Savitribai Phule Pune University

(Formerly University of Pune)

Three Year B.Sc. Degree Program in Aviation

(Faculty of Science & Technology)

F.Y.B.Sc. (Aviation)

Choice Based Credit System Syllabus

To be implemented from Academic Year 2019-2020

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) SEM – I

Course Code	Title of Course	Credits		Lectures/Week			Evaluation		
		Th.	Pr.	Th.	Tu.	Pr.	CA	UE	TOTAL
BAV101	Mathematics – I	4		4			30	70	100
BAV102	Workshop Technology	4		4			30	70	100
BAV103	Electrical Fundamentals	4		4			30	70	100
BAV104	Basic Aerodynamics	4		4			30	70	100
BAV105	Lab – I (Electrical Practical)		3	-		6	30	70	100
BAV106	Lab – II (Workshop Practices)		3	-		6	30	70	100
	Total	16	6	16		12	180	420	600

B Sc (Aviation) SEM – II

Course Code	Title of Course	Credits		Lectures/Week			Evaluation		
		Th.	Pr.	Th.	Tu.	Pr.	CA	UE	TOTAL
BAV201	Mathematics – II	4		4			30	70	100
BAV202	Aviation Legislation	4		4			30	70	100
BAV203	Engineering Graphics	4		4			30	70	100
BAV204	Analog Electronics	4		4			30	70	100
BAV205	Lab – I (Electronics Practical)		3			6	30	70	100
BAV206	Lab – II (Graphics)		3			6	30	70	100
	Total	16	6	16		12	180	420	600

B Sc (Aviation) SEM – III

Course Code	Title of Course	Credits		Lectures / Week			Evaluation		
		Th.	Pr.	Th.	Tu.	Pr.	CA	UE	TOTAL
EVS – 231 (BAV301)	Environment & Human Factor	4		4			30	70	100
BAV302	Fundamentals of Computer and Programming Languages	3		3			30	70	100
BAV303	Thermodynamics	3		3			30	70	100
BAV304	Digital Electronics	4		4			30	70	100
BAV305	Lab – I (Digital Electronics Practical)		3			6	30	70	100
BAV306	Lab – II (Computer Programming)		3			6	30	70	100
LA – 231 (BAV307)	Language Proficiency – I	2		2			20	30	50
	Total	16	6	16		12	200	450	650

B Sc (Aviation) SEM – IV

Course Code	Title of Course	Credits		Lectures/Week			Evaluation		
		Th.	Pr.	Th.	Tu.	Pr.	CA	UE	TOTAL
BAV401	Aircraft Structure	4		4			30	70	100
BAV402	Basic Radar and Radio System	3		3			30	70	100
BAV403	Communication and Navigation System	4		4			30	70	100
BAV404	Propulsion – I	3		3			30	70	100
BAV405	Lab – I (Aircraft maintenance)		3			6	30	70	100
BAV406	Lab – II (Communication and Navigation)		3			6	30	70	100
LA – 241 (BAV407)	Language Proficiency – II	2		2			20	30	50
	Total	16	6	16		12	200	450	650

B Sc (Aviation) SEM – V

Course Code	Title of Course	Credits		Lectures/Week			Evaluation		
		Th.	Pr.	Th.	Tu.	Pr.	CA	UE	TOTAL
BAV501	Aircraft Mechanical and Electrical System	4		4			30	70	100
BAV502	Aircraft Instruments	3		3			30	70	100
BAV503	Propulsion – II	3		3			30	70	100
BAV504	Material Science and Metallurgy	4		4			30	70	100
BAV505	Lab – I (Flight Controls)		3			6	30	70	100
BAV506	Lab – II (Aircraft Mechanical and Electrical System)		3			6	30	70	100
BAV507	Skill Enhancement Course: Project – I		2			4	20	30	50
	Total	14	8	14		16	200	450	650

B Sc (Aviation) SEM – VI

Course Code	Title of Course	Credits		Lectures/Week			Evaluation		
		Th.	Pr.	Th.	Tu.	Pr.	CA	UE	TOTAL
BAV601	Aircraft Electronic and Digital System	4		4			30	70	100
BAV602	Aircraft Ground Handling	3		3			30	70	100
BAV603	Airport Planning and Operations	3		3			30	70	100
BAV604	Soft skill and Organizational behavior	4		4			30	70	100
BAV605	Lab – I (Aircraft Electronic and Digital System)		3			6	30	70	100
BAV606	Activity		2			4	20	30	50
BAV607	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/Weeks

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: **[15L]**

Functions and Their Graphs, Combining Functions; Shifting and scaling Functions and Their Graphs, Combining Functions; Shifting and Exponential Functions, Inverse Functions and Logarithms

Unit II: Limits and Continuity: **[15L]**

Rates of Change and Tangents to Curves, Limit of a Function and Limit Laws.

The Precise Definition of a Limit, One-Sided Limits, Continuity, Limits Involving Infinity, Asymptotes of Graphs

Unit III: Derivatives: **[15L]**

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

Unit-IV: Applications of Derivatives and Integrals: **[15L]**

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

Reference Books:

1. George B. Thomas, Jr., Thomas'Calculus, Thirteenth Edition, Pearson Education 2014.
2. Shantinarayan and S.K. Mittal, Integral Calculus, S. Chand and Co. Publication 2006.
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/Weeks

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.
4. To study corrosion, methods of prevention, removal and re-protection in aircraft.
5. To get familiar with aircraft hardware.
6. To get familiar with aircraft plumbing, tube forming process and different fluid line fittings in aircraft.
7. To get familiar with aircraft transmission system.

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 usethe precision measuring instruments.
5. Identify the hardware used in aircraft
6. Compare welding, brazing, soldering and riveting.

Unit I: Basics of Workshop Practice [15L]

Aspects of safe working practices including precautions to be taken up while working with electricity, gases especially Oxygen, Acetylene, oils and chemicals. 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. Care of tools, control of tools and use of workshop materials. Limits, fits and tolerances, Standards of workmanship, Calibration of tools and equipment, Calibration Standards, Common hand tool types, Common power tool types, 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, Types of composite, manufacturing of composite and working with composite i.e. machining and joining.

Unit II: Jointing, Measuring & Inspection [15 L]

Different methods of welding, brazing and soldering.Inspection of welded, brazed and soldered joints. Adhesive bonding methods and inspection of bonded joints. Construction, working, application of Micrometers, VernierCaliper, Gauges, Dial test Indicator. Chemistry of corrosion, formation by galvanic action process, Microbiological, Stress. Types of corrosion and their identification; Causes of corrosion; Material types and their susceptibility to corrosion

Unit III: Basic Aircraft Hardware [15 L]

Screw threads, screw nomenclature; thread forms. Dimensions and tolerances for standard threads used in aircraft, measuring screw threads; bolts, studs and screws, Bolt types: specification, identification and marking of aircraft bolts, International standards. Nuts: self-locking, anchor, standard types;Machine screws: aircraft specifications; Studs: types and uses, insertion and removal; Self tapping screws dowels, Tab and spring washers, locking plates, split pins, pal-nuts, wire locking, Quick release fasteners, Keys, circlips, cotter pins, Types of solid and blind rivets: specifications and Identification, heat treatment.

Unit IV: Aircraft Plumbing, Mechanism & Linkages [15 L]

Types of rigid and flexible pipes and their connectors used in aircraft. Standard unions for aircraft hydraulic, fuel, oil, pneumatic system pipes. Types of springs, materials, characteristics and their applications**.** Purpose of bearings, loads, material, and construction; types of bearings and their application, Gear types and their application; Gear ratios, reduction and multiplication gear systems, driven and driving gears, idler gears, mesh Patterns; belts and pulleys, chains and sprockets., Types of cables; end fittings, turnbuckles and compensation devices; Pulleys and cable system components; Bowden cables; Aircraft flexible control systems.

Reference Books:

1. Shop Theory by Anderson
2. Workshop Technology by HazaraChaudhary
3. Aircraft Gen engineering by Lalit Gupta
4. Aircraft basic science by Michel j Kores
5. Airframe &Powerplant Mechanics (General Handbook EA-AC 65-9A)
6. Civil Aircraft Inspection Procedure (CAP 459) Part II Aircraft
7. Aircraft Materials and Processes- by George F.Titterton.
8. Advanced Composites (EA-358) -by Cindy Foreman
9. Airframe and Powerplant Mechanics (AC 65-1 5A) -Airframe Hand Book
10. General Hand Book by Jappssen
11. Standard Aviation Maintenance Hand book EA-282-0
12. Standard Aircraft Handbook (5th Edition) -Larry Reithmaier

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/Weeks

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 outcomes:

After learning this course, 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.

Unit I: Passive Components **[15L]**

Concepts of emf., p.d. and current, resistance, effect of temperature on resistance. resistance temperature coefficient, insulation resistance. S.I. units of work, power and energy.Conversion of energy from one form to another in electrical, mechanical and thermal systems. batteries and cells, their types, primary cells and secondary cells, Lead Acid, Ni-Cd and Ni-MH batteries, current capacity and cell ratings. charging , importance of initial charging and discharging of batteries. series and parallel battery connections,

Resistor, Capacitor and Inductor : Types, Construction and working, Color codes for resistors and capacitors, series and parallel connections.

Unit II: DC and AC Circuits **[15L]**

DC Circuits: Classification of electrical networks, Ohm's law, Kirchhoff's law and their applications for network solutions. Simplifications of networks using series and parallel combinations, Superposition theorem, Thevenin's theorem and maximum power transfer theorem

AC Circuits: Study of A.C. circuits consisting of pure resistance, pure inductance, pure capacitance & corresponding voltage-current phasor diagrams and waveforms. Development of concept of reactance, study of series R-L, R-C, R-L-C circuit and resonance, study of parallel R-L, R-C and R-L-C circuit, concept of impedance , admittance, conductance and susceptance, concept of active, reactive and apparent power and power factor.

Unit III: Magnetism and Transformer [**15 L]**

Magnetic effect of an electric current, cross and dot conventions, right hand thumb rule and cork screw rule, nature of magnetic field of long straight conductor, solenoid and toroid. Concept of m.m.f., flux, flux density, reluctance, permeability and field strength, their units and relationships. simple series and parallel magnetic circuits, comparison of electrical and magnetic circuit, force on current carrying conductors placed in magnetic field, Fleming's left hand rule. Faradays laws of electromagnetic induction, statically and dynamically induced e.m.f., self and mutual inductance, coefficient of couplings. energy stored in magnetic field.

Single phase transformers: Construction, principle of working, e.m.f. equation, voltage and current ratios. losses, definition of regulation and efficiency, determination of these by direct loading method. descriptive treatment of auto transformers and dimmerstats.

Unit IV: Electrical Machines [**15 L]**

DC Motors and Generators: Basic theory, Construction and purpose of components in DC generator; Series wound, shunt wound and compound motors;

AC Motors and Generators: Operation and construction of revolving armature and revolving field type AC generators; Single phase, two phase and three phase Permanent Magnet Generators,

Introduction to AC synchronous and Induction motors.

References Books

1. A Textbook of Electrical Technology Volume- I – B. L.Theraja, S.Chand and Company Ltd., New Delhi.
2. Basic Electrical Engineering, V.K.Mehta, S.Chand and Company Ltd., New Delhi.
3. Electrical Machines, I J Nagrath & D P Kothari, TMH Publications, 4th Edition
4. Theory and problems of Basic Electrical Engineering- I.J.Nagrath and Kothari, Prentice-Hall of India Pvt. Ltd.
5. Airframe &Power plant Mechanics (General Handbook EA-AC 65-9A)
6. Aircraft Electrical Systems-by E. H.J. Pallet
7. Aircraft Electricity and electronics-by Bent McKinley and also by Eismin

Semester I

Course code: BAV 104 Course Title: Basic Aerodynamics

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

Teaching Scheme: Theory – 04 Lectures/Weeks

Course Objectives:

1. To understand the concepts of Atmosphere.
2. To understand the concepts of Aerodynamics, airflow over body of aircraft at low and high speed, forces generated on body.
3. To understand the shape of airfoils 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 Outcomes:

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 airfoils.
4. Understand various devices used in connection with flight to augment or obtain required performance.

Unit I: Physics of the Atmosphere **[15 L]**

Atmosphere: Composition and the Structure, International Standard Atmosphere (ISA), application to aerodynamics.

Unit II: Aerodynamics **[15L]**

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.

Unit III: Theory of Flight **[15 L]**

Relationship between lift, weight, thrust and drag; Glide ratio; Steady state flights, straight, climbing, turning, gliding and diving flight and their performance. Theory of the turn; Influence of load factor: stall, flight envelope and structural limitations; Lift augmentation.

Unit IV: Flight Stability and Aerodynamics **[15 L]**

Concept of static stability, Locations of CG of airplane, moment coefficient and slope, neutral point, Longitudinal, lateral and directional stability.

Reference Books:

1. Mechanics of Flight by -A.C. Kermode, Longman, 1996
2. Aerodynamics-L.J. Clancy, Shroff pubs & distspvt.ltd, 2006
3. Airframe and Power Plant Mechanics (AC 65-1 5A) -Airframe Hand Book
4. EASA Module- 08 Basic Aerodynamics
5. A& P Technician air frame text book- Jappesn

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 /Weeks

Learning Outcomes:

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 all components.
4. Fabricate the electrical circuit
5. To understand various types of operation characteristics and applications of Motor/Generator/Transformer.

Students will have to perform minimum 12 practicals from following:

List of Practicals:

1. To verify the ohm law & Kirchhoff law using resistive network.
2. To design electrical circuit using electrical appliances like fuse, switch , circuit breaker, socket, bulb, contactor and verify its operation
3. To identify various types of resister on the basis of colour code and validate using DMM/AMM. Demonstration of the resister in series/parallel /in combination and measure the value of resister through AMM/DMM.
4. To demonstrate the use of potentiometer and rheostat by using electrical circuit
5. To study operation of Wheatstone bridge.
6. To identify the various type of capacitor using colour code and validate its value by using LCR Q meter. Connection of the capacitor in series/parallel /in combination and measure the value of Capacitor through capacitor meter.
7. To Demonstrate the process of Magnetization and demagnetization;
8. To Identify the various type of Inductor and measurement its value by LCR Q meter , Connection of the Inductor in series, parallel and in combination and measure the value of inductor through Inductor meter.
9. To demonstrate the faradays law of electromagnetic Induction.
10. To study the constructional part of DC Generator/Motor & Perform the inspection and operation of DC Generator/motor
11. To test the armature in Growler and through multimeter/ test lamp.
12. Familiarize the constructional part of AC generator and motor & Perform the inspection and operation of AC Generator/Motor
13. To demonstrate the reversing the direction of rotation and speed control of AC motor/DC motor.
14. To familiarize the current and voltage transformer and demonstrate the use and testing by simple circuit.
15. To measure the high resistance by megger, and extension of range of voltmeter ammeter and ohm meter.

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 /Weeks

Learning Outcomes:

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

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

Students have to perform minimum 12 practicals from following:

List of Practicals:

1. Demonstration of safety precautions while using fluids, gases, electricity, fire and chemicals & identification of different type of Fire & Fire Extinguishers.
2. Demonstration of hand tools and equipment and their correct use.
3. Use tools and equipment for cutting, filing, of commonly used material to fabricate one simple Job (Fitting, sheet metal, welding).
4. Demonstration of correct use of measuring equipment (tools) like micrometers, verniers caliper, Dial Indicator, bevel protector, combination set etc.
5. Demonstration and use of torque wrench for given torque value.
6. Demonstration of the use of calipers, feeler, fillet, radius limit, telescopic gauge for inspection of one simple assembly.
7. One simple assembly of minimum two components including operation like turning, drilling, internal and external threading.
8. Use hand & power tools to drilling (example: rivet holes drilling).
9. Demonstration of simple soldering tasks.
10. Demonstration of electric arc welding.
11. Demonstration of oxy Acetylene welding.
12. Demonstration of the Inspection and lubrication of aircraft control cable.
13. Survey of corrosion prone area and suggestion for remedial action.
14. Demonstration of the wire and cotter pin licking practice.
15. Demonstration of the riveting practice
16. Visit of Industry Sheet metal shop/Automobile/Aviation

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/Weeks

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.
6. To find eigenvalues and eigenvectors of a matrix up to order 3x3.

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.
6. Apply Cayley Hamilton Theorem to find Inverse of a matrix.

Unit 1:Analytical Geometry of two dimensions [15L]

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

Unit II :Planes in 3-Dimension [15L]

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

Unit III: Cones and Cylinders [15L]

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

Unit IV: Matrices and System of linear equations [15L]

Echelon and Reduced echelon form of a matrix, Reduction of matrix to itsechelon form, Rank of a matrix, System of linear equations, Matrix form of system of linear equations, Homogeneousand non-homogeneous system of linear equations, Gauss Elimination and Gauss JordanMethods, Consistency of a system of linear equations, condition of consistency, Eigen values, Eigen vectors, characteristic equation of a matrix of order up to 3x3, 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., New Delhi 1998.
2. H. Anton and C. Rorres, Elementary Linear Algebra with Applications, Seventh Edition, Wiley 1994.
3. P. K. Jain and Khalil Ahmed, A Text Book of Analytical Geometry of Three Dimensions, Wiley Eastern Ltd. 1999.
4. K.B. Datta, Matrix and Linear Algebra, Prentice hall of India Pvt.Ltd., New Delhi 2000.

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/Weeks

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 the students

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

Unit I: Regulatory Framework [15 L]

Role of International Civil Aviation Organization , The Aircraft Act 1934 and Aircraft Rules (1937) 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 section 2 part Sections 1 and 2.

Unit II : Approved Maintenance/Management Organization [15 L]

Detailed understanding of CAR-145 and CAR M Subpart F, Detail understanding of CAR M provisions related to Continuing Airworthiness, Detailed understanding of CAR-M., Personnel Requirements in Maintenance/Management Organizations, Maintenance Organization Expositions, Continued Airworthiness Organization Exposition, and Maintenance Organization Manual, Safety Management System, State Safety Programme, Basic Safety Concepts, Hazards & Safety Risks, SMS Operation, SMS, Safety performance, Safety Assurance.

Unit III: Aircraft Operartions [15 L]

Commercial Air Transport/Commercial Operations , Air Operators Certificates, Operators, Responsibilities in particular regarding continuing airworthiness and maintenance, Documents to be carried on board and Aircraft Placarding (Markings), 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.

Unit IV: Aircraft Certification **[15 L]**

General Certification rules: such as FAA & EACS 23/25/27/29**,** Type Certification, Supplemental Type Certification**,** CAR-21 Design/Production Organization Approvals, Aircraft Modifications and repairs approval and certification permit to fly requirements, Certificate of Airworthiness**,** Certificate of Registration**,** Noise Certificate**,** Weight Schedule**,** Radio Station Licence and Approval, CAR-66 Certifying Staff – Maintenance.

Reference Books

1. Aircraft Manual - DGCA
2. CAR-21, CAR-M, CAR-145, CAR-66, CAR 147 –DGCA
3. CAR Vol- 1 & 2- DGCA

Semester II

Course code: BAV 203 Course Title: Engineering Graphics

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

Course Objectives:

1. To develop imagination of Physical Objects to be represented on paper for engineering communication
2. To develop the manual drawing skill , drawing interpretation skill
3. To develop physical realization of the dimension of the object
4. To learn basic AutoCAD skills

Course Outcomes:

After learning this course students will be able to:

1. Apply the basic principles of projections in 2D drawings
2. Apply basic principles of projections in converting 3D view to 2D drawing
3. Read a given drawing
4. Use CAD tool to draw different views of a 3D objects

Unit 1:Introduction of Engineering Drawing [15L]

Introduction to drawing instrument and their uses, Drawing sheet layout and sizes, Types of lines and their applications, Dimensioning terminology, Quadrant and its positions, First angle and third angle projection method and their comparison

Engineering Curves

Ellipse, parabola and hyperbola only focus-diretrix method

Unit II: Projection of Point, Lines and Planes [15L]

Theory of projections (First angle and third angle projection method, reference planes, auxiliary planes), Projection of point only in first and third quadrant with all possible positions, Projection of lines (only first angle projection method) inclined to HP or VP or both planes, Projection of planes (only first angle projection method) inclined to HP or VP or both planes

Unit III: Projection of Solid [15L]

Projection of Solids (Prism, pyramid, cylinder, tetrahedron, hexahedron and cone only) solid projection with axis inclined to HP, axis inclined to VP (problems on solid resting on HP only)

Section of Solid

Section of prism, pyramid, cylinder, tetrahedron, hexahedron and cone cut by plane perpendicular to any one reference plane

Development of Lateral Surface of Solid

Development of prism, cylinder, pyramid and cone only (No sectional solids)

Unit IV: Orthographic Projection [15L]

Orthographic Projection of given pictorial view by first angle method of projection, Types of sections, sectional orthographic projection (only full sectional orthographic view)

Isometric View

Introduction of isometric view with example of cube, isometric axes, scale, isometric projection and isometric view, drawing isometric view of simple solids and its dimensioning

Free Hand Sketches

free hand sketching – FV and TV of standard machine parts- Hexagonal headed nut and bolt, foundation bolt, shafts, keys, couplings, springs, screws, threaded forms, welded joints, riveted joints

Text books:

1. N.D.Bhatt and V.M.Panchal, Engineering Drawing, Plane and solid geometry, Charotor publication house, Anand, Gujrat, India
2. Dhananjay A. Jolhe, Engineering Drawing with an introduction to AutoCAD, Tata Magraw Hill publishing company Ltd. New Delhi, India
3. BasantAgarwal and C.M.Agarwal,Engineering Drawing, Tata Magraw Hill publishing company Ltd. New Delhi, India

Reference books:

1. Warren J. Luzzader, Fundamentals of Engineering Drawing, Prentice Hall of India New Delhi
2. Prof. Sham Tickoo(Purdue University) and GauravVerma, (CAD soft Technologies): AutoCAD 2012, Dreamtech Press New Delhi

Semester II

Course code: BAV 204 Course Title: Analog Electronics

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

Course Objectives:

1. To introduce semiconductor devices like Diode, BJT, FET, their construction, operation and characteristics.
2. To study elementary electronic circuits and applications
3. To study Integrated Circuits operational amplifiers and applications

Learning outcome:

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

1. Acquire a basic knowledge of diodes, MOSFET, BJT, UJT, SCR and operational amplifier.
2. Develop the ability to analyze and design analog electronic circuits using discrete components.
3. Implement the circuit and test the performance

Unit I: Semiconductor Diodes and Circuits [15 L]

Semiconductors Insulators and Conductors, concept of doping, p an n type semiconductors, pn Junction Diode, Construction, Characteristics and working; Diode as a switch, Characteristics and working of silicon controlled rectifiers, light emitting diode, photo diode, schottky diode, varactor diode and Zener diode.

Applications of diode as clippers, clampers, half and full wave rectifiers, bridge rectifiers, voltage doublers and triplers.

Unit II: Bipolar Junction Transistor and Circuits [15 L]

BJT symbol and types, construction and working principles, Modes of operation (CB,CE CC configurations) and its characteristics. Comparison of different modes (Ri, Ro, Av, Ai and Ap), Transistor as Amplifier and Switch. Transistor biasing, Concept of AC and DC load line, operating point.

Amplifiers: types and working principle such as Class A, B AB and C types. push-pull amplifiers, multivibrators.

Unit III: FET and Oscillators [15 L]

FET Symbol and types, construction, working principle and characteristics, Difference between BJT FET and MOSFET. voltage variable resistor, enhancement MOSFET, Construction and working, MOSFET as a switch.

Oscillators: Basic Concept, Barkhausen's Criterion, LC (Heartly, Colpits) and RC (Wein bridge and Phase Shift) oscillators using BJT.

Unit IV: Operational Amplifier and Timer [15 L]

Block Diagram of OP AMP, pin configuration, Differential amplifier, Inverting, Noninverting Amplifier, Op AMP parameters, Applications of OP AMP such as: Voltage follower, integrator, differentiator, comparator; Schmitt Trigger.

IC 555 Timer: Block diagram and pin Configuration, Applications of IC 555 timer such as astable, monostable and bistable multivibrator.

References Books :

1. Principles of Electronics by V.K. Mehta , S Chand Publications
2. Integrated Electronics by Jacob Miliman and Halkies TMH
3. Op Amps and Linear Integrated Circuits, Ramakant Gaikwad Pearson Education
4. Aircraft Electricity and electronics-by Bent Mekinley and also by Eismin/
5. Aircraft Engineering and Principle
6. Micro Electronics Aircraft System- by E.H.J.Pallett
7. Aviation Electronics Vol.I (Every Pilot Guide to Aviation Electronics-by John M.Ferrara -Air and Space Company)

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 /Weeks

Learning Outcomes:

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

1. Identify the active and passive components.
2. Understand the use and application and testing of diode, transistor, FET, MOSFET, IC etc.
3. Design & fabricate the circuit containing electronics components.
4. Understand basics of operational amplifiers and Timer IC .

Students will have to perform any 12 practicals.

List of Practicals:

1. To study forward and reverse biased characteristics of PN Junction Diode
2. To Study Zener diode as a voltage regulator.
3. To study Bipolar Junction Transistor characteristics
4. To study characteristics of JFET/MOSFET.
5. To demonstrate the half wave rectifier circuit.
6. To demonstrate the full wave bridge rectifier circuit.
7. To demonstrate the voltage doublers and triplers using simple circuit.
8. To verify Inverting and non-inverting amplifier characteristics using OPAMP.
9. To verify adder and subtractor circuits using OPAMP.
10. To study of clipping and clamping circuits
11. To demonstrate Schmitt Trigger using op amp.
12. To study LC oscillator circuit.
13. To study RC oscillator circuit.
14. To verify astable multivibrator using IC 555.
15. Use of multimeters (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.
    - Thermister

Semester II

Course code: BAV 206 Course Title: Lab II (Graphics)

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

Teaching Scheme: Practical – 06 /Weeks

Course Outcomes:

After performing the practicals students will be able to:

1. Apply the basic principles of projections in 2D drawings
2. Apply basic principles of projections in converting 3D view to 2D drawing
3. Read a given drawing
4. Use CAD tool to draw different views of a 3D objects

Student have to perform minimum 12 Practicals

List of Practicals :

1. Types of lines, lettering, dimensioning of simple orthographic view
2. Engineering curves (minimum 3 problems)
3. Projection of points (all possible positions)
4. Projection of lines (minimum 3 problems)
5. Projection of planes (minimum 3 problems)
6. Projection of solids (minimum 3 problems)
7. Projection of section of solids (minimum 3 problems)
8. Development of lateral surface of solids (minimum 3 problems)
9. Orthographic projection (2 Problems)
10. Sectional orthographic projection (2 Problems)
11. Isometric views (simple solid 2 problem)
12. Isometric views (machine component 2 problem)
13. Free hand sketches (Hexagonal headed nut and bolt, foundation bolt, shafts, keys, couplings)
14. Free hand sketches (springs, screws, threaded forms, welded joints, riveted joints)
15. Introduction of Auto CAD software (simple object)