

Mahakaushal University, Jabalpur (M.P.)



Scheme & Syllabus

For

B.Sc. with Research/honors

Aviation

2022-23

Duration of Course: 4 Years

Examination Mode: Semester

Examination System: CBCS

**Mahakaushal University
Village-Aithakheda, Mukunwara Road, Post- Tilwara Jabalpur (M.P.) 482003**

Credit Distribution

SEMESTER SYSTEM			Credits Required								
			Sem	MJ	MI	DSE	GEC/ OEC	AECC	SEC SB/VB	FW	Total Credit
Level 5	Certificate	1 st Year Pass (Sem I+Sem II)	I	6	6		4	4			20
			II	6	6		4	4			20
Level 6	Diploma	2 nd Year Pass (Sem III+Sem IV)	III	6	6		4		4		20
			IV	6	6		4		4		20
Level 7	Degree	3 rd Year Pass (Sem V+Sem VI)	V	6		4			4	6	20
			VI	6		8				6	20
Level 8	Honors/ Research	4 th Year Pass (Sem VII+Sem VIII)	VII	6	4	4				6	20
			VIII	6	4					10	20
Total Credit				48	32	16	16	8	12	28	160

SEMESTER SYSTEM			Credits Required								
			MJ	MI	DSE	GEC/ OEC	AECC	SEC SB/VB	FW	Total Credit	
Level 5	Certificate	1 st Year Pass	12	12		8	8			40	
Level 6	Diploma	2 nd Year Pass	12	12		8		8		40	
Level 7	Degree	3 rd Year Pass	12		12			4	12	40	
Level 8	Honors/ Research	4 th Year Pass	12	8	4				16	40	
Total Credit			48	32	16	16	8	12	28	160	

For Regular Students Course Duration:

Min. Years for Completing UG Degree	3 Years
Min Years for Completing UG (Hons.) Degree	4 Years
Maximum Years for Completing UG Degree	6 Years
Max Years for Completing UG (Hons.) Degree	8 Years

Faculty of Science									
Major: Aviation									
Sem	Major	Minor	DSE	Open Elective/ Generic Elective	AECC	SEC		FW	Total Credits
						Skill Based	Value Based		
1	MJ-I (4+2)	MN-I (4+2)		OEC-I (4)	AECC-I (4)				20
2	MJ-II (4+2)	MN-II (4+2)		OEC-II (4)	AECC-II (4)				20
3	MJ-III (4+2)	MN-III (4+2)		OEC-III (4)		SECSB-I (4)			20
4	MJ-IV (4+2)	MN-IV (4+2)		OEC-IV (4)		SECSB-II (4)			20
5	MJ-V (4+2)		DSE-I (4)				SECVB (4)	Field Work (6)	20
6	MJ-VI (4+2)		DSE-II (4) DSE-III (4)					Internship (6)	20
7	MJ-VII (4+2)	MN-V (4)	DSE-IV (4)					Minor Project (6)	20
8	MJ-VIII (4+2)	MN-VI (4)						Major Research Project (10)	20
Total Credits	48	32	16	16	8	8	4	28	160

Major/Minor

Course Code	Category	Paper	Credits
BAVI101T	MJ	Familiarization of Airport	6
BAVI102T	MI	Aviation Calculation & Numerical	6
BAVI201T	MJ	Radio Telephony	6
BAVI202T	MI	Familiarization of Aircraft	6
BAVI301T	MJ	Basic Aerodynamics	4
BAVI301P	MJ	Aerodynamics Lab	2
BAVI302T	MI	Aircraft Structure	4
BAVI302P	MI	Aircraft Structure Lab	2
BAVI401T	MJ	Aircraft Electrical Systems	4
BAVI401P	MJ	Hangar Workshop	2
BAVI402T	MI	Air Regulation-I	6
BAVI501T	MJ	Air Navigation	4
BAVI501P	MJ	ATC Communication Lab	2
BAVI601T	MJ	Piston Engine & Propellers	4
BAVI601P	MJ	Aircraft Propulsion Lab	2
BAVI701T	MJ	Meteorology-I	4
BAVI701P	MJ	Flight Planning Lab	2
BAVI702T	MI	Airport Planning and Operations	4
BAVI801T	MJ	Meteorology-II	4
BAVI801P	MJ	Flight Vehicle Design and Instrumentation Lab	2
BAVI802T	MI	Air Regulation-II	4

Department Specific Elective

BAVI101D-I	DSE	Radio Aids	4
BAVI101D-II	DSE	Aero Engines	4
BAVI102D-I	DSE	Aircraft Instruments	4
BAVI102D-II	DSE	Aircraft Systems	4
BAVI103D-I	DSE	Civil Aviation Requirements (CAR) and Safety Management Systems	4
BAVI103D-II	DSE	Aviation Security	4
BAVI104D-I	DSE	Flight Performance and Planning	4
BAVI104D-II	DSE	Dangerous Goods Management	4

Skill Enhancement Course (Skill Based) (Any Two)

Course Code	Category	Paper	Credits
BAVI101SB	SEC-SB	Aircraft Maintenance and Air Transportation	4
BAVI102SB	SEC-SB	UAV Modelling & Design	4
BAVI103SB	SEC-SB	Airport Ground Handling	4
BAVI104SB	SEC-SB	Flight Simulation and Training	4
BAVI105SB	SEC-SB	Ticketing and Visa	4

Open Elective Compulsory Course/ Generic Elective Compulsory Course

Course Code	Category	Paper	Credits
OECC101-I	OEC	Fundamental of Computer	4
OECC101-II	OEC	Environmental Studies	4
OECC102-I	OEC	Entrepreneurship	4
OECC102-II	OEC	Principle of Management	4
OECC103-I	OEC	Nutrition and Fitness	4
OECC103-II	OEC	Current Concerns in Public Health Nutrition	4
OECC104-I	OEC	Travel and Tourism	4
OECC104-II	OEC	Tourism Operation Software Skills	4

Ability Enhancement Compulsory Course

Course Code	Category	Paper	Credits
AECC101	AECC	English Language-I	4
AECC102	AECC	English Language-II	4

Skill Enhancement Course (Value Based) (Any One)

Course Code	Category	Paper	Credits
SECVB101	SEC-VB	Constitution of India	4
SECVB102	SEC-VB	Yoga in Life	4
SECVB103	SEC-VB	National Service Scheme (NSS)	4
SECVB104	SEC-VB	Health & Wellness	4
SECVB105	SEC-VB	Sports	4

Field Work

Course Code	Category	Paper/Description	Credits
BFWF-501	FW	Field work is the process of observing and collecting data about people, cultures, and natural environments.	6
BFWI-601	FW	The aim of the internship provides a direction to the activities, helps to focus on a result, and to assess the result achieved.	6
BFWP-701	FW	The objective of the minor project is to provide an opportunity for students to undertake short research training outside the classroom to solve real-world issues.	6
BFWR-801	FW	Project objectives describe the desired outcome of a project, which is often a tangible object. It's beneficial to create objectives for your project because creating a specific goal for you helps everyone know what they're supposed to be working toward.	10

BAVI101T: Familiarization of Airport

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Unit-I

(14 Lectures)

Buildings & Installations: Basic definitions and understanding of Terminals, Security, Apron, Hangar, Taxiway, Runway, Fire Station, Airport Vehicles, Fuel depot. Regulations related to each of airport services. Purpose hanger, apron, aircraft stand, taxiway and runway.

Unit-II

(16 Lectures)

Markings & Lightings: Difference between markings, Lightings and Signboards Apron markings- aerobridge movement area markings, stand lead in line, Apron edge marking Aircraft stand identification marking, Taxiway center line and edge marking & lighting, Runway center line and edge line marking & lighting Threshold, aiming point, touch down zone marking & lighting Declared distances, PCN, Lighting system, Aerodrome Beacon, Obstacle Lighting & Marking. Location, Direction & Destination signboard.

Unit-III

(16 Lectures)

Facilities & Equipment's: Basic understanding of Navigational facilities. Basic radio principle, frequency used and introduction about various navigational equipment's VOR, NDB/ADF, DME; Basic radar principle, Primary and secondary radar, Surveillance equipment's: Primary Radar, SSR, Surface Movement Radar, ADS; GPS, VHF antennae, ILS.

Unit-IV

(14 Lectures)

Air Traffic Control: Different Air Traffic Control Units, Concept of Flight Information Region, Role of Flight Information Centre, five different Flight information regions in India, Roles and responsibilities of Various air traffic control units- Ground control, Tower, Approach, Area control, Flight Plan briefing and filling, Flight Dispatch, ATC briefing.

Unit-V

(15 Lectures)

Important Organizations: Roles and Responsibility of International Air Transport Association (IATA), International Civil Aviation Organization (ICAO), Director General Civil Aviation (DGCA), Airport Authority of India (AAI)& its wings, Ministry of Civil Aviation,

Bureau of Civil Aviation Security, Central Industrial Security Force. Important convention with these organization.

Reference Books:

- ICAO Annex 14 Volume 1 Aerodrome Design and Operations
- Civil Aviation Requirements Section-4, Aerodrome Standards & Air Traffic Services.
- R.K. Bali Air Regulations.
- Airport council international (Second Edition).

BAVI102T: Aviation Calculation & Numerical

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Unit-I

(15 Lectures)

Basic Trigonometry & Pythagoras Theorem: Revision of trigonometric Ratios and Pythagoras theorem and their applications, Revision of Mathematical calculations, BODMAS Rule, Algebra calculations, Percentage calculation.

Unit-II

(18 Lectures)

Conversions: Conversions between units, Basic definitions of Kilometres, Statute mile, Nautical Mile, feet, meter and conversion between each other. Temperature Conversions, Kelvin to Celsius, Celsius to Kelvin, Fahrenheit to Celsius and its importance in aviation and their applications.

Unit-III

(14 Lectures)

Compass: Basic understanding of Compass it's working Principle, Basic understanding about magnetism, Earth magnetism, Understanding Compass errors- Variation and deviation, Calculating Aircraft direction, Relative heading, True Heading magnetic heading, compass heading and Heading Calculation.

Unit-IV

(12 Lectures)

Relative Motion and Vertical Speed: Calculation of Speed in relation to speed, distance, time. Calculating Estimated Time of Arrival (ETA), Estimated Time of Departure (ETD), Estimated Elapsed Time (EET), Calculating Endurance and Still Air Range (SAR) Calculation of Rate of Climb (ROC), Rate of Descent (ROD)& selection of Altitude according to the flight path, Top of Climb (TOC)&Top of Descent (TOD), its understanding and Implementation.

Unit-V

(16 Lectures)

Time Calculation and Fuel Calculation: Understanding Coordinated Universal Time (UTC), Calculation of LMT at any given place, longitude, latitude, meridians, Standard meridian, rhumb line, Indian Standard Time (IST), Difference in longitude, Difference in latitude. Calculating IST and LMT from GMT. Selection of alternate aerodrome, Different alternate,

Take off alternate, Enroute Alternate, Destination Alternate, Fuel calculation for the flight, minimum fuel requirement and payload.

Reference Books:

- Aviation's Mathematics, Oxford Publications
- Oxford General Navigation.
- Ground Studies for Pilots (General Navigation)
- General navigation by R.K. Bali

BAVI201T: Radio Telephony

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Unit-I

(16 Lectures)

Regulations: Duties of International Telecommunication Union (ITU), International Civil Aviation Organization (ICAO), Airport Authority of India (AAI), Wireless Planning and Coordinating Wing (WPC), ICAO Annexure, Spelling of Alphabets and Transmission of numerical, Aircraft Identification, Location Indicators, Flight Information Regions (FIR), Identification of Ground Services.

Unit-II

(16 Lectures)

Radio Propagation: Relationship between wavelength, frequency and speed of light, Frequency bands and ranges, Ionosphere layers during day and night, Mode of Propagation MF, HF and VHF & above, Operation of Geostationary Satellites, Operation of Polar orbiting Satellites, Skip Distance, Choice of Frequencies during Day & Night.

Unit-III

(14 Lectures)

Phraseology: Phraseology used in Aeronautical Communication Services; Abbreviations used in Aeronautical Communication Services. Distress, Distress Relay, Direction Finding, Flight Safety, Metrological Information, Flight regulatory.

Unit-IV

(16 Lectures)

'Q' CODES: 'Q' Codes used in Aeronautical Communication Services, Basic Understanding of atmospheric pressure, QNH, QFE, QFF, QNE, Understanding difference between Height, Elevation, Altitude and Flight Level, QDR, QDM, QUJ, QTE, Relative bearing, Radial, Magnetic Heading, Compass Heading, True Heading, Variation & Deviation.

Unit-V

(13 Lectures)

Communication: Introduction to radio call format, Radio strength check call, Start-up clearance and pushback clearance call, Taxi clearance call, ATC clearance call.

Reference Books:

- Radio telephony, K.D. Tuli
- Radio telephony manual by R.K. Bali
- Air Regulation by R.K Bali

BAVI202T: Familiarization of Aircraft

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Unit-I

(16 Lectures)

Understanding of Basic Mechanics, Thermodynamics and Fluid Mechanics: Speed, Velocity, Newton's laws of motion, Friction, Centre of Mass, Centre of Gravity, Torque, Work, Energy, Power, Pressure, Stress, Elasticity of Material, Principle of the Gyroscope; Laws of Thermodynamics, Heat Transfer, Specific Heat, Calorific values of fuels; Viscosity, Fluid Resistance, Specific Gravity, Absolute and relative humidity, Pascal's law & its application in Hydraulic press, Hydraulic and Pneumatic system, Bernoulli's Theorem, Venturi's tube theory, Streamline, Laminar and turbulent flow.

Unit-II

(16 Lectures)

Airframe & Systems: Types of Fuselages, Load transfer technique, Various Wing Structures- Rectangular, Elliptical, swept back, swept forward, Anhedral, Dihedral; Definition of Control Surfaces, Primary control surface, Secondary control Surface, Working of Aileron, Elevator, Rudder, Flaperons; Airframe, fuel system, Cooling System.

Unit-III

(16 Lectures)

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

Unit-IV

(14 Lectures)

Aircraft Engine (Piston): Basic understanding of Piston engine components: Crankcase, Crankshaft, Camshaft, Bearings, Connecting Rod, Piston, Piston Rings, Four-Stroke engine cycle, carburettor, Engine Handling, normally aspirated, Turbo charging, Supercharging.

Unit-V

(13 Lectures)

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.

Reference Books:

- Oxford – Aircraft General Knowledge 1(Airframe and systems)
- Oxford – Aircraft General Knowledge 3(power plant)
- Aero plane Technical by Trevor Thom

BAVI301T: Basic Aerodynamics

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Unit-I

(8 Lectures)

Aerodynamics: Airflow around a body; Boundary layer, laminar and turbulent flow, free stream flow, relative airflow, up wash and downwash, vortices, stagnation; stagnation aerodynamic chord, aerodynamic centre, centre of pressure, stagnation point, profile (parasite) drag, induced drag, 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.

Unit-II

(12 Lectures)

Aerodynamics and Flight Controls: Operation and effect of roll control: ailerons and spoilers pitch control: elevators, stabilators, variable incidence stabilizers and canards: yaw control, rudder limiters; Control using elevons, rudder, elevators; High lift devices, slots, slats, flaps, Flaperons; Drag inducing devices, spoilers, lift dumpers, speed brakes; Effects of wing fences, saw tooth leading edges; Boundary layer control using, vortex generators, stall wedges or leading-edge devices; Operation and effect of trim tabs, balance and anti-balance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels; Pressure measuring devices and systems.

Unit-III

(8 Lectures)

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

(12 Lectures)

Flight Stability and Dynamics: Definition of Stability, Different type of Stability- Static stability, Dynamic Stability, Positive, Neutral and Negative stability, Longitudinal, lateral, and

directional stability, Explanation of Controllability, Relationship between stability and Controllability.

Unit-V

(12 Lectures)

High Speed Flight: Speed of sound, subsonic flight, transonic flight, supersonic flight, Mach number, critical Mach number, compressibility effect, buffet, shock wave, aerodynamic heating, Factors affecting airflow in engine intakes of high-speed aircraft; Effects of sweepback on critical Mach number.

Reference Books:

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

BAVI301P: Aerodynamics Lab

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List of Experiments:

1. Calibration of a subsonic wind tunnel: Test section static pressure and total head distributions.
2. Smoke flow visualization studies on a two-dimensional circular cylinder at low speeds.
3. Smoke flow visualization studies on a two-dimensional airfoil at different angles of incidence at low speeds.
4. Tuft flow visualization on a wing model at different angles of incidence at low speeds.
5. Surface pressure distribution on a two-dimensional circular cylinder at low speeds and calculation of Pressure drag.
6. Surface pressure distribution on a two-dimensional symmetric airfoil at zero angle of incidence at low speeds and calculation of Pressure drag.
7. Surface pressure distribution on a two-dimensional cambered airfoil at different angles of incidences and calculation of lift and pressure drag.
8. Calculation of total drag of a two-dimensional circular cylinder at low speeds using pitot-static probe wake survey.
9. Calculation of total drag of a two-dimensional cambered airfoil at low speeds at incidence using pitot-static probe wake survey.
10. Measurement of a typical boundary layer velocity profile on the tunnel wall (at low speeds) using a pitot probe and calculation of boundary layer displacement and momentum thickness.

BAVI302T: Aircraft Structure

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Unit-I

(10 Lectures)

Airframe Structures General Concepts: Airworthiness requirements for structural strength; Structural classification, primary, secondary & tertiary; Fail safe, safe life, damage tolerance concepts; Zonal and station identification systems; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Drains and ventilation provisions; System installation provisions; Lightning strike protection provision. Aircraft bonding, Rotary Wing aerodynamics and structure concepts.

Unit-II

(12 Lectures)

Airframe Structures Construction method: Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, methods of skinning, anti-corrosive protection, wing, empennage and engine attachments; Structure assembly techniques: riveting, bolting, bonding Methods of surface protection, such as chromating, anodising, painting; Surface cleaning. Airframe symmetry: methods of alignment and symmetry checks.

Unit-III

(10 Lectures)

Airframe Structures-I: Fuselage Construction and pressurisation sealing; Wing, stabiliser, pylon and undercarriage attachments; Seat installation and cargo loading system; Doors and emergency exits: construction, mechanisms, operation and safety devices; Windows and windscreen construction and mechanisms. Wings Construction; Fuel storage.

Unit-IV

(10 Lectures)

Airframe Structures-II: Landing gear, pylon, control surface and high lift/drag attachments. Stabilisers Construction; Control surface attachment. Flight Control Surfaces Construction and attachment; Balancing — mass and aerodynamic, Nacelles/Pylons Construction; Firewalls; Engine mounts.

Unit-V

(8 Lectures)

Composite and Non- Metallic: Characteristics, properties and identification of common composite and non-metallic materials used in Aeroplane, Sealant and bonding agents.

Reference Books:

- Federal Aviation Administration (FAA) H 8083 30(9A) by USA Dept of transportation
- Airframe-Volume-1& 2 Structures Dale Crane
- FAA-H-8083-31 AMT_AIRFRAME_VOL 1 & 2by USA Dept of transportation
- Jeppesen-021-01-Airframes-Systems
- Advance Composite Material by Cindy foreman
- Composite Material by Lalit Gupta
- Elements of Strength of Materials by Timoshenko and Young, East West Press

BAVI302P: Aircraft Structure Lab

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List of Experiments:

1. Study To conduct tensile test on a mild steel specimen and determine the following:
(Ultimate strength, Young's Modulus, Percentage reduction in area, Malleability, Percentage elongation, True stress & true strain.)
2. To find the deflection of the cantilever beam and calculate the Poisson's ratio.
3. To find out the young's modulus of the given long column.
4. To find the compressive stress of a short column for a given material.
5. To determine the shear center of an open section.
6. To determine the shear center of a closed section.
7. To detect the internal defects in the given specimen.
8. To detect the flaws on the surface of a given material.
9. To analyse the intensity of cracks or surface and sub layer flaws in a given specimen.
10. To verify Maxwell's Reciprocal Theorem for a given simply supported beam.
11. To make a riveted joint (double riveted Zig-Zag lap joint) between two given metal
12. To investigate and study the behaviour of a semi-tension beam (Wagner beam).
13. To determine the flexural stress and strain of a simply supported beam subjected to four-point loading.

Reference Books:

- Federal Aviation Administration (FAA) H 8083 30(9A) by USA Dept of transportation
- Airframe-Volume-1& 2 Structures Dale Crane
- FAA-H-8083-31 AMT_AIRFRAME_VOL 1 & 2by USA Dept of transportation
- Jeppesen-021-01-Airframes-Systems
- Advance Composite Material by Cindy foreman
- Composite Material by Lalit Gupta
- Elements of Strength of Materials by Timoshenko and Young, East West Press

BAVI401T: Aircraft Electrical Systems

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Unit-I

(8 Lectures)

Static Electricity and Conduction: Distribution of electrostatic charges; Unit of charge; Polarity of a charge; Electric Field of Static Charge; Electrostatic laws of attraction and repulsion- Coulomb's Law; Electrostatic induction; Conduction of electricity through Solid, liquid and gas.

Unit-II

(10 Lectures)

Electrical Terminologies: The following terms, their units and factors affecting them: potential difference, electromotive force, voltage, current, resistance, conductance, charge, Power, Work, conventional current flow, electron flow, Sources of Electricity, Meters used for measurement; Direct Current and Alternating Current.

Unit-III

(12 Lectures)

Resistance/Resistor: Ohm's law, Resistors in series and parallel; Calculation of total resistance using series, parallel and series parallel combinations; Conductance in series and parallel; Open and short circuits; Operation of Wheatstone Bridge. Fixed resistors, Variable resistors, stability, tolerance and limitations, methods of construction; Construction and operation of potentiometers and rheostats.

Unit-IV

(10 Lectures)

DC Circuits and Circuit Protection Electric circuit terminologies; Kirchhoff's Voltage and Current Laws; Calculations using the above laws to find resistance, voltage and currents; Significance of the internal resistance of a supply; Electrical faults; Circuit protection devices.

Unit-V

(10 Lectures)

AC Theories and Aircraft Electrical System: Capacitance; Inductance; Electromagnetic induction; 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, Single/3 phase principles.

Reference Books:

- Basic Electronics- BernadGrob
- Aircraft Electricity and Electronics by T.K.Eismin, R.D.Bent &J.L.Mckinley
- Electrical systems- BL Thereja
- Aircraft Electrical System by E.H.J. Pallett
- Oxford ATPL ground training series- Electrics

BAVI401P: Hangar Workshop

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Familiarization of General Hand Tools:

- General Purpose Tools, Hummers and Mallets
- Screwdrivers, Pliers and Plier-Type Cutting Tools.
- Punches Wrenches, Special Wrenches, Torque Wrench, Strap Wrenches.
- Impact Drivers, Metal Cutting Tools.
- Hand Snips, Hacksaws, Chisels, Vices, Files, Files—care and Use, Most Commonly Used Files, Care of files.
- Drills. Twist Drills, Reamers, Countersink, Taps and Dies, Layout and Measuring Tools, Rules.
- Combination Sets, Scribe, Dividers and Pencil Compasses, Callipers, Micrometre Callipers, Micrometre Parts.
- Reading a Micrometre, Vernier Scale, using a Micrometre, Vernier Scale, Using a Micrometre, callipers.

Fire Training:

- Different Types & class of fire.
- Different types of fire-extinguishers.
- Procedure of use of fire extinguishers, fire-alarm bell.

Familiarization on Cessna 152

- Airframe familiarization
- Engine familiarization
- Cessna 152 Electrical system
- Cessna 152 Hydraulic system
- Cessna 152 Landing gear system
- Cessna 152 Aircraft Instrument system

Familiarization on Cessna 172

- Airframe familiarization
- Engine familiarization

- Cessna 172 Electrical system
- Cessna 172 Hydraulic system
- Cessna 172 Landing gear system
- Cessna 172 Aircraft Instrument system

Reference Books:

- Shop Theory.
- Airframe and Power plant Mechanics Airframe Handbook (Ac65- 9A) by Shroff Publishers.
- Airframe and Power Plant mechanics Airframe handbook (Ac65- 15A) by Shroff Publishers
- Cessna 152 Aircraft Service manual by Cessna Aircraft Company
- Cessna 172 Aircraft Maintenance manual by Cessna Aircraft Company

BAVI402T: Air Regulation-I

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Unit-I

(16 Lectures)

Indian Aircraft Act, 1934: Short title and extent, Power of Central Government to exempt certain aircraft, Power of Central Government to make rules, Power of Central Government to make orders in emergency, Power of Central Government to make rules for investigation of accidents, Power to detain aircraft, Power of Central Government to prohibit or regulate construction of buildings, planting of trees, Payment of compensation, Penalty for act in contravention of rule made under this Act, Penalty for flying so as to cause danger, Penalty for abetment of offences and attempted offences, Laying of rules before Parliament, Use of patented invention on aircraft not registered in India, Saving for acts done in good faith under the Act.

Unit-II

(12 Lectures)

Indian Aircraft Rules, 1937: Short title and extent, Nationality of aircraft, Definitions and Interpretation, General condition of flying, General safety condition, Personal of aircraft, Airworthiness, Radio telegraph Apparatus Aeronautical beacon, Ground lights and false lights, Log book, Investigation of accidents, Investigation of Incidents.

Unit-III

(16 Lectures)

Separation Methods and Minima: Air traffic control clearances-Scope & Purpose-Emergencies, General provisions for the separation of controlled traffic, Vertical separation during climb and descend, Horizontal Separation, Lateral Separation- By using same navigation aid or method-VOR, NDB, DR, RNAV, Longitudinal Separation- Same track, Reciprocal tracks, Crossing tracks, Longitudinal Separation minima based on time-Aircraft at same level, Aircraft flying on crossing track, Aircraft Climbing or descending –Same track, crossing track, reciprocal track.

Unit-IV

(15 Lectures)

Aerodrome Control Service: Functions of aerodrome control tower, alerting service provided by aerodrome control tower, Control of aerodrome traffic, Selection of runway in use, Essential

information on aerodrome conditions on, Control of traffic in the traffic circuit, Control of departing & arriving aircraft, Aeronautical Ground Lights.

Unit-V

(16 Lectures)

Operational Procedures: General Requirements, Operator Certification, Operational requirements, Minimum Equipment List, Aero-plane flight manual, Fire/Smoke-Classifications-Fire Extinguisher Locations, Ground De-icing, Icing Conditions, De-icing, Anti-icing, Types of De-icing fluids, NOTAMs, Wake turbulence-categories-wake turbulence separation minima-time, distance- dealing with wake turbulence.

Reference Books:

- Indian Aviation Act 1934 by Ministry of Civil Aviation, Govt. of India.
- Indian Aircraft Manual by Ministry of Civil aviation, Govt. of India.
- Air Regulation Part 1 by R.K Bali.
- Air Regulation Part 2 by R.K Bali.
- Air Pilot's Manual, Vol 2, and Aviation Laws by Peter. D. Godwin

BAVI501T: Air Navigation

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Unit-I

(10 Lectures)

The Earth: The cardinal Points, The Earth Graticule, Great Circles, Rhumb Line, Meridians and Anti Meridians, Small Circles, The Equator, Latitude, Longitude, The Prime Meridian, Difference in Latitude and Longitude, Great Circle Tracks, Rhumb Line Tracks.,360-degree notation, True Direction, Magnetic Direction and Variation, Isogonal, Agonal, Magnetic Direction, Compass Direction and Deviation, Convergence angle, Convergency, Grid Direction and Grivation, Isogrivs.

Unit-II

(12 Lectures)

Speed Conversions: Statute Mile, Nautical Mile, Kilometer, Conversion between Units, Departure, Meters and Feet, Basic principles of Circular Slide Rule., units of Speed, Knots, Miles per Hour, Kilometers per Hour, Indicated Airspeed, Rectified Airspeed, True Airspeed, Equivalent Airspeed, Ground Speed, Mach Number, Calibrated Airspeed, Correct Outside Air Temperature, Conversion of Rectified Airspeed to True Airspeed, Conversion of Mach number to True Airspeed, Speed, Distance and Time; Relationships and Calculations.

Unit-III

(12 Lectures)

Triangle of Velocities: The Three basic velocity vectors- Drift- The Basic Vector Triangle Problems, Introduction to Flight Computer, Geometrical Solution and Solutions on the Navigation Computer, Finding the wind Velocity at a turning point, Head and Crosswind on a Runway, 1 in 60 Rule. Top of Climb (TOC), Top Of descent (TOD), Track Error, Track, Tack Made Good (TMG), Aircraft Air Velocity, Aircraft Ground Velocity.

Unit-IV

(8 Lectures)

Maps and Charts: Definition and differences about Maps and Charts, Types of charts on the basis of placement of paper and placement of light in reduced earth, Different types of projection, Mercator projection, Lambert Conical, Polar stereographic projection,

Orthomorphism, Scale, Representation of Scale factor, The Reduced Earth, Topographical Maps.

Unit-V

(8 Lectures)

Fuel and Navigational Emergency Data: Different Units of Measurements, Liters, Imperial Gallons and US Gallons, Conversion factors, specific gravity, fuel flow and fuel consumption, Endurance, Still Air Range (SAR), Fuel economy, selecting the most economical cruising level, Payload.

Reference Books:

- Air Navigation by R.K. Bali
- Oxford – Navigation 1(General Navigation)
- Ground studies for pilot-Navigation 6th edition royunderdown & tony palmer.
- Navigation for pilots by J.E.Hitchcock.

BAVI501P: ATC Communication Lab

L T P
0 0 2

Understand the Air Traffic control operations, their role in maintaining safety and easy flow of traffic, different units that work closely with ATC Employability

List of Experiments:

1. Functioning of ATS Reporting Office (ATC Briefing), booking of Flight Plan (FPL)/ Repetitive Flight Plan (RPL), Joint Regional Coordination Centre (JRCC), Non-scheduled Bill generation, NOTAM bulletin broadcasting.
2. Communication Briefing/ Meteorological Briefing
3. NOTAM office/ Aeronautical Information Service (AIS) office
4. Automation in ATC
5. Aerodrome Control Unit and its functioning (TOWER & GROUND controller)
6. Advanced Surface Movement and Guidance Control System (ASMGCS)
7. Approach Control Unit
8. Area Control Centre
9. Flight Information Centre (FIC)
10. Rescue and Coordination Centre (RCC)
11. Radar Control
12. Military Liaison Unit (MLU)
13. Oceanic Control Centre (OCC)

Reference Books:

- Fundamentals of Air Traffic Control (5th Ed 2011) Nolan, M.S. Florence, KY: Brooks/Cole Pub
- Air Traffic Controller's Handbook, FAA (2015) (Canvas, free on-line) (Order 7110.65W)
- Aeronautical Information Manual, FAA Flight Prep: A Pilot's guide to VFR ATC Communications by Miguel Puente
- Understanding Air Traffic Control by Dieudonne Ndayizera
- Radio telephony by K.D. Tuli

BAVI601T: Piston Engine & Propellers

L T P
4 0 0

Unit-I

(10 Lectures)

Piston Engine: Fundamentals, Mechanical, thermal and volumetric efficiencies operating principles – 2 stroke, 4 stroke, Otto and Diesel, Piston displacement and Compression ratio, Engine configuration and firing order.

Unit-II

(10 Lectures)

Engine Construction and Performance: Crank case, Crank shaft, Cam shafts, Sumps, Accessory gearbox, cylinder and piston assemblies, connecting rods, inlet and exhaust manifolds, valve mechanism, power calculation measurement, factors affecting engine power , mixture rich-lean, pre-ignition.

Unit-III

(10 Lectures)

Supercharging and Turbo charging: Principle and purpose of supercharging and its effects on engine parameters, construction and operation of supercharging / turbo charging systems terminology, control system, system protection.

Unit-IV

(10 Lectures)

Lubricants and Fuel and Powerplant Installation: Properties and Specifications, fuel additives, safety precautions, Configuration of firewalls, cowlings, acoustic panels, engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains.

Unit-V

(10 Lectures)

Propeller: Fundamentals, blade element theory, high-low blade angels, reverse angel , angle of attack , rotational speed, propeller slip, aerodynamic, centrifugal and thrust forces, torque, relative airflow on blade angle of attack , vibrations and resonance, Propeller construction

methods and materials used in wooden, composite and metal propellers, blade station, blade phase, blade shank, blade back and hub assembly, fixed pitch control pitch, constant speed propeller, Propeller pitch control, propeller ice protection.

Reference Books:

- Airframe and power plant mechanics – power plant hand FAA
- Oxford – General knowledge 3 (power plant)
- Piston Engines for Aircraft Maintenance by Charles Rodriguez.
- Aircraft Piston Engines by Herschel Smith
- Multi-engine Piston by David Robson
- Combustion in Piston Engines by A. K. Oppenheim
- Fundamentals of Aero-Engines by A. Viswanathakurup
- Aircraft Propulsion and Gas Turbine Engines 2Nd Edition by Ahmed F El-Sayed, Taylor & Francis
- Aircraft Propulsion by Smithsonian Air and Space Museum
- Aircraft Powerplants 9th Edition by Thomas W. Wild

BAVI601P: Aircraft Propulsion Lab

L T P
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List of Experiments:

- 1) Study of an aircraft piston engine. (Includes study of assembly of sub systems, various components, their functions and operating principles)
- 2) Study of an aircraft jet engine (Includes study of assembly of sub systems, various components, their functions and operating principles)
- 3) Study of forced convective heat transfer over a flat plate.
- 4) Cascade testing of a model of axial compressor blade row.
- 5) Study of performance of a propeller.
- 6) Determination of heat of combustion of aviation fuel.
- 7) Study of free jet
- 8) Measurement of burning velocity of a premixed flame.
- 9) Fuel-injection characteristics
- 10) Measurement of nozzle flow.

Reference Books:

- Airframe and power plant mechanics – power plant hand FAA
- Oxford – General knowledge 3 (power plant)
- Piston Engines for Aircraft Maintenance by Charles Rodriguez.
- Aircraft Piston Engines by Herschel Smith
- Multi-engine Piston by David Robson
- Combustion in Piston Engines by A. K. Oppenheim
- Fundamentals of Aero-Engines by A. Viswanathakurup
- Aircraft Propulsion and Gas Turbine Engines 2Nd Edition by Ahmed F El-Sayed, Taylor & Francis
- Aircraft Propulsion by Smithsonian Air and Space Museum
- Aircraft Powerplants 9th Edition by Thomas W. Wild

BAVI701T: Meteorology-I

L T P
4 0 0

Unit-I

(10 Lectures)

The Atmosphere: Different Layers of Atmosphere, Composition of gases in atmosphere, Vertical extent of atmosphere, vertical classification of atmosphere, Properties of each layer of atmosphere, physical properties of air, atmosphere, pressure, temperature, density, humidity, Newton law of motion, Bernoulli's principles.

Unit-II

(10 Lectures)

Temperature: Definition of temperature, different units of measurements, Vertical distribution of temperature, Different mode of transfer of heat, solar and terrestrial Radiation, Nocturnal cooling, Conduction, convection, Advection and Turbulence, Lapse rate, stability and instability, Development of inversions, type of inversions, temperature near the earth's surface, Surface effects, Diurnal variation, Effect of clouds, Effect of wind.

Unit-III

(10 Lectures)

Atmospheric Density and Pressure: Inter-relationship of pressure, Temperature and Density, International Standard Atmosphere, Altimetry Pressure, True Altitude, Height, Altitude, Flight Level, Altimeter settings, QNH, QFE, QNE, QFF, Density affecting the performance of aircraft, Low Pressure system, High pressure system, cold, Difference in wind pattern, visibility and weather in different pressure system, Density altitude.

Unit-IV

(10 Lectures)

Winds: Definition and measurement of Wind, Primary cause of Wind, Pressure Gradient, Coriolis Force, Gradient Wind, General circulation of Wind, Turbulence, gustiness, type of turbulence, Origin and Location of Turbulence, Variation of Wind with height, Variation of wind in the friction layer, Variation of the wind caused by fronts, Wind related to pressure system, Local winds, Anabatic and Katabatic, Land and sea breezes, Vertical movements, Mountain waves, Wind shear, Turbulence.

Unit-V

(10 Lectures)

Visibility: Definition of Visibility, Visibility reducing phenomenon, Reduction and visibility caused by mist, smoke, dust, sand, Haze and precipitation, Reduction of visibility caused by low drifting and blowing snow, Difference between mist, fog and haze, dust storm, Runway Visual Range (RVR), Horizontal Visibility, Vertical Visibility, Slant Visibility.

Reference Books:

- Aviation meteorology by I.C Joshi
- Ground studies for pilots – Aviation Meteorology
- Oxford - Meteorology

BAVI701P: Flight Planning Lab

L T P
0 0 2

List of Experiments:

- 1) Understanding, Coordination with different agencies.
- 2) Filling of Flight Plan
- 3) Mode of submissions of flight plan
- 4) Obtaining FIC and ADC
- 5) Study of NOTAM
- 6) ATIS
- 7) Weather obtaining procedures.

Reference Books:

- Ground Studies for Pilots: Flight Planning by Peter J. Swatton
- Flight Plan: The Real Secret of Success by Brian Tracy

BAVI702T: Airport Planning & Operations

L T P
4 0 0

Unit-I

(8 Lectures)

Airport an Operational System: Private Airports and Public use Airports, Commercial Service Airports and Primary Commercial Service Airports, General Aviation Airports, Deliver Airports. Components of an Airports, L and Side. Airport as a System Function of Airport and Complexity of Airport Operation.

Unit-II

(10 Lectures)

Airport Planning: Need of Airport System planning. Airport Master Plan. Airport layout plan- For-casting Facility Requirements, Design Alternatives. Financial plans, Land Use Planning and Environmental Planning.

Unit-III

(12 Lectures)

Ground Handling: Passenger Handling, Ramp Handling - Aircraft Ramp Servicing, Ramp Layout, Departure Control. Division of Ground handling responsibility. Ground handling Efficiency. Baggage Handling and its Operations - Operating Characteristics of Baggage Handling System - Inbound Baggage systems, Outboard Baggage System - Operating performance and Organizing for the task.

Unit-IV

(12 Lectures)

Passenger Terminal Operations and Cargo Operations: Function of the Passenger Terminal, Philosophies of Terminal Management. Direct Passenger Services, Airline related Passenger Services, Airline Related Operation Functions. Governmental requirements - Non - Passenger Related Airport Authority Functions, Processing Very Important Persons. Passenger Information system. Air Cargo Market - Expanding the Movement. Flow through the cargo Terminal unit, Loading Devices. Handling with in the terminal Cargo Apron Operations - Computerization of Facilitation. Example of Modern Cargo Design - Fright Operations for integrated carrier.

Unit-V

(10 Lectures)

Airport Technical Services and Access: Scope of Technical services – Air traffic Control
Telecommunications Metrology - Aeronautical Information. Access as a part of Airport System
- Factors Effecting Access Mode Choice, Access Users and Model Choice, Access Interaction
with Passenger Terminal Operation, Access Modes in - Town and Off - Airport Terminals.

Reference Books:

- Airport Planning and Management, 5th edn, by McGraw - Hill, 2004, Well, A. T. And Young, S. B.
- Airport Operations, McGraw - Hill, 1997 by Ashford, N. Stanton, H.P.M. and Moore
- Airport Design and Operation, 2nd end, Elsevier, 2007 by Kazda, A and Caves, R. E.
- Planning and Design of Airport, 5th end. McGraw - Hill, 2010 by Ho ronjeff, R. McKelvey, F. X. Sproule, W. J. And Young, S. B.

BAVI801T: Meteorology-II

L T P
4 0 0

Unit-I

(10 Lectures)

Clouds: Types of clouds according to their height and form, Precipitation, Humidity, Dew point temperature, Adiabatic process, the Fohn wind effect, Precipitation associated with cloud, cumino nimbus, Ice crystal theory, Coalescence theory, Giant nuclei theory, Types of cloud, Various Mountain Clouds, necessary condition for the formation of clouds, condensation trails.

Unit-II

(12 Lectures)

Thunderstorm and Air Masses: Necessary conditions for thunderstorm, life cycle of a thunderstorm, the danger of thunderstorm Air masses, the origin of an air mass, its path, divergence and convergence, the warm front, observation from the ground, observation from the air, the cold front, observation from the ground, observation from the air, the occluded front, depressions, 124 weather associated with it, trough of low pressure, the wave of frontal depression, the cyclone storm, anti-cyclone, weather associated with it, a ridge of high pressure.

Unit-III

(8 Lectures)

Icing: The dangers of icing, the formation of ice, super-cooled water drops, clear ice, Rime ice, cloudy ice, hoar frost, Deicing, anti-icing, structural icing and cloud type, carburettor icing, pitot static system icing.

Unit-IV

(10 Lectures)

Weather Forecast and Reports: Dissemination of weather information, AIR MET service, types of weather information, meteorological forecast, special forecast, aerodrome forecast, Terminal Aerodrome forecast (TAF), METAR, TRENDS, Speci, Cloud base, VFR- in flight weather report, Automatic Terminal Information System (ATIS), Notam, Sigmet.

Unit-V

(10 Lectures)

Symbols and Abbreviations: Symbols for significant weather on MET charts, weather abbreviations (Cloud Type), Cloud amount, CB amount, common MET abbreviations,

CAVOK, TEMPO, lasting change, Synoptic charts, wind symbols, visibility, METAR decoding.

Reference Books:

- Aviation meteorology by I.C. Joshi
- Oxford- meteorology
- The Air Pilot's Manual, Vol 2, Peter. D. Godwin
- Ground Studies for Pilots – Meteorology

BAVI801P: Flight Vehicle Design and Instrumentation Lab

L T P
0 0 2

List of Experiments: -

1. Aircraft Conceptual 3D sketching
2. Creating Airfoil and sketching
3. Estimating Wing Loading
4. Initial sizing of a Transport Aircraft
5. Weight Estimation of Fighter Aircraft
6. Design of Crew compartment
7. Wing Design and Drag Estimation
8. Engine Sizing
9. Cost Estimation
10. Horizontal and Vertical Tail Design

Reference Books:

- AIRCRAFT DESIGN: A Conceptual Approach AIAA Book ISBN:0-930403-51-7 by Daniel P Raymer

BAVI802T: Air Regulation-II

L T P
4 0 0

Unit-I

(10 Lectures)

Rules of The Air: Applicability of rules of the air, General Rules-Protection of persons & property, Surface movement of Aircraft, Lights to be displayed by aircraft, Flight plans, VFR, IFR, SVFR, Airspace classification, FIRs & Location indicator, Air Défense Identification Zones, Restricted Areas, Prohibited Area, Danger Area, Navigational lights to be displayed in the aircraft.

Unit-II

(10 Lectures)

Interceptions of Civil Aircraft: Interceptions of civil aircraft, procedure, signals for use in the event of interception, phrases for use by intercepting/intercepted aircraft, signals initiated by intercepted aircraft and response by intercepting aircraft, visual signals for aerodrome traffic, visual ground signals, marshalling signals, indicators & signaling devices wind direction indicators, landing direction indicator, signaling lamp, signal panel and signal area.

Unit-III

(12 Lectures)

Aerodromes: Location- Characteristics- Identification Aeronautical Beacon- Beacon Characteristics, right of way on the ground, Runway Markings-Threshold Markings Holding position markings, Taxiway markings, Runway lightings-wing bar lights, Taxiway lightings-stop way lights, Isolated aircraft parking position, Aircraft stand markings, Apron safety lines, Road holding position marking, mandatory instruction marking, Declared Distances.

Unit-IV

(10 Lectures)

Facilitation: Definitions, Entry & Departure of aircraft-Description, Purpose & use of aircraft documents, General Declaration-Entry & departure of persons and their baggage Entry requirement & amp; procedures for crew & other operator's personnel, National Provisions-Customs duty on aircraft, Customs requirement.

Unit-V

(8 Lectures)

ICAO Annexure Terminology: Various definitions, terminologies used in aviation.

Reference Books:

- Air Pilot's Manual, Vol 2, Aviation Laws by Peter. D. Godwin
- Air Regulation Part 1 by R.K Bali.
- Air Regulation Part 2 by R.K Bali.

Department Specific Elective

BAVI101D-I: Radio Aids

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4 0 0

Unit-I

(12 Lectures)

Direction Finding Aids: Basic Radio Propagation Principles. VDF-Principles, Factors affecting range (D), Factors affecting accuracy, VHF let down service. ADF/NDB-Types of NDB, principles of airborne D/F, frequency range, ADF, RBI, RMI, uses of RBI, Errors (ADF and NDB), and Accuracy. VOR (VHF OMNIRANGE)-Principle of operation, airborne equipment, frequency range, Factors affecting accuracy, factors affecting range. RMI-Advantages and use of RMI, HSI.

Unit-II

(8 Lectures)

Basic Radar: Introduction to RADAR principles, Primary RADAR, Secondary RADAR, Terminology, Advantages and Disadvantages of primary and secondary RADAR, RADAR parameters, use of RADAR, Types of ground radar services, Use of Surveillance RADAR, Types of radar approaches.

Unit-III

(10 Lectures)

Airborne Weather Radar and Cockpit Displays: Introduction to CRT and LCD Head-up display, Principle of operation and functions of airborne weather Radar, Types of antennae and beam used, Selection of frequency, Intensity of weather displayed in colour display, Iso echo circuit, Controls in panel, Mapping display, hazard detections.

Unit-IV

(12 Lectures)

Secondary Radar Theory and DME: Introduction to Secondary Radar principle, Transponder, airborne equipment, working principle of DME, Saturation of ground equipment, Distance calculation, slant range, Search mode, Track mode, co-located VOR and DME, ILS paired DME, Use of the equipment.

Unit-V

(8 Lectures)

Secondary Surveillance Radar: Working principle of SSR, Frequency used, Advantages and disadvantages of SSR, current modes and codes, Mode 'C' and 'S' interrogation, Advantage of

Mode S, SQUAWK codes, Fruiting and Garbling.

Reference Books:

- Oxford- Navigation 2(Radio Navigation)
- Ground studies for Pilots-Radio Aids
- General navigation by R.K. Bali
- Guide to Radio telephony, Radio aids and avionics.

BAVI101D-II: Aero Engines

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Unit-I

(6 Lectures)

Gas Turbine Theory: Introduction, Jet engine types, principle of jet thrust, engine efficiency, factors affecting thrust, internal engine parameter change, The gas turbine cycle, effects of Ram, density, and Temperature.

Unit-II

(12 Lectures)

Air Intakes: Intake design, Design requirement of an ideal air intake, Airflow through Ducts, Types of Air intake design (simple pitot, conical spike, wedge type), Subsonic Intake & Intake operation (critical, sub critical & super critical operations), Supersonic intake, shock waves, supersonic theory & supersonic inlet duct three speed zones operations (subsonic, Transonic & supersonic), Types of intakes for supersonic flight (pitot type & External compression, External compression types (Two shock, three shocks, Isentropic Amp; variable geometry intakes), Super intake critically (critical, sub critical & super critical operations).

Unit-III

(12 Lectures)

Compressors: Introduction, design basic requirement of a compressor, Centrifugal Compressor, Main feature of single stage centrifugal compressor, Principles of operation & efficiency loss of CF Compressor, airflow through double entry impeller, , diffuser system, Axial flow compressor , construction & its principles of operation, Reverse flow compressor, The main features of axial flow compressors, 63 compressor stall & surging, Stall conditions/occasions (At low & high RPM & acceleration stall) effects of compressor surge, Avoidance of compressor stall & surge (variable position guide vanes, air release valves (Bleed valves), multi spool engines, Variable area nozzle), compressor icing Axial & centrifugal type and causes of icing, comparison of axial flow and centrifugal flow compressor engines.

Unit-IV

(10 Lectures)

Combustion Systems: Introduction, combustion system requirements, Basic types of combustion chambers, multiple combustion chambers, The annular combustion chamber, cannular combustion chamber, The direct flow type combustion chamber, Reverse flow combustion chamber, Advantage & disadvantages of Annular over other two types of CC, Fuel

injection and vaporization, Atomization of fuel, Types of Burners (simplex, duplex, spill & Lubbock).

Unit-V

(10 Lectures)

Turbines: Introduction, turbine principle of operation, constructions of Reaction and impulse turbine, Basic Material requirements of turbine, turbine faults (loss of tip clearance, buckling, cracking and distortion, FOD, Turbine blade containment), turbine blade creep, Types of installations (Single spool, multi spool, Direct couple & free turbines), nozzle guide vanes (NGV), Exhaust system & its components (Exhaust unit, Jet pipe & Propelling Nozzle), Turbofan Engines: Turbofan engine layout, Bypass ratio, Turbofan engine performance, Turboprop Engines: principle of operation, types of turboprop engines, turboprop reduction gearing, propeller and engine control (constant speed control unit), turboprop performance, Introduction, Turbo Prop aircraft, principle of operation.

Reference Books:

- The Professional Pilot Study Guide Series, Mike Burton.
- Aerodynamics, Engines and Airframe Systems for Air Transport Pilot, A Trevor Thom Manual.
- Heat transfer: J.P.Holman, McGraw Hill.
- I.C.Engines: L.C.Litchy, McGraw Hill.
- Gas Turbine Theory: Cohen, Rogers and Saravanamuttu, Pearson Education
- Heat transfer: B.Gebhart, McGraw Hill.
- Elements of Gas Turbine Propulsion: J.D. Mattingly, McGraw Hill.
- Airframe and power plant mechanics – power plant hand FAA
- Fundamentals of Aero-Engines by A. Viswanathakurup
- Aircraft Propulsion and Gas Turbine Engines 2Nd Edition by Ahmed F El-Sayed, Taylor & Francis
- Aircraft Propulsion by Smithsonian Air and Space Museum

BAVI102D-I: Aircraft Instruments

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Unit-I

(10 Lectures)

Pressure Instruments: Revision on atmospheric pressure, static pressure, dynamic pressure, Pressure system, Pressure altimeter, simple altimeter, sensitive altimeter, servo-assisted altimeter- its working principle and construction, 10000 feet warning flag, altimeter errors, blockage and leakage associated with altimeter, purpose of servo assisted altimeter, Hysteresis.

Unit-II

(10 Lectures)

Airspeed Indicators: Working Principle and construction of ASI, speeds which are mentioned on the dial of ASI using coloured ark, IAS, TAS, EAS, CAS, RAS, conversion, error, leakages and blockages associated with ASI. Mach meter, its principle, Mach/TAS calculations, Mach meter errors.

Unit-III

(10 Lectures)

Vertical Speed Indicator: Working principle and construction of VSI, Delayed Static pressure, best rate of climb (V_y), Best angle of climb (V_x), Pressure error, Time lag, Position error and blockages, Instantaneous vertical speed indicator (IVSI), Purpose of IVSI, Dashpot, Problem with Dashpot during turn.

Unit-IV

(8 Lectures)

Magnetism and Compass: Earth magnetism, Properties of magnet, Horizontality, sensitivity, aperiodicity, turning error, acceleration error, variation and deviation, Compass heading, magnetic heading, true heading.

Unit-V

(12 Lectures)

Gyro Instruments: Properties and fundamentals of gyros, types of gyros-space gyro, earth gyro, tied gyro, rate gyro, drift, topple and wander, gyro rotor, spin axis Direction Indicator Principle of operation, adjustment procedure, erection system, gimbal error, Drift calculation, Drift compensation Attitude Indicator- Principle and construction, erection mechanism,

acceleration errors, turning errors, electrically driven attitude indicator and its errors Turn and slip Indicator- Principle and construction, bank indication, turn coordinator.

Reference Books:

- GSP – Flight instruments
- Aircraft systems: Ian Moir and Allan Seabridge
- Aircraft instruments: E H J Pallet
- Oxford – general Knowledge 4 (Instrumentation)

BAVI102D-II: Aircraft System

L T P
4 0 0

Unit-I

(10 Lectures)

Hydraulic and Pneumatic Power Systems: Hydraulic System lay-out; Reservoir, pumps, actuator, valves. Pneumatic System lay-out; sources: engine/APU, compressors, air bottles, ground supply, pressure control; distribution.

Unit-II

(14 Lectures)

Air Conditioning and Cabin Pressurization: Air Supply-sources of air supply including engine bleed, APU and ground cart; Air conditioning systems; Air cycle and vapour cycle machines distribution systems; Flow, temperature and humidity control system. Pressurization-Pressurization systems; control and indication including control and safety valves; cabin pressure controllers, safety and warning devices; protection and warning devices.

Unit-III

(10 Lectures)

Fuel Systems: System lay-out, fuel tanks, supply systems, dumping, venting and draining, cross-feed and transfer, indications and warnings, refuelling and defueling, longitudinal balance fuel systems.

Unit-IV

(14 Lectures)

Landing Gear: Construction, shock absorbing, extension and retraction systems, normal and emergency, Indications and warning, wheels, brakes, antiskid and auto braking, tyres, steering, air-ground sensing, skids, floats.

Unit-V

(12 Lectures)

Engine Fuel Systems: Carburettor types, construction and principles of operation, icing and heating, Types of fuel system, construction and principle of operation, Starting systems, pre-heat systems, Magneto types, construction and principles of operation, ignition harness, spark plugs-, low- and high-tension systems.

Reference Books:

- Professional Pilot Study Guide (Mike Burton)
- Oxford ATPL ground training series-Airframe system.
- Aircraft systems: Ian Moir and Allan Seabridge
- Aircraft instruments: E H J Pallet

BAVI103D-I: Civil Aviation Requirements (CAR) and Safety Management Systems

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Unit-I

(12 Lectures)

Introduction: Purpose of Civil Aviation requirement (CAR), purpose of safety management systems, applications, circulars, sections pertaining to various operations.

Unit-II

(12 Lectures)

Aviation Environmental Protection: Noise management of aircraft, Noise Abatement operational Procedure, aircraft operations at airport, climate change initiatives and local air quality monitoring in civil aviation.

Unit-III

(12 Lectures)

Civil Aviation Requirements (CAR): Section 1 to Section 11

General, Airworthiness, Air transport, Aerodrome standards, Air safety, Design standard and type certification, Flight crew standard training & licensing, Aircraft operations, Airspace and air navigation service standards, Aviation environment protection, Safe transport of dangerous goods by air.

Unit-IV

(12 Lectures)

Safety Management System (SMS): Indian safety policy, Indian safety plan, SMS, SSP, ICAO ANNEX 19- Safety management, establishment of safety management system, applicability of SMS, safety policy and objective, coordination of emergency response planning, documentation, safety management system manual, safety risk management, safety assurance, safety promotions, quality policy.

Unit-V

(12 Lectures)

Case Studies: Description, error, cause of accident and solution of following accidents.

American Airlines Flight 587, Aires Flight 8250, American airlines flight 191, Air France 447, Flight Itavia 870.

Reference Books:

- DGCA website for latest CAR updates.
- Aerodrome Information Publication (AIP)

BAVI103D-II: Aviation Security

L T P
4 0 0

Unit-I

(8 Lectures)

Definitions, Objectives and Threats: Aviation security and Airport security – Terminologies related to aviation security – Objectives of Aviation security – Nature of threats – Types / Characteristics of offenders.

Unit-II

(8 Lectures)

Screening and Searching of Passengers and Staff: Stages involved in inspection/screening process – Equipment's required for screening – X-ray examination of baggage – Physical inspection of baggage.

Unit-III

(10 Lectures)

Restricted Articles and Substances: Definition – Categories of restricted articles – Improvised explosive devices – Places of concealment of Explosives – Types of explosives detectors – Bomb threat – Threat to an airborne aircraft.

Unit-IV

(12 Lectures)

Aircraft Hijacking and International Conventions: Unlawful seizure of Aircraft (Hijacking) – Why is Civil aviation considered as an attractive target? Where can the threats come from? – Historical review of the past incidents – Dealing with the hijacking situation onboard – Tokyo convention Hague convention – Montreal convention.

Unit-V

(12 Lectures)

Hostage Negotiation: Hostage situation – Hostage situation move through several distinct phases – Hostage takers – The negotiator arrives on the scene – Negotiator objectives and tactics – Making a deal with the hostage taker – Role of Cabin crew in hostage situation.

Reference Books:

- Brown R.K. Bali – Regulation
- Kathleen M. Sweet – Aviation and airport security
- ICAO Annex 17

BAVI104D-I: Flight Performance and Planning

L T P
4 0 0

Unit-I

(12 Lectures)

Take-Off Performance: Using performance data, effects of weight and altitude, Take- Off performance, wind factors, Runway inclination, Condition of Runway, V_1 , V_2 , V_r , V_{lof} , V_{mbe} , V_{mcg} , V_{mca} , Take- Off flap setting, factors affecting take-off performance.

Unit-II

(12 Lectures)

Landing Performance: Landing performance data, factors affecting landing performance, effects of weight and altitude, wind factors, runway surface, runway slope, Runway condition, flap setting, recommended safety factors for landing, approach speeds.

Unit-III

(10 Lectures)

Runway Characteristics: Take-off distance available (TODA), Take-Off run available (TORA), clearway, rejected Take-Offs, emergency distance, stop way, landing distance available (LDA). Accelerate Stop Distance Available (ASDA).

Unit-IV

(8 Lectures)

EN Route Performance: Power required and power available curves, range and endurance, best -range speed, maximum- range speed, best endurance speed, cost index, influence of density, weight of aircraft, winds, ceiling, service ceiling, absolute ceiling.

Unit-V

(8 Lectures)

Weight and Balance: Definitions (basic empty weight, maximum zero fuel weight, maximum take-off weight, maximum landing weight, payload, rap weight), weight of fuel, weight restrictions, effect of cg on the position of airplane, movement of CG position, mathematical approaches to weight and balance, dangerous goods, baggage and cargo restraint.

Reference Books:

- Oxford – Flight Performance and planning.
- Ground studies for pilots, Flight planning.
- Introduction to Flight: J D Anderson, Mc Graw Hill.
- Fundamentals of Aerodynamics: J D Anderson, Mc Graw Hill.
- Aerodynamics for Engineering Students: E L Houghton and N.B. Carruthers, Arnold Publisher.

BAVI104D-II: Dangerous Goods Management

L T P
4 0 0

Unit-I

(8 Lectures)

Carriage Of Dangerous Goods: ICAO requirements – Government of India requirements – Aircraft Act 1934 – The aircraft (Carriage of dangerous goods) Rules, 2003.

Unit-II

(8 Lectures)

Dangerous Goods Definitions: Definition of dangerous goods – Dangerous goods categories.

Unit-III

(10 Lectures)

Classification of Dangerous Goods: Name of the class – Divisions – Identification – Packing – Marking and labelling.

Unit-IV

(12 Lectures)

Air Cargo Concept: Introduction–Operations and Industry Regulations–Service Function, Organisation and Liability – SLI, Types of cargo-Handling of Perishable, Valuable Cargo and Special Cargo. -Air cargo Tariff, Rates & Charges – Valuation charges and Disbursement-Airway Bill, Function, Purpose and Validation.

Unit-V

(12 Lectures)

Handling Facility: Airport Cargo Activity & Cargo Zone. -Aircraft Handling with Cargo. - Cargo Terminals and Facilities. -Emerging trend in Cargo & Cargo Carriers.

Reference Books:

- Annex 19
- Oxford – Air Law
- John F Magee & William C Copalino, — Modern Logistics Management, John Wiley & Sons.

**Skill Based: Skill
Enhancement Courses**

BAVI101SB: Aircraft Maintenance and Air Transportation

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Unit-I

(8 Lectures)

Air Traffic Control: Principles of Air Navigation and Air Traffic Control, Overview of CNS & ATM, Separation standards, Radar and Non-radar separation, Wake turbulence longitudinal separation minima, Precision approaches for landing, Radar systems for ATC.

Unit-II

(8 Lectures)

Airlines: Introduction to airline industry and economics, Determination of operating costs, Airline route selection and scheduling, Planning of flight operations, Special topics in airline operations, Emergence of LCC.

Airports: Aircraft characteristics affecting airport design, Airport layouts and configurations, Geometric design of the airfield, Wind Rose Diagram, Geometric design of the airfield.

Unit-III

(10 Lectures)

Current Issues and Trends in Air Transportation: Modelling & Simulation of ATC systems, Estimation of airway Capacity & Delay, Human factors and Controller Workload, Performance based Navigation, Free Flight, Conflict Detection and resolution, Environmental effects of Aviation, Modelling air transport systems.

Unit-IV

(12 Lectures)

Maintenance Schedules: Maintenance of aircraft, its components, systems and sub-systems. Types of maintenance schedules, Mandatory schedules, Inspection of aircraft and components: Types of Inspections, Various Aircraft Manuals, Service Letters, Service Bulleting, Advisory Circulars, Repair, Modifications, Alteration, Reconditioning, History Record Sheet.

Unit-V

(12 Lectures)

Maintenance of Structure and Various Systems Maintenance of aircraft structure, Propeller, Power-plant, Undercarriage, Hydraulic system, Fuel system, Air-conditioning system.

Aircraft Assembly and Rigging Aircraft Assembly, Rigging, Alignment of fixed surfaces and flight controls systems in details, Balancing, Inspection and Maintenance. Flight control system of Helicopter.

Reference Books:

- Aircraft Maintenance and Repair: Kroes et.al, GLENCOE.
- Fundamentals of Air Traffic Control: Michael S. Nolan, Thomson Brooks, Cole, USA.
- Airline Route Planning: John H. H. Grover, BSP Professional Books, Blackwell Scientific Publications, Oxford, UK.
- Air Transportation: A Management Perspective: John G. Wensveen, Ashgate Publishing, Ltd., UK.
- Aircraft Basic Science: Kroes et.al, GLENCOE
- An Introduction to Airline Economics: William E. O'Connor, Greenwood Publishing Group
- Planning and Design of Airports: Robert Horonjeff & Francis X. McKelvey, McGraw Hill Professional Publishing.
- Air Transportation Systems Engineering: George L. Donohue, Andres G. Zellweger, Editors, American Institute of Aeronautics and Astronautics.

BAVI102SB: UAV Modelling & Design

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Importance of Diagnosis of Diseases: Bacterial, Viral, Fungal and Protozoan Diseases of various human body systems, Disease associated clinical samples for diagnosis.

Collection of Clinical Samples: How to collect clinical samples (oral cavity, throat, skin, Blood, CSF, urine and faeces) and precautions required. Method of transport of clinical samples to laboratory and storage.

Direct Microscopic Examination and Culture: Examination of sample by staining - Gram stain, Ziehl-Neelson staining for tuberculosis, Giemsa stained thin blood film for malaria, Preparation and use of culture media - Blood agar, Chocolate agar, Lowenstein-Jensen medium, MacConkey agar, Distinct colony properties of various bacterial pathogens.

Serological and Molecular Methods: Serological Methods - Agglutination, ELISA, immunofluorescence, Nucleic acid based methods - PCR, Nucleic acid probes

Kits for Rapid Detection of Pathogens: Typhoid, Dengue and HIV, Swine flu

Testing for Antibiotic Sensitivity in Bacteria: Importance, Determination of resistance/sensitivity of bacteria using disc diffusion method, Determination of minimal inhibitory concentration (MIC) of an antibiotic by serial double dilution method.

Reference Books:

- Ananthanarayan R and Paniker CKJ (2009) Textbook of Microbiology, 8th edition, Universities Press Private Ltd.
- Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
- Randhawa, VS, Mehta G and Sharma KB (2009) Practicals and Viva in Medical Microbiology 2nd edition, Elsevier India Pvt Ltd
- Tille P (2013) Bailey's and Scott's Diagnostic Microbiology, 13th edition, Mosby
- Collee JG, Fraser, AG, Marmion, BP, Simmons A (2007) Mackie and McCartney Practical Medical Microbiology, 14th edition, Elsevier.

BAVI103SB: Biofertilizers and Biopesticides

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Biofertilizers: General account of the microbes used as biofertilizers for various crop plants and their advantages over chemical fertilizers. Symbiotic N₂ fixers: *Rhizobium* - Isolation, characteristics, types, inoculum production and field, application, legume/pulses plants; *Frankia* - Isolation, characteristics, Alder, Casurina plants, non-leguminous crop symbiosis. Cyanobacteria, *Azolla* - Isolation, characterization, mass multiplication, Role in rice cultivation, Crop response, field application.

Non - Symbiotic Nitrogen Fixers: Free living *Azospirillum*, *Azotobacter* - free isolation, characteristics, mass inoculums, production and field application.

Phosphate Solubilizers: Phosphate solubilizing microbes - Isolation, characterization, mass inoculum production, field application

Mycorrhizal Biofertilizers: Importance of mycorrhizal inoculum, types of mycorrhizae and associated plants, Mass inoculum production of VAM, field applications of Ectomycorrhizae and VAM.

Bioinsecticides: General account of microbes used as bioinsecticides and their advantages over synthetic pesticides, *Bacillus thuringiensis*, production, Field applications, Viruses – cultivation and field applications.

Reference Books:

- Kannaiyan, S. (2003). Bioethnology of Biofertilizers, CHIPS, Texas.
- Mahendra K. Rai (2005). Hand book of Microbial biofertilizers, The Haworth Press, Inc. New York.
- Reddy, S.M. et. al. (2002). Bioinoculants for sustainable agriculture and forestry, Scientific Publishers.
- Subba Rao N.S (1995) Soil microorganisms and plant growth Oxford and IBH publishing co. Pvt. Ltd. NewDelhi.
- Saleem F and Shakoori AR (2012) Development of Bioinsecticide, Lap Lambert Academic Publishing GmbH KG
- Aggarwal SK (2005) Advanced Environmental Biotechnology, APH publication.

BAVI104SB: Food Fermentation Techniques

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Fermented Foods: Definition, types, advantages and health benefits

Milk Based Fermented Foods: Dahi, Yogurt, Buttermilk (Chach) and cheese: Preparation of inoculums, types of microorganisms and production process

Grain Based Fermented Foods: Soy sauce, Bread, Idli and Dosa: Microorganisms and production process

Vegetable Based Fermented Foods: Pickels, Saeurkraut: Microorganisms and production process

Fermented Meat and Fish: Types, microorganisms involved, fermentation process

Probiotic Foods: Definition, types, microorganisms and health benefits.

Reference Books:

- Hui YH, Meunier-Goddik L, Josephsen J, Nip WK, Stanfield PS (2004) Handbook of food and fermentation technology, CRC Press
- Holzapfel W (2014) Advances in Fermented Foods and Beverages, Woodhead Publishing.
- Yadav JS, Grover, S and Batish VK (1993) A comprehensive dairy microbiology, Metropolitan
- Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7th edition. Springer

BAVI105SB: Management of Human Microbial Diseases

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Human Diseases: Infectious and non infectious diseases, microbial and non microbial diseases, Deficiency diseases, occupational diseases, Incubation period, mortality rate, nosocomial infections

Microbial diseases: Respiratory microbial diseases, gastrointestinal microbial diseases, Nervous system diseases, skin diseases, eye diseases, urinary tract diseases, Sexually transmitted diseases: Types, route of infection, clinical systems and general prevention methods, study of recent outbreaks of human diseases (SARS/ Swine flu/Ebola) – causes, spread and control, Mosquito borne disease – Types and prevention.

Therapeutics of Microbial diseases: Treatment using antibiotics: beta lactam antibiotics (penicillin, cephalosporins), quinolones, polypeptides and aminoglycosides. Judicious use of antibiotics, importance of completing antibiotic regimen, Concept of DOTS, emergence of antibiotic resistance, current issues of MDR/XDR microbial strains. Treatment using antiviral agents: Amantadine, Acyclovir, Azidothymidine. Concept of HAART.

Prevention of Microbial Diseases: General preventive measures, Importance of personal hygiene, environmental sanitation and methods to prevent the spread of infectious agents transmitted by direct contact, food, water and insect vectors.

Vaccines: Importance, types, vaccines available against microbial diseases, vaccination schedule (compulsory and preventive) in the Indian context.

Reference Books:

- Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
- Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
- Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier
- Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition

