres, Elementary Linear Algebra with Applications.
3. P. K. Jain and Khalil Ahmed, A Text Book of Analytical Geometry of Three Dimensions.
4. K.B. Datta, Matrix and Linear Algebra, Prentice hall of India Pvt.Ltd.

Semester-II

Course Code: BAV 202 **Course Title: Aviation Legislation**

Total Contact Hours: 60 hrs **Total Credits: 04** **Total Marks: 100**

Teaching Scheme: Theory – 04 Lectures/ Week

Course Objectives:

1. To get familiar with Aircraft Act 1934.
2. To Understand Aircraft Rules.
3. To study Aircraft Rules 2003, AIC, AAC.

Learning Outcomes:

Through this course:

1. Students will be able to refer and follow rules and regulations laid down in connection with aircraft operations and maintenance in particular.

Sl. No.	Description	Allotted hours
Unit-I: Regulatory Framework		
1.	• Role of International Civil Aviation Organization; • The Aircraft Act and Rules made there under • Role of the DGCA; • Relationship between CAR-21, CAR-M, CAR-145, CAR-66, CAR 147 • The Aircraft Rules (Applicable to Aircraft Maintenance and Release) • Aeronautical Information Circulars (Applicable to Aircraft Maintenance and Release) • CAR Sections 1 and 2	10 hrs
Unit-II : Approved Maintenance/Management Organization		
2.	**CAR-145 — Approved Maintenance Organisations** • Detailed understanding of CAR-145 and CAR M Subpart F	9 hrs
3.	**CAR-66 Certifying Staff – Maintenance** • Detailed understanding of CAR-66.	9 hrs
4.	**CAR-M** • Detail understanding of CAR M provisions related to Continuing Airworthiness • Detailed understanding of CAR-M.	7 hrs
5.	**Safety Management System** • State Safety Programme • Basic Safety Concepts • Hazards & Safety Risks • SMS Operation • SMS Safety performance • Safety Assurance	3 hrs
6.	**Fuel Tank Safety** • Special Federal Aviation Regulations (SFARs) from 14 CFR SFAR 88 of the FAA and of JAA TGL 47 • Concept of CDCCL, • Airworthiness Limitations Items (ALI)	2 hrs

Sl. No.	Description	Allotted hours
Unit-III: Aircraft Operations		
7.	**Aircraft Operations** • Commercial Air Transport/Commercial Operations • Air Operators Certificates; • Operators Responsibilities, in particular regarding continuing airworthiness and maintenance; • Documents to be carried on board; • Aircraft Placarding (Markings);	5 hrs
8.	**Applicable National and International Requirements** • Maintenance Programme, Maintenance checks and inspections; • Master Minimum Equipment Lists, Minimum Equipment List, Dispatch Deviation Lists; • Airworthiness Directives; Service Bulletins, manufacturers service information; Modifications and repairs; • Maintenance documentation: maintenance manuals, structural repair manual, illustrated parts catalogue, etc.; • Continuing airworthiness; • Test flights; • ETOPS / EDTO , maintenance and dispatch requirements; • RVSM, maintenance and dispatch requirements • RNP, MNPS Operations • All Weather Operations, • Category 2/3 operations and minimum equipment requirements.	8 hrs
Unit-IV: Aircraft Certification		
9.	**General** • Aircraft Modifications and repairs approval and certification • Permit to fly requirements	3 hrs
	Documents • Certificate of Airworthiness; • Certificate of Registration; • Noise Certificate; • Weight Schedule; • Radio Station Licence and Approval.	4 hrs

Reference Books:

Sl. No.	Author / Publisher	Nomenclature of Book
1	DGCA	Airworthiness Advisory Circulars
2	DGCA	Civil Aviation Requirements (CAR) relevant to CAR-66 Syllabus
3	DGCA	Civil Aviation Procedures (CAP) relevant to CAR-66 Syllabus
4	Govt. of India	Aircraft Act 1934
5	Govt. of India	Aircraft Rule 1937

Semester-II

Course Code: BAV 203 **Course Title: Material Science And Metallurgy**

Total Contact Hours: 60 hrs **Total Credits: 04** **Total Marks: 100**

Teaching Scheme: Theory – 04 Lectures/ Week

Course Objectives:

1. Introduction to material science.
2. To discuss the different types of ferrous and non-ferrous materials.
3. To discuss the different types of Composite and Non-Metallic materials.
4. To introduce corrosion.

Learning Outcomes:

1. Understand the basic concept of ferrous materials.
2. Understand the basic concept of non-ferrous materials.
3. Understand the Characteristic and application of Composite and Non- Composite aircraft materials.
4. Know importance of Corrosion and its prevention in Aviation.

Sl. No.	Description	Allotted hours
Unit-I: Introduction to Material Science & Metallurgy		
1.	• Understanding of Engineering Materials and Importance of Aviation Materials. • Properties of Aviation Materials and its selection. • Classification of Materials **Introduction to Metallurgy:** • Phase diagram • Time, temperature and Transformation (TTT) diagram	5 hrs
Unit-II: Aircraft Materials- Ferrous & Non Ferrous		
2.	• Characteristics, properties and identification of common alloy steels used in aircraft; • Heat treatment and application of alloy steels; • Testing of ferrous materials for hardness, tensile strength, fatigue strength and impact resistance.	17 hrs
	• Characteristics, properties and identification of common non-ferrous materials used in aircraft; • Heat treatment and application of non-ferrous materials; • Testing of non-ferrous material for hardness, tensile strength, fatigue strength and impact resistance.	13 hrs

Sl. No.	Description	Allotted hours
Unit-III: Aircraft Materials - Composite and Non-Metallic		
3.	**Composite and Non-Metallic** • Characteristics, properties and identification of common composite and non-metallic materials, other than wood, used in aircraft; Sealant and bonding agents. **Wooden Structures** • Construction methods and wooden airframe structures. • Characteristics, properties, Types of wood and glue used in aircraft **Fabric Covering** • Characteristics, properties and Types of Fabric used in Aviation	15 hrs
Unit-IV: Corrosion		
4.	• Chemical fundamentals; • Formation by, galvanic action process, microbiological, stress; • Types of corrosion and their identification; • Causes of corrosion; • Material types, susceptibility to corrosion. • Introduction to CPCP (Corrosion Protection and Corrosion Prevention). • Advanced material used in Jet Engines.	10 hrs

Reference Books:

Sl. No.	Author / Publisher	Nomenclature of Book
1.	Aircraft Tech Book Co	EASA Module-06 Hardware And Materials
2.	CAIP I	Civil Aircraft Inspection Procedures - Part I, Basic
3.	Cindy Foreman	Advanced Composites
4.	FAA H 8083-30	Aviation Maintenance Technician Handbook- General
5.	George F. Titterton	Aircraft Materials and Processes
6.	J. A Enderson & Tatro	Shop Theory
7.	Jeppesen	A & P Technician Airframe Text Book

Semester-II

Course Code: BAV 204 **Course Title: Analog Electronics**

Total Contact Hours: 60 hrs **Total Credits: 04** **Total Marks: 100**

Teaching Scheme: Theory – 04 Lectures/ Week

Course Objectives:

1. To study semiconductor diodes & transistors.
2. To study Integrated Circuits and applications.
3. To study printed circuit boards.
4. To study servomechanism.

Learning Outcomes:

After learning this course, the students will be able to:

1. Acquire a basic knowledge of semiconductor diodes and transistors.
2. Acquire a basic knowledge of printed circuit boards.
3. Acquire a basic knowledge of servomechanism.

Sl. No.	Description	Allotted hours
Unit-I: Semiconductor Diodes		
1.	**Diodes** • Diode symbols; • Diode characteristics and properties; • Diodes in series and parallel; • Main characteristics and use of silicon controlled rectifiers (thyristors), light emitting diode, photo conductive diode, varistor, rectifier diodes; • Functional testing of diodes. • Application of Diodes as Clippers, Clampers, Half & Full Wave rectifiers, Bridge Rectifiers, Voltage Doublers and Triplers	20 hrs
Unit-II: Transistor and Circuits		
2.	**Transistors** • Transistor symbols; • Component description and orientation; • Transistor characteristics and properties. • Use of Transistor as Amplifier and Switch • Transistor Biasing	10 hrs
	Integrated Circuits • Description and operation of logic circuits and linear circuits/ operational amplifiers.	5 hrs

Sl. No.	Description	Allotted hours
Unit-III: Amplifiers		
3.	• Introduction to UJT, FET, MOSFET • Classes of Amplifier (A, B, AB and C types). • Push pull Amplifiers and Multivibrators • Block Diagram of OP AMP • Integrator circuit, differentiator circuit • Block diagram & application of IC 555	5 hrs
Unit-IV: Printed Circuit Boards & Servomechanisms		
4.	**Printed Circuit Boards** • Description and use of printed circuit boards.	5 hrs
	Servomechanisms • Understanding of the following terms: Open and closed loop systems, feedback, follow up, analogue transducers; • Principles of operation and use of the following synchro system components/ features: resolvers, differential, control and torque, transformers, Inductance and capacitance transmitters.	15 hrs

Reference Books:

Sl. No.	Author / Publisher	Nomenclature of Book
1	Aircraft Tech Book Co.	EASA Module- 04 Electrical Fundamentals
2	B.L. Theraja	Electrical Technology
3	Bernard Grob	Basic Electronics
4	CAIP	Civil Aircraft Inspection Procedure (Part-I)
6	John M Ferrara	Aviation Electronics
7	Mike Tooley & David Wyatt	Aircraft Electrical & Electronic Systems
8	Millman and Halkias	Integrated Electronics
9	Sterling	Basic Synchros and Servomechanism Part – I & II
10	Thomas K Eismin	Aircraft Electricity & Electronics
11	V K Mehta	Principle of Electronics

Semester-II

Course Code: BAV 205 **Course Title: Lab- I (Electronics Practical)**

Total Contact Hours: 90 hrs **Total Credits: 03** **Total Marks: 100**

Teaching Scheme: Practical – 06/ Week

Learning Outcomes:

After successfully completing this laboratory course, the students will be able to:

1. Understand the use and application of DMM/ AMM.
2. Understand the use and application and testing of diode & transistors.
3. Understand voltage doublers & voltage triplers.
4. Understand truth tables of various logic Gates.

Students have to perform minimum 12 Practical listed below:

Sl. No.	Basic Practical Tasks
1.	Identify the electronic components and perform testing by DMM/ AMM
2.	Study the characteristics of PN Junction by using trainer kit
3.	Study Half wave in trainer kit
4.	Study Full wave bridge rectifier circuit in trainer kit
5.	Study the Zener Diode by using trainer kit
6.	Study Bipolar Junction Transistor characteristics
7.	Study the multivibrator circuit by using trainer kit
8.	Study the clipper & clamper circuit by using trainer kit
9.	Study the voltage doublers by using trainer kit
10.	Study the voltage triplers by using trainer kit
11.	Study of transistor biasing by using trainer kit
12.	Study the truth tables of various logic Gates by using trainer kit
13.	Study LC oscillator circuit
14.	Study RC oscillator circuit
15.	To verify adder and subtractor circuits using OPAMP.
16.	To demonstrate Schmitt Trigger using op amp.
17.	To verify Astable Multivibrator using IC 555
18.	Use of multimeter (Analog and Digital) for: • Measurement of AC/ DC voltage and Current – on different ranges Measurement of R & C • Testing of Diodes & Transistors • Measurement of HFE • Variation of Resistance of LDR. • Thermistor

Semester-II

Course Code: BAV 206 **Course Title: Lab-II (Aircraft Maintenance)**

Total Contact Hours: 90 hrs **Total Credits: 03** **Total Marks: 100**

Teaching Scheme: Practical – 06/ Week

Learning Outcomes:

After successful completion, the students will be able to:

1. Learn safety precautions to be taken around aeroplane.
2. Learn the use of ground support equipment.
3. Learn jacking procedure of aircraft.
4. Learn tool control programme.
5. Learn aircraft operation procedures.

Students have to perform minimum 12 Practical listed below:

Sl. No.	Basic Practical Tasks
1.	Daily Inspection on aircraft: • Fuel sampling and water Contamination checks
2.	Conversant with safety precautions around aircraft, protection at engine exhaust areas
3.	Conversant with use of fire extinguishers around the aircraft and shops
4.	Conversant with safety from noise, FOD, tools & equipment
5.	Perform the use of chocks, trestles. Check the tire pressure
6.	Perform the use of sling, ladder and other ground support equipment
7.	Perform parking procedures and use of protective covers of aircraft
8.	Perform marshalling practices
9.	Perform tie down procedures and mooring procedures
10.	Connection and uses of external electrical power supply. Perform grounding/ earthing of aircraft
11.	Perform jacking of nose or main wheel and/or complete aircraft
12.	Perform inspections after abnormal events
13.	Conversant with tool control programme
14.	Conversant with scheduled inspection procedure
15.	Swaging & Splicing of control cable