Study Scheme & Syllabus of

Bachelor of Science

Honours (Aircraft Maintenance)

Batch 2018 onwards

By

Board of Studies Aerospace / Aeronautical Engineering

Department of Academics

IK Gujral Punjab Technical University

Semester-I

Course Code	Course Title	Lord Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Int.	Ext.		
BSCARM101-18	Aerodynamics	4	0	0	40	60	100	4
BSCARM102-18	Ground Handling Safety and Support System	4	0	0	40	60	100	4
BSCARM103-18	Physics	4	0	0	40	60	100	4
BSCARM104-18	Mathematics	5	1	0	40	60	100	6
BSCARM105-18	Workshop Practices	4	0	0	40	60	100	4
BSCARM106-18	Aerodynamics Lab	0	0	4	20	30	50	2
BSCARM107-18	Ground Handling safety and support System Lab	0	0	4	20	30	50	2
BSCARM108-18	Physics Lab	0	0	4	20	30	50	2
BSCARM109-18	Workshop Practices Lab	0	0	4	20	30	50	2
BMPD-101-18	Mentoring and Professional Development	0	0	2	Satisfactory/Un-Satisfactory			Non Credit
	TOTAL	**21**	**1**	**18**	**280**	**420**	**700**	**30**

Semester-II

Course Code	Course Title	Lord Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Int.	Ext.		
BSCARM201-18	Aircraft Structure and Associated Systems	4	0	0	40	60	100	4
BSCARM202-18	Electronic Fundamentals and Digital Techniques- I	4	0	0	40	60	100	4
BSCARM203-18	Electrical Fundamentals - I	4	0	0	40	60	100	4
BSCARM204-18	Electrical Fundamentals – II	4	0	0	40	60	100	4
BSCARM205-18	English Communication	5	1	0	40	60	100	6
BSCARM206-18	Aircraft Structure and Associated Systems Lab	0	0	4	20	30	50	2
BSCARM207-18	Electronic Fundamentals and Digital Techniques - I Lab	0	0	4	20	30	50	2
BSCARM208-18	Electrical Fundamentals - I Lab	0	0	4	20	30	50	2
BSCARM209-18	Electrical fundamentals - II Lab	0	0	4	20	30	50	2
BMPD-201-18	Mentoring and Professional Development	0	0	2	Satisfactory/Un-Satisfactory			Non Credit
	TOTAL	**21**	**1**	**18**	**280**	**420**	**700**	**30**

Semester-III

Course Code	Course Title	Lord Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Int.	Ext.		
BSCARM-301-18	Aircraft Systems-I	4	0	0	40	60	100	4
BSCARM-302-18	Aircraft Materials and Hardware	4	0	0	40	60	100	4
BSCARM-303-18	Human factors	5	1	0	40	60	100	6
BSCARM-304-18	Piston Engines and Propellers	4	0	0	40	60	100	4
BSCARM-305-18	Electronic Fundamentals and Digital Techniques-II	4	0	0	40	60	100	4
BSCARM-306-18	Aircraft Systems-I Lab	0	0	4	20	30	50	2
BSCARM-307-18	Aircraft Materials and Hardware Lab	0	0	4	20	30	50	2
BSCARM-308-18	Piston Engines and Propellers Lab	0	0	4	20	30	50	2
BSCARM-309-18	Electronic Fundamentals and Digital Techniques-II Lab	0	0	4	20	30	50	2
	TOTAL	**21**	**1**	**16**	**280**	**420**	**700**	**30**

Semester-IV

Course Code	Course Title	Lord Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Int.	Ext.		
BSCARM-401-18	Aircraft Systems-II	4	0	0	40	60	100	4
BSCARM-402-18	Aircraft Maintenance Practices	4	0	0	40	60	100	4
BSCARM-403-18	Gas Turbine Engine	4	0	0	40	60	100	4
BSCARM-404-18	Aviation Legislation	5	1	0	40	60	100	6
BSCARM-405-18	Chemistry	4	0	0	40	60	100	4
BSCARM-406-18	Aircraft Systems-II Lab	0	0	4	20	30	50	2
BSCARM-407-18	Aircraft Maintenance Practices Lab	0	0	4	20	30	50	2
BSCARM-408-18	Gas Turbine Engine Lab	0	0	4	20	30	50	2
BSCARM-409-18	Chemistry Lab	0	0	4	20	30	50	2
	TOTAL	**21**	**1**	**16**	**280**	**420**	**700**	**30**

Semester-V

Course Code	Course Title	Lord Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Int.	Ext.		
BSCARM-501-18	Avionics	4	0	0	40	60	100	4
BSCARM-502-18	Corrosion and NDT Techniques	4	0	0	40	60	100	4
BSCARM-503-18	Environmental Science	4	0	0	40	60	100	4
BSCARM-504-18	Avionics Lab	0	0	4	20	30	50	2
BSCARM-505-18	Corrosion And NDT Techniques Lab	0	0	4	20	30	50	2
BSCARM-506-18	Project-I	-	-	6	100	50	150	3
	TOTAL	12	0	14	260	290	550	19

Semester-VI

Course Code	Course Title	Lord Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Int.	Ext.		
BSCARM-601-18	Aircraft Stores	8	0	0	40	60	100	8
BSCARM-602-18	Aircraft (Hydraulic) Component Maintenance	4	0	0	40	60	100	4
BSCARM-603-18	Typical Piston Engine Maintenance	4	0	0	40	60	100	4
BSCARM-604-18	Aircraft (Hydraulic) Component Maintenance Lab	0	0	4	20	30	50	2
BSCARM-605-18	Typical Piston Engine Maintenance Lab	0	0	4	20	30	50	2
BSCARM-606-18	Project-II	-	-	6	100	50	150	3
	TOTAL	16	0	14	260	290	550	23

CHOICEBASEDCREDITSYSTEM

B.Sc. Honours
(AIRCRAFT MAINTENANCE)

Core Course – B.Sc. Honours (Aircraft Maintenance)

Subject: Aerodynamics **Subject Code: BSCARM-101-18**

Objectives:

The objective of this course is to introduce students to the advanced concepts of aerodynamics, flow dynamics and factors affecting aircraft stability and control. The course provides students with the physics of atmosphere; and basic aerodynamics including: the airflow around a body, airfoil sections, the aerodynamic forces acting on the aircraft, generation of aerodynamic lift and different types of aerodynamic drag. The course also includes theory of flight: the aerodynamic forces and aircraft performance during steady level flight, climb and descent, and turning; and aircraft stability and flight dynamics.

Outcome:

After completion of the course students will be able to understand how various atmosphere conditions affect an aircraft and aircraft aerodynamics control services, devices and their impact.

		Hours
Unit I	**Physics of the Atmosphere** International Standard Atmosphere (ISA), application to aerodynamics.	**2**
Unit II	**Aerodynamics** 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, aerodynamic centre, centre of pressure, stagnation point, profile (parasite) drag, induced drag, 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.	**12**
Unit III	**Theory of Flight** Relationship between lift, weight, thrust and drag; Glide ratio; Steady state flights, performance; Theory of the turn; Influence of load factor: stall, flight envelope and structural limitations; Lift augmentation.	**10**
Unit IV	**Flight Stability and Dynamics** Longitudinal, lateral and directional stability (active and passive)	**3**
Unit V	**Theory of Flight - Aeroplane Aerodynamics and Flight Controls** Operation and effect of:	**16**

- roll control: ailerons and spoilers;
- pitch control: elevators, stabilators, variable incidence stabilisers and canards;
- yaw control, rudder limiters;

Control using elevons, ruddervators; 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 antibalance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels;

Unit VI **Basic Instrument Systems** **5**

Classification; Atmosphere; Terminology; Pressure measuring devices and systems;Pitot static systems; Altimeters; Vertical speed indicators; Airspeed indicators; Machmeter; Altitude reporting/alerting systems; Air data computers; rate of climb/ vertical speed indicator, cabin pressure indicator, pneumatic systems instruments;

Unit VII **High Speed Flight** **8**

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

Unit VIII **Rotary Wing Aerodynamics** **4**

Elementary rotary wing and aerodynamic Terminology; Basic operation and effect of cyclic, collective and anti-torque controls.

Reference Books:

Aerodynamics - By Clancey

Mechanics of Flight By - A.C. Kermode

Force measurement on symmetric airfoil.

Force measurement on cambered airfoil.

Aircraft Instruments-by E.H.J. Pallett

Aircraft Instruments-by C.A. Williams

Core Course – B.Sc. Honours (Aircraft Maintenance)

Subject: Ground Handling Safety and Support System Subject Code: BSCARM-102-18

Objectives:

The objective of this course is intended to develop the students' knowledge and skills in the knowledge of airport and its procedures. Areas of study include ground handling of Aircraft, Maintenance and handling of ground equipment used in maintenance of aircraft, Aircraft Safety and fire precautions. The course also covers the rigging of flight control surfaces, duplicate inspection and Maintenance of landing gear.

Outcome:

After undergoing the course the students shall be able to demonstrate the skills in ground handling the aircraft and other equipments at airports and shall be able to maintain the personal and equipment safety.

		Hours
Unit I	General knowledge of ground handling of Aircraft, Aircraft Safety; Mooring, Jacking, Levelling, Hoisting of aircraft, Towing, Mooring of an a/c during adverse conditions. Aircraft cleaning and maintaining. Ground signalling/marshalling of aircraft in day & night time.	**5**
Unit II	Brief knowledge of airport and its procedures. Control tower, Dispersal areas, Aprons, Tarmac, Taxy track, Runway and its ends. Approach and clear zone layout. Brief knowledge of the signals given by the control tower. Knowledge of Airfield lighting system, Aircraft Rescue & Fire Fighting.	**10**
Unit III	Maintenance and handling of ground equipment's used in maintenance of aircraft. Compressors, Portable hydraulic test stands, Electrical power supply equipment, charging trolley. Air-conditioning and Heating unit, Ground support air start unit. Pressure oil unit, Fire extinguishers, jacks, Hoisting cranes/gantry, Ladders, Platforms, Trestles, and Chocks.	**15**
Unit IV	Knowledge of safety and fire precautions to be observed during maintenance including refuelling, defueling & engine start. Maintenance of hydraulic accumulators, reservoirs and filters:	**10**
Unit V	Rigging of flight control surfaces and duplicate inspection; Rigging checks-Angular alignment checks and symmetry checks, Knowledge and use of Tensiometers, Protractors etc.	**10**

Unit VI	Maintenance of landing gear (L/G), Shock strut charging and bleeding, Maintenance of L/G brakes i.e., Dragging, Grabbing, Fading, Brakes and excessive brake pedal travel. Maintenance on wheels, tyres and tubes i.e., dismantling, inspection, assembling, inflating, inspection and installation Storage of Rotables.	**10**

Reference books

General Handbook AC65-9A

Airframe Handbook AC 65-15A

General Electives– B.Sc. Honours (Aircraft Maintenance)

Subject: Physics **Subject Code: BSCARM-103-18**

Objectives:

This course enables students to develop their skills in understanding physics concepts of Vector algebra, Scalar and vector products. It helps students approach questions in a logical and systematic manner. This course covers a variety of topics, that are relevant for the degrees offered at the polytechnic. Topics include Elasticity, Hooke's law - Stressstrain diagram,Momentum and Energy,Gravitation: Newton's Law of Gravitation,Oscillations, Simple harmonica motion and Special Theory of Relativity.

Outcome:

At the end of the course students will demonstrate written and oral communication skills in communicating physics related topics as classical mechanics and modern physics.

		Hours
Unit I	Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter."	**4**
Unit II	Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion - Torsional pendulum- Determination of Rigidity modulus and moment of inertia - q, η and sby Searle's method	**14**
Unit III	Momentum and Energy: Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets. Rotational Motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum. Laws of Motion: Frames of reference. Newton's Laws of motion. Dynamics of a System of particles. Centre of Mass."	**12**
Unit IV	"Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only). Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS).	**10**
Unit V	Oscillations: Simple harmonica motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped Oscillations.	**10**

Unit VI	Special Theory of Relativity: Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of Velocities."	**10**

Reference Books

University Physics. FW Sears, MW Zemansky and HD Young13/e, 1986. Addison Wesley

Mechanics Berkeley Physics course,v.1: Charles Kittel, et. Al. 2007, Tata McGraw-Hill

General Electives – B.Sc Honours (Aircraft Maintenance)

Subject: Mathematics **Subject Code: BSCARM-104-18**

Objectives:

The objective of this course is to develop students' understanding and skills on the concepts from the five branches of mathematics (Linear Algebra, Trigonometry Functions, Multivariable Differential calculus, Multivariable Integral calculus and Vector Calculus).Select and apply appropriate inquiry and mathematical problemsolving techniques, recognize and describe patterns, draw conclusions consistent with findings, justify or prove mathematical relationships and general rules.To use mathematical language appropriately when communicating. mathematical ideas, reasoning and findings—both orally and in writing reflect upon findings and problem-solving processes.

Outcome:

By the end of the course students will develop and maintain problems solving skills and address mathematics ideas.

		Hours
Unit I	**Linear Algebra:** Elementary Row Transformation, Reduction of a Matrix to Row Echelon Form, Rank of a Matrix, Consistency of Linear Simultaneous Equations, Gauss Elimination Method, Gauss-Jordan Method, Eigen Values and Eigen Vectors of a Matrix, Caley-Hamilton Theorem, Diagonalization of a Matrix,	10
Unit II	**Trigonometry Functions:** Elementary trigonometry, sine, cosine and tan functions, reciprocals of trig functions, angle values of trig functions, geometrical problems, trigonometric inverse functions	5
Unit III	**Multivariable Differential calculus** Functions of 2 Variables, Limits and continuity, Partial differentiation, Euler's Theorem, Maxima and Minima of two variables, Method of Lagrange Multipliers, Taylor Series and Maclaurin Series of two variables, Jacobian.	20
Unit IV	**Multivariable Integral calculus** Multiple Integrals-Double integrals, Change of order, Applications to areas, volumes, Triple Integral.	20
Unit V	**Vector Calculus**	20

Gradient, Divergence, Curl, Evaluation of Line Integral, Green's Theorem in Plane (without proof), Stoke's Theorem (without proof), Gauss Divergence Theorem (without proof).

References Books:

Differential Calculus by Shanti Narain

Integral Calculus by Shanti Narain

Linear Algebra- Schaum Outline Series.

Engineering Mathematics by B.S. Grewal

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Workshop Practices **Subject Code: BSCARM-105-18**

Objectives:

Workshop Practice course makes students competent in handling practical work inengineering environment.Workshop is a place where students acquire knowledge on the operation of various processes involved in engineering Materials, Working practices, equipments, tools and safety precaution to be observed in operations.The course includesmeasuring,layout and General tools, drilling and Turningprocedures.Material handling,SheatMaterial handling,Welding Techniques,Smithy and Foundry operationsgears usage and inspection,Hoses and Pipes

Outcome:

After the completion of the course students will acquire skills in basic engineering practice and indentify the hand tools and various instruments to gain measuring skills.

		Hours
Unit I	Safety & Precautions to be taken while working in the Machine shop. Various type of aids to be used while working on machines. Basic Machining	4
Unit II	**Material handling - Sheet Metal** Marking out and calculation of bend allowance; Sheet metal working, including bending and forming; Inspection of sheet metal work.	6
Unit III	Various types of gears and usage and inspection Various Hand tools for working on bench	8
Unit IV	Drills and drilling procedures. Simple Turning and Taper turning. Various types of measuring and layout tools	6
Unit V	Welding Techniques: Preparation of arc welding of butt joints, lap joints and tee joints. Gas welding practice; Metric Measurement	8
Unit VI	Various forms of Surface Finish and Surface measurement Various forms of Heat Treatment & Testing of Materials Various forms of Taps & Dies	16
Unit VII	(a) Smithy operations, upsetting, swaging, setting down and bending (b) Foundry operations like mould preparation for gear and step cone pulley	8
Unit VIII	**Hoses and Pipes** Pneumatic, Hydraulic pipes and end fitting identification, pipe bending and	4

flaring, pipe inspection.

Types of hoses, identification, hose end fittings, house routing and inspection.

Reference Books

Workshop technology By: K.P. Roy , A.K. HAJRA CHOWDHARY 2000 edition;

Shop Theory By: James Anderson

Core Course – B.ScHonours (Aircraft Maintenance)

Subject: Aerodynamics Lab **Subject Code: BSCARM-106-18**

1	Flow around various objects in a 'Water Channel' - Square, Cylinder, Aerofoil - Understanding laminar flow, turbulent flow, stagnation point, flow separation, boundary layer,
2	Fabricate Aerofoil Model - Understanding associated terms
3	Water Channel - Effect of vortex generator on boundary layer control
4	Effect of angle of attack and airflow velocity on lift and Stalling
5	Study of flow over streamlined bodies with different angle of attack by flow visualization technique
6	Identification of flight control surfaces and their effect on flight control - Aircraft Model
7	Identifying High lift devices and practical understanding of their effect on lift with respect to aircraft speed (Air flow)
8	Practical understanding of lift spoiling devices.
9	Removal / installation of Pitot Static Instruments.
10	Calibration of a Pitot Static System using a Pitot Static Leak tester.
11	Fabrication of model - high speed flight
12	Practical study of various factors affecting lift and drag on an aerofoil.
13	Factors affecting flow of fluid over an aerofoil surface and demonstrate the venturi effect
14	Identify various type of flap surfaces and their effect on high lift and high drag characteristic
15	Identification of various parts of Rotary wing

Core Course – B.ScHonours (Aircraft Maintenance)

Subject: Ground Handling Safety And Support System Lab **Subject Code:BSCARM-107-18**

1	Hydraulic system bleeding, replenish fluid reservoir and handling precautions
2	Hydraulic accumulator charging
3	Use of ground power unit and checks
4	Identification and control of various types of fires, practicing fire extinguishing
5	Practical on headset communication during arrival and departure of aircraft & Identification of aircraft hazard zones
6	Fuel sample check and refueling
7	Flight control system lubrication
8	Landing gear system lubrication
9	Landing gear oleo charging
10	Tyre pressure check
11	Aircraft parking and mooring

General Electives – B.Sc Honours (Aircraft Maintenance)

Subject: Physics Lab **Subject Code:BSCARM-108-18**

1 Measurements of length (or diameter) using Vernier caliper, screw gauge and

2 Travelling microscope.

3 To determine the Height of a Building using a Sextant.

4 To determine the Moment of Inertia of a Flywheel.

5 To determine the Young's Modulus of a Wire by Optical Lever Method.

6 To determine the Modulus of Rigidity of a Wire by Maxwell's needle.

7 To determine the Elastic Constants of a Wire by Searle's method.

8 To determine g by Bar Pendulum.

9 To determine g by Kater's Pendulum.

10 To determine g and velocity for a freely falling body using Digital Timing technique

Core Course – B.ScHonours (Aircraft Maintenance)

Subject: Workshop Practices Lab **Subject Code: BSCARM-109-18**

1	Sheet metal marking, cutting, sheet metal structural defects
2	Practice of 1st model. Butt Joint and inspect
3	Practice of 2nd model. Lap Joint and inspect
4	Practice of 3rd model. V-Joint and inspect
5	Practice of 3rd model. T-Joint and inspect
6	Demonstration of 1st model - Dovetail
7	Demonstration of 2nd model- Radius Gauge
8	Inspection of various welded samples with / without defects and record 4 observation
9	Soldering Exercises, inspection and defects
10	Cable splicing and swaging
11	Pipe bending and inspection of pipe assembly
12	Taps and Dies, thread cutting and inspection

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Mentoring and Professional Development **Subject Code: BMPD-101-18**

Objectives:

- Overall Personality
- Aptitude (Technical and General)
- General Awareness (Current Affairs and GK)
- Communication Skills
- Presentation Skills

The course shall be split in two sections i.e. outdoor activities and class activities. For achieving the above, suggestive list of activities to be conducted are:

Unit I **Part – A (Class Activities)**

- Expert and Video Lectures
- Aptitude Test
- Group Discussion
- Quiz (General/Technical)
- Presentations by the students
- Team building Exercises

Unit II **Part – B (Outdoor Activities**

- Sports/NSS/NCC
- Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.

Evaluation shall be based on rubrics for Part- A & B

Mentors/Faculty incharges shall maintain proper record student wise of each activity conducted and the same shall be submitted to the department.

Semester II

Core Course – B.ScHonours (Aircraft Maintenance)

Subject: Aircraft Structure and Associated Systems Subject Code: BSCARM-201-18

Objectives:

The objective of this course is intended to develop the students' knowledge and skills in .Introduction to aircraft, major aircraft components, Areas of study include aircraft systems and their functions, Airframe Structures — General Concepts, Fasteners Bolts, studs, screws and rivets used on aircraft and Structural Assembly. The course also covers the Airframe Structures (Aeroplane), Wings, Stabilizers, Flight Control Surfaces and Nacelles/Pylons.

Outcome:

After the completion of the course students will understand the modern method in aircraft structural analysis for stress analysis of aircraft structure and shall be able to maintain the aircraft.

		Hours
Unit I	**Introduction to General term and vocabulary used in Aeronautical science** Introduction to aircraft technical literature. Introduction to ATA system	**4**
Unit II	**Introduction to aircraft, major aircraft components, aircraft systems and their functions, reference lines, station and zone identification systems**	**4**
Unit III	**Airframe Structures — General Concepts** Airworthiness requirements for structural strength; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Lightning strike protection provision. Drains and ventilation provisions, System installation provisions Aircraft bonding and continuity. 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; Describe current practice in aircraft design related to load transfer, load path continuity and reduction of stress raisers in pressurized fuselages.	**20**
Unit IV	**Fasteners used on aircraft**	**4**

Fasteners, 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.

Aircraft rivets

Types of solid and blind rivets: specifications and identification, heat treatment.

Riveting

Riveted joints, rivet spacing and pitch; Tools used for riveting and dimpling; Inspection of riveted joints.

Unit V	**Structural Assembly**	**4**

Structural assembly techniques: riveting, bolting, bonding methods of surface protection, such as chromating, anodising, painting; Surface cleaning. Airframe symmetry: methods of alignment and symmetry checks. Complete airframe for symmetry fuselage for twist and bending, vertical stabiliser for alignment wings and horizontal stabilisers for dihedral and incidence

Unit VI	**Airframe Structures — Aeroplane**	**10**

Fuselage (ATA 52/53/56) :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.

Unit VII	**Wings (ATA 57)**	**4**

Anhedral, dihedral incidence angle interplane struts longitudinal dihedral rigging position, stagger, wash in, washout Construction; Fuel storage; Landing gear, pylon, control surface and high lift/drag attachments.

Unit VIII	**Stabilizers**	**4**

Construction; Control surface attachment.

Unit IX	**Flight Control Surfaces (ATA 55/57)**	**4**

Construction and attachment; Balancing — mass and aerodynamic.

Unit X **Nacelles/Pylons (ATA 54)** **2**

Construction; Firewalls; Engine mounts.

Reference Books:

Dictionary of Aeronautical terms (Dale Crane)

Aircraft handbook FAA (AC 65-15 A)

Aircraft structure Ch. 01 (FAA)

Aircraft Construction Repair and Inspection-By Joe Christy Aviation Maintenance Technician Hand book by FAA Aircraft Maintenance and Repair-Delp/Bent/McKinley, AC 43.1B

Core Course – B.Sc.Honours (Aircraft Maintenance)

Subject: Electronic Fundamentals and Digital Techniques-I Subject Code: BSCARM-202-18

Objectives:

The objective of this course is to develop student's skills and understanding in semiconductors, diodes and transistors and their applications in aircraft. it intends to develop student knowledge in Servomechanisms, Microprocessors and Fiber Optics. The course covers an advanced level of digital systems with emphasis put on electronic instrument systems, numbering systems, data conversion and logic circuits in the avionics systems of aircraft.

Outcome:

After acquiring the knowledge of the course, students shall be able to understand and demonstrate the basic function, operation and testing of the various components involved in the maintenance of avionics system of the aircraft.

		Hours
Unit I	**Semiconductors**	**8**
	Diode symbols; Diode characteristics and properties; Diodes in series and parallel; Main characteristics and use of silicon controlled rectifiers (thyristors), light emitting diode, photo conductive diode, varistor, rectifier diodes; Functional testing of diodes. Materials, electron configuration, electrical properties; P and N type materials: effects of impurities on conduction, majority and minority characters; PN junction in a semiconductor, development of a potential across a PN junction in unbiased, forward biased and reverse biased conditions; Operation and function of diodes in the following circuits: clippers, clampers, full and half wave rectifiers, bridge rectifiers, voltage doublers and triplers; Detailed opera on and characteristics of the following devices: silicon controlled rectifier (thyristor), light emiting diode, Shotiky diode, photo conductive diode, varactor diode, varistor, rectifier diodes, Zener diode.	
Unit II	**Transistors**	**8**
	Transistor symbols; Component description and orientation; Transistor characteristics and properties. Construction and operation of PNP and NPN transistors; Base, collector and emitter configurations; Testing of transistors. Basic appreciation of other transistor types and their uses. Application of transistors: classes of amplifier (A, B, C); Simple circuits including: bias, decoupling, feedback and stabilization; Multistage circuit	

principles: cascades, push-pull, oscillators, multi-vibrators, flip-flop circuits.

Unit III	**Integrated Circuits**	**8**

Description and opera on of logic circuits and linear circuits/operational amplifiers. Description and opera on of logic circuits and linear circuits; Introduction to opera on and function of an operational amplifier used as: integrator differentiator, voltage follower, comparator; Operation and amplifier stages connecting methods: resistive capacitive, inductive (transformer), inductive resistive (IR), direct; Advantages and disadvantages of positive and negative feedback Operation and use of encoders and decoders, functions of encoders type. Uses of medium, large and very large scale integration.

Unit IV	**Printed Circuit Boards**	**4**

Description and use of printed circuit boards.

Unit V	**Servomechanisms**	**10**

Understanding of the following terms: Open and closed loop systems, feedback, follow up, analogue transducers; Principles of operation and use of the following synchro system components/features: resolvers, differential, control and torque, transformers, inductance and capacitance transmitters. Understanding of the following terms: Open and closed loop, follow up, servomechanism, analogue, transducer, null, damping, feedback, dead band; Construction operation and use of the following synchro system components: resolvers, differential, control and torque, E and I transformers, inductance transmitters, capacitance transmitters, synchronous transmitters; Servomechanism defects, reversal of synchro leads, hunting

Unit VI	**Numbering Systems**	**3**

Numbering systems: binary, octal and hexadecimal; Demonstration of conversions between the decimal and binary, octal and hexadecimal systems and vice versa.

Unit VII	**Data Conversion**	**3**

Analogue Data, Digital Data; Operation and application of analogue to digital, and digital to analogue converters, inputs and outputs, limitations of various types.

Unit VIII	**Data Buses**	**3**

Operation of data buses in aircraft systems, including knowledge of ARINC

and other specifications.

Unit IX	**Logic Circuits**	**3**

(a) Identification of common logic gate symbols, tables and equivalent circuits; Applications used for aircraft systems, schematic diagrams.

(b) Interpretation of logic diagrams.

Unit X	**Microprocessors**	**6**

Functions performed and overall operation of a microprocessor;

Basic operation of each of the following microprocessor elements: control and processing unit, clock, register, arithmetic logic unit.

Unit XI	**Fiber Optics**	**4**

Advantages and disadvantages of fiber optic data transmission over electrical wire propagation; Fibre optic data bus; Fiber optic related terms; Terminations; Couplers, control terminals, remote terminals; Application of fiber optics in aircraft systems.

Reference Books

Basic Electronics-BemardGrob

Digital Fundamentals by Malvino and Leech

Principles of Electronics by V K Mehta

Core Course – B.Sc. Honours (Aircraft Maintenance)

Subject: Electrical Fundamentals-I **Subject Code: BSCARM-203-18**

Objectives:

The aim of this course is to introduce students to the basic principles of electricity and electron theory and develop their knowledge in the concept of direct current circuits and applications. The course covers the basic principles of electricity such as electron theory, static electricity and conduction, electrical terminology, generation of electricity, DC sources of electricity, and DC theory. This course introduces the concept of direct current circuits and studies it applications and its fundamental theories.

Outcome:

After acquiring the knowledge of the course, students shall be able to understand and demonstrate the basic function, operation and testing of the various components involved in the maintenance of electrical system of the aircraft.

		Hours
Unit I	**Electron Theory** Structure and distribution of electrical charges within: atoms, molecules, ions, compounds. Molecular structure of conductors, semiconductors and insulators.	**3**
Unit II	**Static Electricity and Conduction** Static electricity and distribution of electrostatic charges; Electrostatic laws of attraction and repulsion; Units of charge, Coulomb's Law; Conduction of electricity in solids, liquids, gases and a vacuum.	**3**
Unit III	**Electrical Terminology** The following terms, their units and factors affecting them: potential difference, electromotive force, voltage, current, resistance, conductance, charge, conventional current flow, electron flow.	**2**
Unit IV	**DC Circuits** Ohms Law, Kirchhoff's Voltage and Current Laws; Calculations using the above laws to find resistance, voltage and current; Significance of the internal resistance of a supply.	**4**
Unit V	**Resistance/Resistor** (a) Resistance and affecting factors; Specific resistance; Resistor colour code, values and tolerances, preferred values, wattage ratings; Resistors in series and parallel; Calculation of total resistance using series, parallel and series parallel combinations; Operation and use of potentiometers and	**5**

rheostats; Operation of Wheatstone Bridge.

(b) Positive and negative temperature coefficient conductance; Fixed resistors, stability, tolerance and limitations, methods of construction; Variable resistors, thermistors, voltage dependent resistors; Construction of potentiometers and rheostats; Construction of Wheatstone Bridge;

Unit VI **Capacitance/Capacitor** **4**

Operation and function of a capacitor; Factors affecting capacitance area of plates, distance between plates, number of plates, dielectric and dielectric constant, working voltage, voltage rating; Capacitor types, construction and function; Capacitor colour coding;

Calculations of capacitance and voltage in series and parallel circuits; Exponential charge and discharge of a capacitor, time constants; Testing of capacitors.

Unit VII **Magnetism** **5**

Theory of magnetism; Properties of a magnet Action of a magnet suspended in the Earth's magnetic field; Magnetisation and demagnetisation; Magnetic shielding; Various types of magnetic material; Electromagnets construction and principles of operation; Hand clasp rules to determine: magnetic field around current carrying conductor.

Magneto motive force, field strength, magnetic flux density, permeability, hysteresis loop, retentivity, coercive force reluctance, saturation point, eddy currents; Precautions for care and storage of magnets.

Unit VIII **Inductance/Inductor** **6**

Faraday's Law; Action of inducing a voltage in a conductor moving in a magnetic field;

Induction principles; Effects of the following on the magnitude of an induced voltage: magnetic field strength, rate of change of flux, number of conductor turns; Mutual induction; The effect the rate of change of primary current and mutual inductance has on induced voltage; Factors affecting mutual inductance: number of turns in coil, physical size of coil, permeability of coil, position of coils with respect to each other; Lenz's Law and polarity determining rules; Back emf, self-induction; Saturation point; Principle uses of inductors;

Unit IX **AC Theory** **8**

Sinusoidal waveform: phase, period, frequency, cycle; Instantaneous, average, root mean square, peak, peak to peak current values and

calculations of these values, in relation to voltage, current and power Triangular/Square waves; Single/3 phase principals.

Unit X	**Resistive (R), Capacitive (C) and Inductive (L) Circuits**	**8**

Phase relationship of voltage and current in L, C and R circuits, parallel, series and series parallel; Power dissipation in L, C and R circuits; Impedance, phase angle, power factor and current calculations; True power, apparent power and reactive power calculations.

Unit XI	**Transformers**	**6**

Transformer construction principles and operation; Transformer losses and methods for overcoming them; Transformer action under load and no-load conditions;

Power transfer, efficiency, polarity markings; Calculation of line and phase voltages and currents; Calculation of power in a three phase system; Primary and Secondary current, voltage, turns ratio, power, efficiency; Auto transformers.

Unit XII	**Filters**	**6**

Operation, application and uses of the following filters: low pass, high pass, band pass, band stop.

Reference Books:

Electrical Technology- by B.L.Theraja

Aircraft Electrical System- by E.H.J.Pallett

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Electrical Fundamentals-II **Subject Code: BSCARM-204-18**

Objectives:

The objective of this course is to develop student understanding and skills in electric power circuits, motors and generators. This course is a continuation of Electrical Engineering I and covers an advanced level with emphasis put to electrical terms such as resistance, power, capacitance, magnetism, inductance, AC theory, resistive, capacitive and inductive circuits, and transformers, filters, AC generators and motors. Frequency dependent devices are also covered.

Outcome:

After acquiring the knowledge of the course, students shall be able to understand and demonstrate the basic function, operation and testing of the various components involved in the maintenance of electrical system of the aircraft.

		Hours
Unit I	**Generation of Electricity** Elementary knowledge on generation of electricity by the following methods: light, heat, friction, pressure, chemical action, magnetism and motion.	**4**
Unit II	**DC Sources of Electricity** Construction and basic chemical action of: primary cells, secondary cells, lead acid cells, nickel cadmium cells, other alkaline cells; Cells connected in series and parallel; internal resistance and its effect on a battery; Construction, materials and operation of thermocouples; Operation of photo-cells.	**4**
Unit III	**DC Motor/Generator Theory** Basic motor and generator theory; Construction and purpose of components in DC generator; Operation of, and factors affecting output and direction of current flow in DC generators; Operation of, and factors affecting output power, torque, speed and direction of rotation of DC motors; Series wound, shunt wound and compound motors; Starter Generator construction.	**9**
Unit IV	**AC Generators** Rotation of loop in a magnetic field and waveform produced; Operation and construction of revolving armature and revolving field type AC generators; Single phase, two phase and three phase alternators; Three phase star and	**9**

delta connections advantages and uses; Permanent Magnet Generators.

Unit V	**AC Motors**	**8**

Construction, principles of operation and characteristics of: AC synchronous and induction motors both single and polyphase; Methods of speed control and direction of rotation;

Methods of producing a rotating field: capacitor, inductor, shaded or split pole.

Unit VI	**Power**	**8**

Power, work and energy (kinetic and potential); Dissipation of power by a resistor; Power formula; Calculations involving power, work and energy.

Unit VII	**Aircraft Electrical Cables and Connectors**	**8**

a). Cable types, construction and characteristics; High tension and co-axial cables;Crimping; Connector types, pins, plugs, sockets, insulators, current and voltagerating, coupling, identification codes.

b). Electrical Wiring Interconnection System (EWIS) Continuity, insulation and bonding techniques and

Testing; Use of crimp tools: hand and hydraulic operated; testing of crimp joints;

Connector pin removal and insertion; Co-axial cables: testing and installation

Precautions; Identification of wire types, their inspection criteria and damage tolerance

Wiring protection techniques: Cable looming and loom support, cable clamps, and protective

Sleeving techniques including heat shrink wrapping, shielding. EWIS installations,

Inspection, repair, maintenance and cleanliness standards

Unit VIII	**Electromagnetic Environment**	**6**

Influence of the following phenomena on maintenance practices for electronic system:

EMC-Electromagnetic Compatibility; EMI-Electromagnetic Interference; HIRF-High Intensity Radiated Field; Lightning/lightning protection

Unit IX	**Electro sensitive Devices**	**4**

Special handling of components sensitive to electrostatic discharges;

Awareness of risks and possible damage, component and personnel anti-static protection devices.

Reference Books:

Electrical Technology- by B.L.Theraja

Aircraft Electrical System- by E.H.J.Pallett

Aircraft Electricity and electronics-by Bent McKinley and also by Eismin/Bent McKinley

Ability Enhancement Elective Course - B. Sc. Honours (Aircraft Maintenance)

Subject: English Communication **Subject Code: BSCARM-205-18**

Objectives:

The purpose of this course is to introduce students to the theory, fundamentals and tools of communication and to develop in them vital communication skills. It is designed to introduce students to information and language specifically for future technical careers.Thecourse hopes to address some of these aspects through an interactive mode of teaching-learning process. Some of these are: Language of communication, various speaking skills,Writing Skills, Reading and Understanding,socialinteractions and communication in professional situations such as interviews, group discussions and office environments,As well as report writing, note taking etc.

Outcome:

After completion of the course students will improve their fluency in different areas of English through activities that focus on oral and written expression and improve pronunciation and communication.

Preamble

The purpose of this course is to introduce students to the theory, fundamentals and tools of communication and to develop in them vital communication skills which should be integral to personal, social and professional interactions. One of the critical links among human beings and an important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal. In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

The present course hopes to address some of these aspects through an interactive mode of teaching-learning process and by focusing on various dimensions of communication skills. Some of these are: Language of communication, various speaking skills such as personal communication, social interactions and communication in professional situations such as interviews, group discussions and office environments, important reading skills as well as writing skills such as report writing, note-taking etc.

While, to an extent, the art of communication is natural to all living beings, in today's world of complexities, it has also acquired some elements of science. It is hoped that after studying this course, students will find a difference in their personal and professional interactions.

The recommended readings given at the end are only suggestive; the students and teachers have the freedom to consult other materials on various units/topics given below. Similarly, the question in the examination will be aimed towards assessing the skills learnt by the students rather than the textual content of the recommended books.

		Hours
Unit I	**Introduction**	**5**
	Theory of Communication, Types and modes of Communication	
Unit II	**Language of Communication**	**15**
	Verbal and Non-verbal (Spoken and Written), Personal, Social and Business	
	Barriers and Strategies Intra-personal, Inter personal and Group Communication	
Unit III	**Speaking Skills**	**20**
	Monologue, Dialogue, Group Discussion, Effective Communication/ Mis-Communication, Interview, Public Speech	
Unit IV	**Reading and Understanding**	**15**
	Close Reading, Comprehension, Summary Paraphrasing, Analysis and Interpretation, Translation (from Indian language to English and vice-versa), Literary/Knowledge Texts.	
Unit V	**Writing Skills**	**15**
	Documenting, Report Writing, Making notes, Letter writing	

Reference Books

Fluency in English - Part II, Oxford University Press, 2006

V.R. Narayanaswami, Strengthen Your Writing, 3rd Edition, Orient Longman, 2005.

Andrea J. Rutherford, Basic Communication Skills for Technology, 1st Edition, Pearson

Business English, Pearson, 2008

Language, Literature and Creativity, Orient Blackswan, 2013

Education Asia (Singapore) Pvt. Ltd., Bangalore, 2001.

4. Language through Literature (forthcoming) ed. Dr. GauriMishra,DrRanjanaKaul, DrBrati Biswas Nell Ann Pickett, Ann A. Laster, Katherine E. Staples, Technical English (Writing, Reading and Speaking), 8th Edition, Pearson Education, USA, Addison Wesley Longman Inc., 2001

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Aircraft Structure and Associated Systems Lab Subject Code: BSCARM-206-18

1	Identifying aircraft reference lines, station and zone numbers
2	Identification of major structural members of fixed wing aircraft. Loads on majorstructural members.
3	Identification of detail structural members of aircraft and loads acting on these structural members
4	Aircraft structure construction
5	Aircraft structural assembly, joints and lightning protection
6	Identification of components of flight control surfaces and methods of mass 4 balancing
7	Control surface, landing gear and engine attachment
8	Identification of type of Fuselage and method of pressure sealing. Identification of Pressure bulkheads and unpressurised bulkheads
9	Common structural defects, simple inspection technique and recording
10	Types of rivets, defects. Inspection of riveted joints and structure
11	Construction (Modelling) of various types structural joints
12	Check aircraft symmetry

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Electronic Fundamentals And Digital Techniques-I Lab **Subject Code: BSCARM-207-18**

1. Identification of basic electronic components (diodes, transistors),digital Multimeter, Function Generator and Oscilloscope.
2. Practical on I-V Characteristics of (a) p-n junction Diode, and (b) Zener diode
3. Study of Clipping and Clamping circuits
4. Conversion of A C Voltage using (a) Half wave rectifier and (b) Full wave rectifier (FWR)
5. Uses of basic electronic components (diodes, transistors),digital Multimeter, Function Generator and Oscilloscope
6. Construct a model to study fixed Bias and Voltage divider bias configuration for CE transistor.
7. Construct a model to study Single Stage CE amplifier of given gain.
8. Construct a model to study correlation between different numbering systems.
9. Construct a model to study digital to analogue converters
10. Construct a model to study typical data buses used in aircraft system.
11. Functions performed and overall operation of a microprocessor;
12. Demonstrate fiber optic data transmission over electrical wire propagation;
13. Construct a Universal Gates and test
14. Construct a flip flop circuit using elementary gates
15. Construct a seven segment display driver

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Electrical Fundamentals-I Lab **Subject Code: BSCARM-208-18**

1. Simple experiments with static electricity and the coulomb's law
2. Application of Electromotive forces and Potential difference Ballistic Galvanometer: (i) Measurement of charge and current sensitivity
3. Measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses and connection
4. Use of a range of test meters to measure volts, amps and resistance.
5. Resistor colour codes - Calculation of resistance value using colour codes
6. Potentiometer , rheostat and wheat stone bridges and determine unknown resistance
7. Use a Multimeter for measuring Resistances, checking electrical fuses Identifyvarious types of resistance
8. Identify various types of capacitances
9. Measurement of magnetic field strength. Magnetic field density and permeability using flux meter.
10. Production of electricity by inductance methods
11. Single phase and three phase power supply distribution using star and delta connection
12. Construct series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor,
13. Construct parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q
14. Use of transformer in power distribution and measurements.
15. Make filters circuit to study function of low pass, high pass, band pass and band stop.

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Electrical Fundamentals-II Lab **Subject Code: BSCARM-209-18**

1. Generation of electricity by light , heat, chemical action, magnetism, and motion
2. Construct power sources using primary and secondary cells
3. Construct a model to study usage of thermo-cell and photo-cell
4. Construct a model to generate DC power using different method of coil arrangements (Series, shunt) to understand their Usage.
5. Construct a model of DC motor using different method of coil arrangements (Series, shunt) to understand their Usage.
6. Construct a model to generate single/Poly-phase AC power to understand their Usage.
7. Construct a model of AC motor using single/ Poly-phase l arrangements to understand their Usage.
8. Measure amount of power dissipated by various resistors; calculation of power
9. Using at least two crimping systems, select appropriate cable crimping tools and crimp cables to prepare cable ends or plug / socket terminals.
10. Check an aircraft electrical circuit for continuity in conjunction with an electrical wiring diagram.
11. Identify cables and cables values by reference to the maintenance manuals. Identify a range of electrical component symbols.
12. Inspection of electrical cable looms / bundles and cable trunking.
13. Select and use appropriate cable stripping tools and solder cables to single andmultipin connectors / tag boards
14. Prepare, and install a simple loom, using at least two binding methods
15. Identification of various fasteners and locking devices used in aircraft.

Semester III

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Aircraft Systems–I **Subject Code: BSCARM-301-18**

Objectives

The objective of this course is intended to develop the students' knowledge and skills in aircraft pressurization and air-conditioning, landing gears and their systems. The course is a comprehensive study of EASA module. Areas of study includes hydraulic power, hydraulic systems components, fuel systems and components, fueling and defueling; ice and rain protection system. The course also includes Pneumatic/ vacuum system and components, Flight Control Systems: Primary and Secondary controls, Manually- and Power-operated control systems, Fly-by-wire; Balancing and rigging and Stall warning system.

Out come

After the completion of this course, the students shall be able to understand and recognize the various components of the systems and their lay out as well as working principle and shell be able to work effectively on the systems.

		Hours
Unit I	**Aircraft Weight and Balance** (a) Centre of Gravity/Balance limits calculation: use of relevant documents; (b) Preparation of aircraft for weighing; Aircraft weighing;	**4**
Unit II	**Aircraft Handling and Storage** **Aircraft taxiing/towing and associated safety precautions; Aircraft jacking,** chocking, securing and associated safety precautions; Aircraft storage methods; Refuelling /defueling procedures; De-icing/anti-icing procedures; Electrical, hydraulic and pneumatic ground supplies. Effects of environmental conditions on aircraft handling and operation.	**5**
Unit III	**Pneumatic/Vacuum (ATA 36)** System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.	**8**
Unit IV	**Air Conditioning and Cabin Pressurization (ATA 21)** Air supply- Sources of air supply including engine bleed, APU and ground cart; Air Conditioning- 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;	**8**

	Protection and warning devices.	
Unit V	**Equipment and Furnishings (ATA 25)** Emergency equipment requirements; Seats, harnesses and belts, electronic emergency equipment requirements Cabin lay-out, cargo retention; Equipment lay-out; Cabin Furnishing Installation; Cabin entertainment equipment; Galley installation; Cargo handling and retention equipment; Airstairs. Lifting system; Emergency flotation systems;	**6**
Unit VI	**Flight Controls (ATA 27)** Primary controls: aileron, elevator, rudder, spoiler; Trim control; Active load control; High lift devices; Lift dump, speed brakes; System operation: manual, hydraulic, pneumatic, electrical, fly-by-wire; Artificial feel, Yaw damper, Mach trim, rudder limiter, gust locks systems; Balancing and rigging; Stall protection/warning system.	**8**
Unit VII	**Fuel Systems (ATA 28)** 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.	**8**
Unit VIII	**Hydraulic Power (ATA 29)** System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical, pneumatic; Emergency pressure generation; Filters; Pressure Control; Power distribution; Indication and warning systems; Interface with other systems	**5**
Unit IX	**Ice and Rain Protection (ATA 30)** Ice formation, classification and detection; Anti-icing systems: electrical, hot air and chemical; De-icing systems: electrical, hot air, pneumatic and chemical; Rain repellant; Probe and drain heating; Wiper systems	**3**
Unit X	**Landing Gear (ATA 32)** 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	**3**
Unit XI	**Abnormal Events (ATA 05)**	**2**

(a) Inspections following lightning strikes and HIRF penetration.

(b) Inspections following abnormal events such as heavy landings and fight through turbulence.

Reference Books:

Airframe and Powerplant Mechanics (AC 65-15A) -Airframe Hand Book FAA Civil Aircraft Inspection Procedure (CAP 459) Part II Aircraft

A & P technician Air Frame Text Book by Jeppesen

Aircraft Repair Manual (FAA-AC-43.13)-By Larry Reithmaier Aviation

Maintenance Technician Hand book by FAA Hydraulic Servo

Systems by M. GUILLON:

Aircraft Instruments-by E.H.J.Pallett Aircraft

Electrical System-by E.H.J.Pallett

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Aircraft Materials and Hardware **Subject Code: BSCARM-302-18**

Objectives

The objective of this course is to familiarize students on the characteristics, types and uses of aircraft materials. The course covers aircraft materials both ferrous and nonferrous: characteristics, properties, heat treatment and testing; tension, hardness, and fatigue tests. The course also includes characteristics and properties of composite and non-metallic materials and their identification, sealant types and bonding techniques, wooden aircraft structure; characteristics, preservation, defects and repairs; aircraft fabric coverings.

Out come

After undergoing this course, the students will be able to distinguish between metals and non metals and ferrous and non ferrous materials and know the Characteristics, properties and identification of materials used in aircraft.

		Hours
Unit I	**AIRCRAFT MATERIALS AND HARDWARE** **Aircraft Materials — Ferrous** a) Characteristics, properties and identification of common alloy steels used in aircraft; Heat treatment and application of alloy steels; b) Testing of ferrous materials for hardness, tensile strength, fatigue strength and impact resistance.	**12**
Unit II	**Aircraft Material — Non-Ferrous** a) Characteristics, properties and identification of common non-ferrous materials used in aircraft; Heat treatment and application of non-ferrous materials; b) Testing of non-ferrous material for hardness, tensile strength, fatigue strength and impact resistance.	**12**
Unit III	**Aircraft Materials - Composite and Non- Metallic** a) Characteristics, properties and identification of common composite and non- metallic materials, other than wood, used in aircraft; Sealant and bonding agents. b) The detection of defects/deterioration in composite and non-metallic material. Repair of composite and non-metallic material.	**10**
Unit IV	**Wooden structures** Construction methods of wooden airframe structures; Characteristics, properties and types of wood and glue used in airplanes; Preservation and maintenance of wooden structure; Types of defects in wood material and	**8**

	wooden structures; The detection of defects in wooden structure; Repair of wooden structure.	
Unit V	**Fabric covering & Non Metals** Characteristics, properties and types of fabrics used in aeroplane; Inspections methods for fabric; Types of defects in fabric; Repair of fabric covering. Composite and non-metallic Bonding practices; Environmental conditions Inspection methods	**4**
Unit VI	**Fasteners, Screw threads** Screw nomenclature; Thread forms, dimensions and tolerances for standard threads used in aircraft; measuring screw threads;	**2**
Unit VII	**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.	**2**
Unit VIII	**Locking devices** Tab and spring washers, locking plates, split pins, palnuts, wire locking, quick release fasteners, keys, circlips, and cotter pins and techniques.	**2**
Unit IX	**Aircraft rivets** Types of solid and blind rivets: specifications and identification, heat treatment.	**4**
Unit X	**Riveting** Riveted joints, rivet spacing and pitch; Tools used for riveting and dimpling; Inspection of riveted joints.	**4**

Reference Books:

Aircraft handbook FAA (AC 65-15 A)

Civil Aircraft Inspection Procedures (CAIP 459-Part I, Basic)

Airframe & Powerplant Mechanics (General Handbook EA-AC 65-9A) FAA

Aircraft Materials & Processes by Titterton

Machine Drawing by AC Parkinson

Advanced Composites (EA-358) by Cindy Foreman Electricity, CAIP 562

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Human Factors **Subject Code: BSCARM-303-18**

Objectives

This course is designed with the intention to improve the level of Human Factors awareness and to improve the understanding of Human Performance issues related to activities in a maintenance environment. The course provides students with the necessary knowledge and skills to appraise human error and factors affecting human performance, and to apply tools and methods for error prediction and measurement. Topics covered also include social physiology, physical environments, tasks, communication and hazards in the workplace.

Out come

After the completion of course, students shell be able to learn Human Performance issues, skills to appraise human error and use of tools and methods for error prediction and measurement to work safely in an aircraft maintenance organization.

		Hours
Unit I	**General** The need to take human factors into account; Incidents attributable to human factors/human error; 'Murphy's' law.	**5**
Unit II	**Human Performance and Limitations** Vision; Hearing; Information processing; Attention and perception; Memory; Claustrophobia and physical access.	**5**
Unit III	**Social Psychology** Responsibility: individual and group; Motivation and de-motivation; Peer pressure; 'Culture' issues; Team working; Management, supervision and leadership.	**5**
Unit IV	**Factors Affecting Performance** Fitness/health; Stress: domestic and work related; Time pressure and deadlines; Workload: overload and under-load; Sleep and fatigue, shiftwork; Alcohol, medication, drug abuse.	**5**
Unit V	**Physical Environment** Noise and fumes; Illumination; Climate and temperature; Motion and vibration; Working environment.	**5**
Unit VI	**Tasks** Physical work; Repetitive tasks; Visual inspection; Complex systems.	**5**
Unit VII	**Communication** Within and between teams; Work logging and recording; Keeping up to date, Currency; Dissemination of information.	**5**

Unit VIII	**Human Error** Error models and theories; Types of error in maintenance tasks; Implications of errors (i.e. accidents); Avoiding and managing errors.	**5**
Unit IX	**Hazards in the Workplace** Recognising and avoiding hazards; Dealing with emergencies.	**5**
Unit X	**Human Factors in Aircraft Maintenance and Inspection** Human Factors — Aircraft Maintenance and Inspection; Contemporary Maintenance Problems; the SHEL Model; the Reason Model; Human Error	**5**
Unit XI	**Human Error in Aircraft Maintenance and Inspection (an organizational perspective)**	**5**
Unit XII	**Human Error in the Maintenance Environment** Human Factors Issues Affecting Aircraft Maintenance and Dirty Dozen; Information Exchange and Communication; Training; Aircraft Maintenance Technician Facilities and Work Environment.	**5**
Unit XIII	**Teams and Organizational Issues in Aircraft Maintenance** Team Work; Job Design; Reward Systems; Selection and Staffing; Training	**5**
Unit XIV	**Automation and Advanced Technology System** Automation and Computerization; Advanced Job Aid Tools	**5**
Unit XV	**Error Prevention, Considerations and Strategies**	**5**
	Reference Books: CAP 715 - An Introduction to Aircraft Maintenance Engineering Human Factors for JAR 66, Civil Aviation Authority, UK. CAP 718 - Human Factors in Aircraft Maintenance and Inspection, Civil Aviation Authority, UK. FAA-H-8083-30 - Aircraft Maintenance Technician Handbook - General, US Department of Transportation, Federal Aviation Administration ICAO Doc 9806	**5**

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Piston Engines and Propellers **Subject Code: BSCARM-304-18**

Objectives

The overall objective of the course is to develop student understanding and skills in piston engine and propeller fundamentals, construction, operation and performance. The course covers relationship between force, work, power, energy, acceleration and Otto cycle; construction and working principles of piston Engine and Propeller components. Course also covers characteristics and performance of different types of piston engines and engine fuel, lubrication, starting and ignition systems, engine installation, safety procedures and monitoring systems and engine ground operation.

Out come

After undergoing this course, students shall be able to understand the fundamentals, construction, operation, performance and working of piston Engine and propeller also shell be able to carry out the removal, service and re installation of its components.

		Hours
Unit I	**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	**2**
Unit II	**Engine Performance** Power calculation and measurement; Factors affecting engine power; Mixtures/leaning, pre-ignition.	**2**
Unit III	**Engine Construction** Crank case, crank shaft, cam shafts, sumps; Accessory gearbox; Cylinder and piston assemblies; Connecting rods, inlet and exhaust manifolds; Valve mechanisms; Propeller reduction gearboxes.	**3**
Unit IV	**Engine Fuel Systems** Carburettors Types, construction and principles of operation; Icing and heating	**2**
Unit V	**Fuel injection systems** Types, construction and principles of operation.	**2**
Unit VI	**Electronic engine control**	**4**

	Operation of engine control and fuel metering systems including electronic engine control (FADEC); Systems lay-out and components	
Unit VII	**Starting and Ignition Systems** Starting systems, pre-heat systems; Magneto types, construction and principles of operation; Ignition harnesses, spark plugs; Low and high tension systems	**3**
Unit VIII	**Induction, Exhaust and Cooling Systems** Construction and operation of: induction systems including alternate air systems; Exhaust systems, engine cooling systems — air and liquid.	**2**
Unit IX	**Supercharging/Turbocharging** Principles and purpose of supercharging and its effects on engine parameters. Construction and operation of supercharging/ turbocharging systems; System terminology; Control systems; System protection.	**3**
Unit X	**Lubricants and Fuels** Properties and specifications; Fuel additives; Safety precautions	**2**
Unit XI	**Lubrication Systems** System operation/lay-out and components.	**2**
Unit XII	**Engine Indication Systems** Engine speed; Cylinder head temperature; Coolant temperature; Oil pressure and temperature; Exhaust Gas Temperature; Fuel pressure and flow; Manifold pressure.	**3**
Unit XIII	**Powerplant Installation** 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.	**3**
Unit XIV	**Engine Monitoring and Ground Operation** Procedures for starting and ground run-up; Interpretation of engine power output and parameters; Inspection of engine and components: criteria, tolerances, and data specified by engine manufacturer.	**5**
Unit XV	**Engine Storage and Preservation** Preservation and de-preservation for the engine and accessories/ systems.	**2**
Unit XVI	**Aircraft Propeller** Fundamentals; Blade element theory; High/low blade angle, reverse angle, angle of attack, rotational speed; Propeller slip; Aerodynamic, centrifugal,	**4**

	and thrust forces; Torque; Relative airflow on blade angle of attack; Vibration and resonance.	
Unit XVII	**Propeller Construction**	**3**
	Construction methods and materials used in wooden, composite and metal propellers; Blade station, blade face, blade shank, blade back and hub assembly; fixed pitch, controllable pitch, constant speeding propeller; Propeller/spinner installation.	
Unit XVIII	**Propeller Pitch Control**	**3**
	Speed control and pitch change methods, mechanical and electrical/electronic; Feathering and reverse pitch; Over speed protection.	
Unit XIX	**Propeller Synchronising**	**2**
	Synchronising and synchrophasing equipment.	
Unit XX	**Propeller Ice Protection**	**2**
	Fluid and electrical de-icing equipment.	
Unit XXI	**Propeller Maintenance**	**3**
	Static and dynamic balancing; Blade tracking; Assessment of blade damage, erosion, corrosion, impact damage, delamination; Propeller treatment/repair schemes; Propeller engine running.	
Unit XXII	Propeller Storage and Preservation	**3**
	Propeller preservation and de-preservation.	

Reference Books:

Airframe and Power plant Mechanics (EA-AC 65- 12A) -Power Plant Hand

FAA Power Plant-By Bent and McKinley

Civil Aircraft Inspection Procedure (CAP 459) Part II Aircraft

Aircraft Propeller and Controls-by Frank Delph Powerplant

Section Text book- (EA-ITP-P) Aircraft Piston Engines-By Herschel Smith

Aviation Maintenance Technician Series by Dale Crane

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Electronic Fundamentals and Digital Techniques-II **Subject Code: BSCARM-305-18**

Objectives

This course intends to develop students' knowledge and skills in the area of digital techniques, multiplexing, DE-multiplexing, Electronic Displays and Instrument Systems. The course also covers typical Electronic/Digital Aircraft Systems, Integrated Modular Avionics and Cabin Systems The course covers materials required for avionics specialization as an in depth continuation to the materials covered Digital Techniques I.

Out come

After the completion of course, the students shell be able to understand the digital techniques, multiplexing, DE-multiplexing, Electronic Displays and Instrument Systems and able to properly diagnose the snags related to the avionics system.

		Hours
Unit I	**Basic Computer Structure** (a) Computer terminology (including bit, byte, software, hardware, CPU, IC, and various memory devices such as RAM, ROM, PROM); Computer technology (as applied in aircraft systems). (b) Computer related terminology; Operation, layout and interface of the major components in a microcomputer including their associated bus systems; Information contained in single and multi-address instruction words; Memory associated terms; Operation of typical memory devices; Operation, advantages and disadvantages of the various data storage systems.	**9**
Unit II	**Multiplexing** Operation, application and identification in logic diagrams of multiplexers and demultiplexers.	**3**
Unit III	**Electronic Displays and Instrument Systems** Principles of operation of common types of displays used in modern aircraft, including Cathode Ray Tubes, Light Emitting Diodes and Liquid Crystal Display. Electronic Flight instrument Systems; Typical systems arrangements and cockpit layout of electronic instrument systems ECAM-Electronic Centralized Aircraft Monitoring; EFIS-Electronic Flight Instrument System; EICAS-Engine Indication and Crew Alerting System Instrument warning systems including master warning systems and centralized warning panels;	**18**

Unit IV **Typical Electronic/Digital Aircraft Systems** **10**

General arrangement of typical electronic/digital aircraft systems and associated BITE(Built in Test Equipment) testing such as: ACARS-ARINC Communication and Addressing and Reporting System; Integrated modular Avionics;

Unit V **Integrated Modular Avionics (ATA 42)** **12**

Functions that may be typically integrated in the Integrated Modular Avionic (IMA) modules are, among others: Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature Monitoring, etc.; Core System; Network Components.

Unit VI **Cabin Systems (ATA 44)** **8**

The units and components which furnish a means of entertaining the passengers and providing communication within the aircraft (Cabin Intercommunication Data System) and between the aircraft cabin and ground stations (Cabin Network Service) - Includes voice, data, music and video transmissions; The Cabin Intercommunication Data System provides an interface between cockpit/ cabin crew and cabin systems. These systems support data exchange of the different related LRU's and they are typically operated via Flight Attendant Panels.

The Cabin Network Service typically consists on a server, typically interfacing with, among others, the following systems: Data/Radio Communication; In-Flight Entertainment System;

The Cabin Network Service may host functions such as:

Access to pre-departure/departure reports; E-mail/intranet/Internet access; Passenger database; Cabin Core System; In-flight Entertainment System; External Communication System; Cabin Mass Memory System; Cabin Monitoring System; Miscellaneous Cabin System.

Reference Books

Basic Electronics-Bemard Grob

Digital Fundamentals by Malvino and

Leech Principles of Electronics by V K

Mehta

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Aircraft Systems-I Lab **Subject Code: BSCARM-306-18**

1. Jacking and leveling of an aircraft. Record caution, warnings and procedure
2. Locate and inspect Bleed components installed on aircraft and use maintenance manual
3. Locate and inspect components of air-conditioning system and indications and use maintenance manual.
4. Locate and inspect components of aircraft pressurization system and safety devises and use maintenance manual.
5. Replace passenger seats and Check seat belts for serviceability.
6. Identification and inspection of flight control system
7. Rigging and operational check flight control systems
8. Identification and inspection of landing gear systems. Wheel and Brake removal/ installation.
9. Identification and inspection of Fuel system
10. Quantity Indicating systems functional testing.
11. Inspection of aircraft hydraulic system and servicing
12. Inspection for lightning strike protection.

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Aircraft Materials and Hardware Lab **Subject Code: BSCARM-307-18**

1. Testing of Non -Ferrous materials for hardness, tensile , Fatigue strength
2. Testing of ferrous materials for hardness, tensile , Fatigue strength
3. Identification of the characteristics and properties of common composite and non-metallic materials other than wood, used in aircraft.
4. Detection of defects/deterioration in composite and nonmetallic material.
5. Identification of the characteristics and properties of common types of wood and glue used in aircraft.
6. Identification and detection of defects in wood material and wooden structures.
7. Simple repair of composite and non-metallic materials and structures
8. Inspection and Repair of wooden structures.
9. Identification of the characteristics and properties of common fabrics and adhesives used in wooden structure aircraft.
10. Identification of defects and Repair of fabric covering.
11. Use of basic tools and equipment for: cutting, forming and joining commonly used materials.
12. Identification of Aircraft metallic materials
13. Identification of aircraft non-materials used on aircraft
14. Identification of various rivets and use of any one riveting technique
15. Identification of various fasteners and locking devices used in aircraft.

Core Course – B.ScHonours (Aircraft Maintenance)

Subject: Piston Engines and Propellers Lab **Subject Code: BSCARM-308-18**

1. Familiarise with constructions and functions of piston engines
2. Identification and inspection of various subassemblies of piston engines
3. Identification and inspection of cylinder and piston assemblies.
4. Inspection of accessory gear box valve mechanism.
5. Identification and inspection of various components of piston engines.
6. Identification and inspection of engine fuel system and function of carburetor.
7. Identification and inspection of engine fuel injection system and electronic fuel control.
8. Function check of magneto.
9. Various methods of engine starting and ignition systems and Engine indicating systems
10. Identification and inspection of components and function of lubrication system.
11. Engine control system and rigging
12. Familiarization with engines and airframe interface.
13. Testing of engine fire warning and extinguishing operation
14. Preparation for engine/ propeller storage and preservation.
15. Familiarise with propeller construction
16. Methods of propeller pitch control and its effect on engine power. Feathering and reverse pitch control. Propeller synchrophasing system
17. Check Propeller track.
18. Engine monitoring and ground operation
19. Spark plug cleaning and testing

Core Course – B.ScHonours (Aircraft Maintenance)

Subject: Electronic Fundamentals and Digital Techniques –II Lab Subject Code: BSCARM-309-18

1. Familiarization with computer architecture and its components
2. Identification of components of Display systems
3. Operation check of Display system.
4. Familiarization with CRT and various components associated with EFIS
5. Identification of components in engine display systems
6. Bite / self-test of EFIS system.
7. BITE on different aircraft systems.
8. Familiarization with components of system associated with Integral modular avionics systems such Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication.
9. Operation check of ventilation control system.
10. Operation check of IFE system.
11. Operation check of intercom system.
12. Operation check of cabin systems.
13. Inspection of IFE system, intercom system and other cabin systems.
14. Operation of temperature control system
15. Identify ECAM system components and carry out test

Semester IV

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Aircraft Systems-II **Subject Code: BSCARM-401-18**

Objectives

The overall objective of the course is to develop students' understanding and skills in aircraft instrument, water and waste systems and Oxygen system. Topics covered in this course include flight instruments, engine instruments, gyroscopic principles and instuments as Artificial horizons, horizontal situation indicator, turn coordinator, Directional gyros, Ground Proximity Warning Systems, Flight Data Recording systems and Stall warning systems. The course also includes aircraft electrical power, DC and AC motors and generators, power distribution systems, power control units, aircraft lights.

Out come

After the completion of course, students shell be able to understand and recognize the various components of the systems and their lay out as well as working principle and shell be able to diagnose the snags and rectify them properly.

		Hours
Unit I	**Aircraft Electrical Power System (ATA 24)** Batteries Installation and Operation; DC power generation; AC power generation; Emergency power generation; Voltage regulation; Power distribution; Inverters, transformers, rectifiers; Circuit protection; External/Ground power;	**8**
Unit II	**Aircraft Lights System (ATA 33)** External: navigation, anti-collision, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency Lights.	**4**
Unit III	**Instrument System (ATA 34)** Direct reading pressure and temperature gauges; Temperature indicating systems; Fuel quantity indicating systems; Gyroscopic principles; Artificial horizons; Attitude director, direction indicator, horizontal situation indicator, turn and slip indicators, turn coordinator; Directional gyros; Ground Proximity Warning Systems; Compass systems: direct reading, remote reading; Flight Data Recording systems; Stall warning systems and angle of attack indicating systems; Vibration measurement and indication; Glass cockpit.	**15**
Unit IV	**Oxygen System (ATA 35)** System lay-out: cockpit, cabin; Sources, storage, charging and	**8**

distribution; Supply regulation; Indications and warnings;

Unit V	**Fire Protection (ATA 26)**	**6**

(a) Fire and smoke detection and warning systems; Fire extinguishing systems; System tests.

(b) Portable fire extinguisher.

Unit VI	**Water/Waste (ATA 38)**	**4**

Water system lay-out, supply, distribution, servicing and draining; Toilet system lay-out, flushing and servicing; Corrosion aspects.

Unit VII	**Integrated Modular Avionics (ATA42)**	**10**

Functions that may be typically integrated in the Integrated Modular Avionic (IMA) modules are, among others: Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication,

Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature Monitoring, etc.; Core System; Network Components.

Unit VIII	**Door and Door Warning**	**5**

Type of Doors. Sensors, Escape Slides, Door warning systems, Inspections techniques.

Reference Books:

Aviation Electronics by Keith W Bose

Aircraft Instruments-by E.H.J.Pallett

Aircraft Instruments-by C.A.Williams

Avionics Systems operation & Maintenance by James W

Wasson Principles of Servo mechanism-by A Typers & R.B.Miles

Aircraft Electricity and electronics-by Bent McKinley and also by Eismin/Bent McKinley

Civil Aircraft Inspection Procedure(CAP 459) -Part II Aircraft

The Mechanism of Inertial Position and Heading Indication by Winston Merkey John Hovorka.

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Aircraft Maintenance Practices **Subject Code: BSCARM-402-18**

Objectives

The objective of this course is to develop students' understanding and skills in carrying out the aircraft maintenance as per the proper procedure and to introduce students to basic engineering Drawings, Diagrams and Standards, welding, brazing and soldering, Fits and Clearances. In addition the course covers the workshop tools springs, bearing, transmissions, pipes, hoses and unions, control cables, In addition maintenance, dis assembly, inspection, repair and assembly Techniques.

Out come

After the completion of course, students shell be able to carry out the aircraft maintenance as laid down in the aircraft maintenanance manuals and demonstrate competence in working effectively and safely in an aircraft maintenance organization.

		Hours
Unit I	**Safety Precautions-Aircraft and Workshop** Aspects of safe working practices including precautions to take when working with electricity, gases especially oxygen, oils and chemicals; Instructions on the remedial action to be taken in the event of a fire or another accident with one or more of these hazards including knowledge on extinguishing agents.	**4**
Unit II	**Workshop Practices** Care of tools, control of tools, use of workshop materials; Dimensions, allowances and tolerances, standards of workmanship; Calibration of tools and equipment, calibration standards.	**4**
Unit III	**Tools** Common hand tool types; Common power tool types; Operation and use of precision measuring tools; Lubrication equipment and methods. Operation, function and use of electrical general test equipment;	**4**
Unit IV	**Engineering Drawings, Diagrams and Standards** Drawing types and diagrams, their symbols, dimensions, tolerances and projections; Identifying title block information; Microfilm, microfiche and computerized presentations; Specification 100 of the Air Transport Association (ATA) of America; Aeronautical and other applicable standards including ISO, AN, MS, NAS	**4**

and MIL; Wiring diagrams and schematic diagrams.

Unit V	**Fits and Clearances**	**4**

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.

Unit VI	**Corrosion**	**6**

Chemical fundamentals; Formation by, galvanic action process, microbiological, stress;

(b) Types of corrosion and their identification; Causes of corrosion; Material types, susceptibility to corrosion.

Unit VII	**Welding, Brazing, Soldering and Bonding**	**5**

(a) Soldering methods; inspection of soldered joints.

(b) Welding and brazing methods; Inspection of welded and brazed joints; Bonding methods and inspection of bonded joints.

Unit VIII	**Disassembly, Inspection, Repair and Assembly Techniques**	**9**

(a) Types of defects and visual inspection techniques. Corrosion removal, assessment and re-protection.

(b) General repair methods, Structural Repair Manual; geing, fatigue and corrosion control programs;

(c) Non-destructive inspection techniques including, penetrant, radiographic, eddy current, ultrasonic and borescope methods.

(d) Disassembly and re-assembly techniques.

(e) Trouble shooting techniques

Unit IX	**Maintenance Procedures**	**3**

Maintenance planning; Modification procedures; Stores procedures; Certification/release procedures; Interface with aircraft operation; Maintenance Inspection/Quality Control/Quality Assurance; Additional maintenance procedures; Control of life limited components

Unit X	**Bearings**	**3**

Purpose of bearings, loads, material, construction; Types of bearings and their application. Testing, cleaning and inspection of bearings; Lubrication requirements of bearings; Defects in bearings and their causes.

Unit XI	**Transmissions**	**3**

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. Inspection of gears, backlash; Inspection of belts and pulleys, chains and sprockets; Inspection of screw jacks, lever devices, push-pull rod systems.

Unit XII	**Control Cables**	**3**

Types of cables; End fittings, turnbuckles and compensation devices; Pulleys and cable system components; Bowden cables; Aircraft flexible control systems. Swaging of end fittings; Inspection and testing of control cables; Bowden cables; aircraft flexible control systems.

Unit XIII	**Pipes and Unions**	**3**

(a) Identification of, and types of rigid and flexible pipes and their connectors used in aircraft;

(b) Standard unions for aircraft hydraulic, fuel, oil, pneumatic and air system pipes.

Unit XIV	**Pipes and Hoses**	**3**

Bending and belling/flaring aircraft pipes; Inspection and testing of aircraft pipes and hoses; Installation and clamping of pipes.

Unit XV	**Springs**	**2**

Types of springs, materials, characteristics and applications. Inspection and testing of springs.

Reference Books:

Airframe and Powerplant Mechanics (AC 65-15A)-Airframe Hand Book FAA Civil

Aircraft Inspection Procedure (CAP 459) Part II Aircraft Aircraft Maintenance and Repair By Kroes, Watkin and Delph

Acceptable Methods, Techniques and practices (FAA)-EA-AC 43.13-1 A&2A Aviation

Maintenance Technician Hand book by FAA

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Gas Turbine Engine **Subject Code: BSCARM-403-18**

Objectives

The overall objective of the course is to develop student understanding and skills in Gas Turbine Engine fundamentals, construction, operation, performance, construction and working principles of gas turbine engine and its various components, relationship between force, work, power, energy, acceleration and Briton cycle, Characteristics and performance of different types of gas turbine engines. Engine fuel, lubrication, starting and ignition systems; engine installation, safety procedures and monitoring systems. The course also includes engine ground operation, and thrust augmentation system.

Out come

After undergoing this course, students shell be able to understand the fundamentals, construction, operation, performance and working principles of gas turbine Engine and shell be able to carry out the removal, service and re installation of its components.

		Hours
Unit I	**Theory Fundamentals** Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle; The relationship between force, work, power, energy, velocity, acceleration; Constructional arrangement and operation of turbojet, turbofan, turbo shaft, turboprop.	**3**
Unit II	**Engine Performance** Gross thrust, net thrust, choked nozzle thrust, thrust distribution, resultant thrust, thrust horsepower, equivalent shaft horsepower, specific fuel consumption; Engine efficiencies; By-pass ratio and engine pressure ratio; Pressure, temperature and velocity of the gas flow; Engine ratings, static thrust, influence of speed, altitude and hot climate, flat rating, limitations.	**3**
Unit III	**Inlet** Compressor inlet ducts; Effects of various inlet configurations; Ice protection.	**2**
Unit IV	**Compressors** Axial and centrifugal types; Constructional features and operating principles and applications; Fan balancing; Operation: Causes and effects of compressor stall and surge; Methods of air flow control: bleed valves, variable inlet guide vanes, variable stator vanes, rotating stator blades; Compressor ratio.	**4**

Unit V	**Combustion Section** Constructional features and principles of operation	**2**
Unit VI	**Turbine Section** Operation and characteristics of different turbine blade types; Blade to disk attachment; Nozzle guide vanes; Causes and effects of turbine blade stress and creep.	**3**
Unit VII	**Exhaust** Constructional features and principles of operation; Convergent, divergent and variable area nozzles; Engine noise reduction; Thrust reversers.	**2**
Unit VIII	**Bearings and Seals** Constructional features and principles of operation.	**2**
Unit IX	**Lubricants and Fuels** Properties and specifications; Fuel additives; Safety precautions	**1**
Unit X	**Lubrication Systems** System operation/lay-out and components.	**2**
Unit XI	**Fuel Systems** Operation of engine control and fuel metering systems including electronic engine control (FADEC); Systems lay-out and components.	**3**
Unit XII	**Air Systems** Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services.	**3**
Unit XIII	**Starting and Ignition Systems** Operation of engine start systems and components; Ignition systems and components; Maintenance safety requirements.	**3**
Unit XIV	**Engine Indication Systems** Exhaust Gas Temperature/ Inter-stage Turbine Temperature; Engine Thrust Indication: Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems; Oil pressure and temperature; Fuel pressure and flow; Engine speed, Propeller Speed; Vibration measurement and indication; Torque; Power.	**4**
Unit XV	**Power Augmentation Systems** Operation and applications; Water injection, water methanol; Afterburner systems.	**2**
Unit XVI	**Turbo-prop Engines** Gas coupled/free turbine and gear coupled turbines; Reduction gears; Integrated engine and propeller controls; Over-speed safety devices.	**3**

Unit XVII	**Turbo-shaft engines** Arrangements drive systems, reduction gearing, couplings, control systems.	**3**
Unit XVIII	**Auxiliary Power Units (APUs)** Purpose, operation, protective systems.	**3**
Unit XIX	**Powerplant Installation** 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.	**3**
Unit XX	**Fire Protection Systems** Operation of detection and extinguishing systems.	**2**
Unit XXI	**Engine Monitoring and Ground Operation** Procedures for starting and ground run-up; Interpretation of engine power output and parameters; Trend (including oil analysis, vibration and boroscope) monitoring; Inspection of engine and components to criteria, tolerances and data specified by engine manufacturer; Compressor washing/cleaning; Foreign Object Damage.	**4**
Unit XXII	**Engine Storage and Preservation** Preservation and depreservation for the engine and accessories/ systems.	**3**

Reference Books:

Aircraft Gas Turbine Technology by IRWINE

TREAGER The Jet Engine' by ROLLS ROYCE

Power plant Section Text book- (EA-ITP-P)

Aviation Maintenance Technician Series by Dale Crane

Jet Aircraft power Systems' by JACK V. CASAMASSA and RALPH D.BENT

Gas Turbine Engines' by Turbomeca, Bordes,France.

Hydraulic Servo Systems' by M.GUILLON Introduction to Flight by JOHN ANDERSON:

Civil Aircraft Inspection Procedure (CAP459) Part- II Aircraft

Aircraft Power Plants by M.J.KROES, T.W.Wild, R.D.Bent and J.L.McKINLEY;

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Aviation Legislation **Subject Code: BSCARM-404-18**

Objectives

This course is designed to provide students with a working knowledge of aviation legislation to enable maintenance work to be done within the requirements of the Law. The course covers international regulatory framework, CAR -66 (Certifying Staff-Maintenance) and CAR-145 (Approved Maintenance Organisation), the purpose of the documents required under aircraft certifications, the continuing airworthiness of the aircraft, approved maintenance organisations and the Continuing Airworthiness Management Organisations (CAMO).

Out come

After undergoing the course students shell be able to understand aviation legislation systems and procedures to obtain the approvals in various aviation organizations and shell be able to maintain airworthiness standard as required to fly the aircraft safely.

		Hours
Unit I	**Regulatory Framework** Role of International Civil Aviation Organization; Introduction to Chicago Convention, 1944; Introduction to ICAO, Convention, Standards and Recommended Practices; The Aircraft Act, 1934; The Aircraft Rules, 1937 - Part I, II, III, IV, VI, VII, IX, XIIA, XIIB,XIIC, XIII, XIV Role of the DGCA; Relationship between CAR-21, CAR-M, CAR-145, CAR-66, CAR 147; Aeronautical Information Circulars (Applicable to Aircraft Maintenance and Release); CAR - Sections 1 and 2	**6**
Unit II	**CAR-M** Detail understanding of CAR M provisions related to Continuing Airworthiness; Detailed understanding of CAR-M.	**15**
Unit III	**CAR-145 — Approved Maintenance Organisations** Detailed understanding of CAR-145 and CAR M Subpart F	**15**
Unit IV	**CAR-66 Certifying Staff - Maintenance** Detailed understanding of CAR-66	**5**
Unit V	**CAR-147 Approved Maintenance Training Organization** Detailed understanding of CAR-147.	**5**
Unit VI	**Aircraft Operations** Commercial Air Transport/Commercial Operations; Air Operators	**5**

Certificates; Operators Responsibilities, in particular regarding continuing airworthiness and maintenance; Documents to be carried on board; Aircraft Placarding (Markings);

Unit VII **Aircraft Certification** **10**

(a) General-Certification rules: such as FAA & EACS 23/25/27/29; Type Certification Supplemental Type Certification; Type Approval; CAR-21 Sub-Part F, G, H, I, M, P & Q

Aircraft Modifications and repairs approval and certifications; permit to fly requirements

(b) Documents - Certificate of Airworthiness; Certificate of Registration; Noise Certificate; Weight Schedule; Radio Station Licence and Approval.

Unit VIII **Applicable National and International Requirements** **5**

Introduction to ICAO, FAR, EASA Regulations - Aircraft Maintenance and certification

(a) Maintenance Programme, Maintenance checks and inspections; Master Minimum Equipment Lists, Minimum Equipment List; Dispatch Deviation Lists; Airworthiness Directives; Service Bulletins, manufacturers service information; Modifications and repairs; Maintenance documentation: maintenance manuals, structural repair manual, illustrated parts catalogue, etc.;

(b) Continuing airworthiness; Test flights; ETOPS /EDTO, maintenance and dispatch requirements; RVSM, maintenance and dispatch requirements; RNP, MNPS Operations. All Weather Operations; Category 2/3 operations and minimum equipment, maintenance, training and certification requirements.

Unit IX **Safety Management System** **10**

State Safety Programme; Basic Safety Concepts; Hazards & Safety Risks; SMS Operation; SMS Safety performance; Safety Assurance.

Unit X **Fuel Tank Safety** **4**

Special Federal Aviation Regulations (SFARs) from 14 CFR SFAR 88 of the FAA and of JAA TGL 47; Concept of CDCCL, Airworthiness Limitations Items (ALI).

Reference Books:

The Aircraft Act, 1934

The Aircraft Rules, 1937 VOL 1

The Aircraft Rules, 1937 VOL 3

Aeronautical Information Circular CAR –

Section - 1, 2, & 8 SMS

CAR - 21, M, 145, 66 & 147

Special Federal Aviation Regulations (SFARs) - 14 CFR, SFAR 88 & JAA TGL 47

Airworthiness Procedure Manual

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Chemistry **Subject Code: BSCARM-405-18**

Objectives

This course enables students to develop their skills in understanding concepts of Chemistry. It helps students approach questions in a systematic manner. This course covers a variety of topics such as water technology, Introduction and specifications of water, Hardness and its determination, fuels, Classification, calorific value of fuel, instrumental methods of analysis ,Principle, Instrumentation. The course also covers the course also covers the Types of Lubricants; Chemical structure related to Lubrication and Mechanism of dry and wet corrosion and types of corrosion-Galvanic, Concentration cell, soil, pitting, intergranular.

Out come

After undergoing this course the students shell be able to the find out and rectify the defects, Which may effect the performance of aircraft, such as water presence in fuel, proper fuel Octane, improper viscosity of the lubricant oil and damage which may be caused by the Corrosion.

		Hours
Unit I	**MODULE I: WATER TECHNOLOGY** Introduction and specifications of water, Hardness and its determination (EDTA method only), Alkalinity, Boiler feed water, boiler problems – scale, sludge, priming & foaming: causes & prevention, Boiler problems – caustic embrittlement & corrosion: causes & prevention, Carbonate & phosphate conditioning, colloidal conditioning & calgon treatment, Water softening processes: Lime – soda process, Ion exchange method, Water for domestic use.	**12**
Unit II	**MODULE II: FUELS** Classification, calorific value of fuel, (gross and net), Determination of calorific value of fuels, bomb calorimeter, Solid fuels - Proximate and ultimate analysis, Octane & Cetane No. and its significance. Numerical on combustion.	**12**
Unit III	**MODULE III: INSTRUMENTAL METHODS OF ANALYSIS** Introduction; Principles of spectroscopy; Laws of absorbance IR: Principle, Instrumentation, Application UV : Principle, Instrumentation, Application NMR : Principle, Instrumentation, Application.	**12**
Unit IV	**MODULE IV: LUBRICANTS**	**12**

Introduction; Mechanism of Lubrication; Types of Lubricants; Chemical structure related to Lubrication; Properties of lubricants; Viscosity and Viscosity Index; Iodine Value; Aniline Point; Emulsion number; Flash Point; Fire Point; Drop Point; Cloud Point; Pour Point. Selection of Lubricants.

Unit V **MODULE V: CORROSION** **12**

Introduction, Mechanism of dry and wet corrosion, Types of corrosion- Galvanic, Concentration cell, soil, pitting, intergranular, waterline. Passivity. Factors influencing corrosion. Corrosion control.

Reference Books

Engineering Chemistry- Jain and Jain, Engineering Chemistry- Sunita Rattan

Core Course – B.ScHonours (Aircraft Maintenance)

Subject: Aircraft Systems-II Lab **Subject Code: BSCARM-406-18**

1. Reading and interpretation of electrical schematic and wiring diagrams and Identification of components of electrical power supply system.
2. Replacement of switches and circuit breakers and system check
3. Installation and operation check of Batteries in aircraft
4. Generator power check / voltage adjustment.
5. Internal lighting, replace bulb and filament.
6. Operational check of GPWS
7. Operational checkup of stall warning system and angle of attack indicating system
8. Operational check of temperature indicating system
9. Gyroscopic Instrument component replacements and functional tests.
10. Inspection and operation check of fuel quantity indication
11. Functional check of RR compass
12. Removal and Installation of Crew O2 system component
13. Identification of FDR system components
14. Check operation of fire / smoke detection and warning system.
15. Identification of components of door warning system and its operation check

Core Course – B.ScHonours (Aircraft Maintenance)

Subject: Aircraft Maintenance Practices Lab Subject Code: BSCARM-407-18

1 Draw different projections of a given object – Three View Diagram simple object, structural member, and joints.

2 Fit and remove thread inserts.

3 Use of precision measuring instruments, selection, handling of instruments and marking.

4 Removal and installation of hydraulic system pressurized / unpressurized components – safety, handling precautions, selection of appropriate tools and manuals. Use zonal numbers to record location. Use parts catalog & component location manual to locate components. Identify pipes and hoses.

5 Removal and installation of pneumatic system pressurized / unpressurized components – safety, handling precautions, selection of appropriate tools and manuals. Use zonal numbers to record location. Use parts catalog & component location manual to locate components. Identify pipes and hoses.

6 Removal and installation of oxygen system components – safety, handling precautions, selection of appropriate tools and manuals. Use zonal numbers to record location. Use parts catalog & component location manual to locate components. Identify pipes and hoses.

7 Visual inspection of various types of surface defects of aircraft structure using simple aids like magnifying glass, light and mirror. Use zonal and station numbers to record defect location.

8 Visual inspection of various types of surface defects of aircraft structure and system components like bearings, gears, chain, pulley, spring and cables using simple aids like magnifying glass, light and mirror and record defects.

9 Selection and use of lubrication technique of bearings, flight / engine / propeller 2 controls and undercarriages. Identifying lubricants.

Core Course – B.ScHonours (Aircraft Maintenance)

Subject: Gas Turbine Engine Lab **Subject Code: BSCARM-408-18**

1. Identify engine types, modules and subassemblies and components of turbine engines.
2. Identify various parts of thrust management and bypass system of turbine engine.
3. Identification and inspection of compressors stages.
4. Engine compressor surge and stall management components and control.
5. Identification various components of combustion systems and methods of cooling's.
6. Identification of exhaust system and methods of noise reduction
7. Identification and inspection of components of thrust reversal system.
8. Identify normal & electronic fuel control, monitoring and indication system
9. Familiarization with methods of engine starting and ignition systems.
10. Operation check of Engine indicating systems.
11. Familiarization of APU starting and shutdown procedure
12. Familiarization with power plant removal & installation
13. Visual Inspection of engines.
14. Typical engine control rigging.
15. Familiarization with engines and airframe interface.
16. Testing of engine fire monitoring and extinguishing operation
17. Study engine storage and preservation.

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Chemistry Lab **Subject Code: BSCARM-409-18**

1. To determine the ion exchange capacity of a given cation exchanger.
2. To determine the temporary, permanent and total hardness of a sample of water by by complexometric titration method.
3. To determine the type and extent of alkalinity of given water sample.
4. Determination of amount of oxalic acid and H_2SO_4 in 1 L of solution using N/10 NaOH and N/10 $KMnO_4$ solution
5. To prepare and describe a titration curve for phosphoric acid – sodium hydroxide titration using pH-meter. (a) To find the cell constant of conductivity cell. (b) Determine the strength of hydrochloric acid solution by titrating it against standard sodium hydroxide solution conductometrically.
6. Determination of Dissolved oxygen in the given water sample
7. To determine the total residual chlorine in water.
8. Determination of viscosity of given oil by means of Redwood viscometer I.
9. To determine flash point and fire point of an oil by Pensky Martin's Apparatus
10. Final Lab

Semester V

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Avionics **Subject Code: BSCARM-501-18**

Objectives

The overall objective of this course is to develop students' ability to analyze avionics systems and their applications. This course covers avionic systems used in modern aircraft, the principles, operation, application and maintenance of aircraft Communication, Fundamentals of radio wave propagation, antennas, transmission lines, Navigation, Very High Frequency omnidirectional range (VOR); Automatic Direction Finding (ADF); Instrument Landing System (ILS); Microwave Landing System (MLS); Distance Measuring Equipment (DME); Doppler navigation; Area navigation, Auto-flight and On board Maintenance Systems. The course also includes the Information Systems and Avionic General Test Equipment.

Out come

After the completion of course, students shell be able to analyze avionics systems and their applications and shell be able to independently on of aircraft Communication, Navigation, Auto-flight, On board Maintenance, Information Systems and avionic General Test Equipment.

		Hours
Unit I	**Communication (ATA 23)** Fundamentals of radio wave propagation, antennas, transmission lines, communication, receiver and transmitter; Working principles of following systems: Very High Frequency (VHF) communication; High Frequency (HF) communication; Audio; Emergency Locator Transmitters; Cockpit Voice Recorder ARINC communication and reporting;	**8**
Unit II	**Navigation (ATA 34)** Very High Frequency omnidirectional range (VOR); Automatic Direction Finding (ADF); Instrument Landing System (ILS); Microwave Landing System (MLS); Distance Measuring Equipment (DME); Very Low Frequency and hyperbolic navigation(VLF/Omega); Doppler navigation; Area navigation, RNAV systems; Flight Management Systems; Global Positioning System (GPS), Global Navigation Satellite Systems (GNSS); Inertial Navigation System; Air Traffic Control transponder, secondary surveillance radar; Traffic Alert and Collision Avoidance System(TCAS);Weather avoidance radar; Radio altimeter; IRS-Inertial reference system; TCAS- Traffic Collision Avoidance system.	**18**
Unit III	**Auto-flight (ATA 22)** Fundamentalsofautomaticflightcontrolincludingworkingprinciplesandcurrent terminology:	**15**

Flight Director System; Command signal processing; Modes of operation: roll, pitch and yaw channels; Yaw dampers; Auto-throttle systems; Automatic Landing Systems: principles and categories, modes of operation, Approach, glide slope, land, go-around, system monitors and failure conditions. FBW-Fly by Wire

Unit IV **On board Maintenance Systems(ATA45)** **5**

Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring). Software management control: Awareness of restrictions Airworthiness programmes,

Unit V **Information Systems (ATA46)** **10**

The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. Includes units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller. Does not include units or components installed for other uses and shared with other systems, such as flight deck printer or general use display; Typical examples include Air Traffic and Information Management Systems and Network Server Systems; Aircraft General Information System; Flight Deck Information System; Maintenance Information System; Passenger Cabin Information System; Miscellaneous Information System.

Unit VI **Avionic General Test Equipment** **4**

Operation, function and use of avionic general test equipment. Cabin System; Information system.

Reference Books:

Micro Electronics Aircraft System- by E.H.J.Pallett

Avionics Systems operation & Maintenance by James W Wasson

Aircraft Electricity and electronics-by Bent McKinley and also by Eismin/Bent McKinley

Civil Aircraft Inspection Procedure(CAP 459) -Part II Aircraft

Integrated Electronics-Millman and Halkias Aircraft Radio System-by J. Powell

Electronic Communication System by George Kennedy Avionics navigation systems By kayton & Fried

Radio navigation system by Borje forssell

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Corrosion and NDT Techniques **Subject Code: BSCARM-502-18**

Objectives

The objective of this course is to familiarize students on the Corrosion Theory, Development of Corrosion, Factors influencing corrosion and Forms of Corrosion. Different types of nondestructive techniques for the location of cracks. iquid/Dye penetrant test, Visual testing, Eddy current testing, ultrasonic inspection. Corrosion Prone Areas and Preventative Maintenance. Corrosion removal techniques, Preparations for rework, blending reworked areas, chemical testing, chemical spot analysis of magnetic metals, surface treatment testing, chemical spot testing of nonmagnetic metals, post identification cleaning and refinishing, mechanical corrosion removal by blasting.

Out come

After undergoing this course the students shell be able to recognize the type of corrosion in corrosion prone areas and shell be able to take rectification action (Preventative Maintenance) in time to avoid the damage to the aircraft parts.

		Hours
Unit I	**PART 1** Type of Corrosion, Corrosion Theory; General Development: Development of Corrosion, Factors influencing corrosion Forms of Corrosion, Corrosion and Mechanical Factors, Common Corrosive Agents Metallic Mercury Corrosion on Aluminum Alloys, Micro Organisms	**6**
Unit II	**PART 2** Importance of NDT in quality assurance; Different types of non-destructive techniques to obtain information regarding size, location and orientation of damage or cracks. Visual inspection techniques coin tapping technique for composite structures and adhesive bonds. Ultrasonic testing (UT Level 1, 2), Radiography Inspection (RT Level 1, 2), Magnetic particle testing (MT Level 1, 2), Microwave testing, Pulse echo technique, pitch-catch technique, through transmission technique, A-scan, B- Scan, C-scan. Acoustic emission: Sources of acoustic emission in composites, peak amplitude, rise time during events, ring-down counts duration of events. X-ray radiography: Absorption spectra, short wave length, X-ray for detection of voids. Die penetration technique.	**10**
Unit III	**PART 3** Liquid/Dye penetrant test (PT level 1, 2), Visual testing (VT-level 1, 2),	**10**

Eddy current testing (ET level 1, 2), Guided wave testing

Unit IV	**PART 4**	**8**
	TKY joints ultrasonic inspection, Basics of NDT, Metallurgy for non-metallurgists.	
Unit V	**PART 5**	**6**
	Effects of Corrosion on Metals, Corrosion Prone Areas and Preventative Maintenance Battery Compartments and battery vent openings, Lavatories, Buffets and Galleys, Bilge Areas, Wheel wells and landing gear, External skin areas, Water entrapment areas, Engine Frontal Areas and cooling air vents, Electronic package compartments.	
Unit VI	**PART 6**	**8**
	Factors in corrosion control, preventative maintenance, frequency of inspection, recommended depth of inspection, non-destructive inspection (NDI), Corrosion removal techniques, Standard methods, Preparations for rework, Paint removal, special techniques, fairing or blending reworked areas, chemical testing, chemical spot analysis of magnetic metals, surface treatment testing, chemical spot testing of non-magnetic metals, post identification cleaning and refinishing, mechanical corrosion removal by blasting.	
Unit VII	**PART 7**	**8**
	Corrosion Damage and Rework Limits On Aluminum and Aluminum Alloys, Treatment, Processing Of Aluminum Surfaces, Repair, Corrosion Removal Corrosion damage and rework limits on Magnesium and Alloy treatment, Processing of Aluminum surfaces, repair, corrosion removal Corrosion damage and rework limits on Ferrous CORROSION DAMAGE AND REWORK	
Unit VIII	**PART 8**	**3**
	Limits on Ferrous & Alloy Treatment, Processing of Aluminum Surfaces, Repair, Corrosion Removal; Corrosion damages on composite material Mercury spills/corrosion damage. Corrosion protection for agricultural aircraft	

Reference Books – corrosion and NDT

AC-43-4A

AC-43-1B

Non-Destructive Test and Evaluation of Materials, Prasad J and C.G

Krishnadas Nair Non-Destructive Testing Handbook, Vol 1. Aerospace

NDT – The American Society for Non-destructive Testing

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Environmental Science **Subject Code: BSCARM-503-18**

Objectives

This course is designed with the intention to improve the level of the students to understand the multidisciplinary nature of environmental studies, Scope and importance. The course provides the students with the necessary knowledge structure and function of ecosystems, Renewable and Non-renewable Resources, land degradation, soil erosion and decertification, Biodiversity and Conservation, levels of biological diversity in addition the course includes the study of Environmental Pollution, Environmental Policies & Practices.

Out come

After the completion of course, students shell be able to understand the various ways to land resources and land change procedure, use of alternate energy sources, growing energy needs and the type of environmental pollution.

		Hours
Unit I	**Introduction to environmental studies** Multidisciplinary nature of environmental studies Scope and importance; Concept of sustainability and sustainable development	**2**
Unit II	**Ecosystems** What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	**6**
Unit III	**Natural Resources : Renewable and Non-renewable Resources** • Land resources and land use change; Land degradation, soil erosion and desertification. • Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. • Water: Use and over--exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter--state). • Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.	**8**
Unit IV	**Biodiversity and Conservation**	**8**

- Levels of biological diversity : genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots.
- India as a mega--biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity : Habitat loss, poaching of wildlife, man—wildlife conflicts, biological invasions; Conservation of biodiversity : In--situ and Ex-- situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value

Unit V **Environmental Pollution** **8**

- Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution.
- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial waste.
- Pollution case studies

Unit VI **Environmental Policies & Practices** **7**

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

Unit VII **Human Communities and the Environment** **6**

- Human population growth: Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management: floods, earthquake, cyclones and landslides.
- Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.

- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Unit VIII Field work **15**

- Visit to an area to document environmental assets: river/ forest/flora/fauna etc.
- Visit to a local polluted site--Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds and basic principals of identification.
- Study of simple ecosystems--pond, river etc

Reference Books

Gadgil, M., & Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press

Gilbert M.Masters, "Introduction to Environmental Engineering and Science", Pearson education Pvt., Ltd., second edition, ISBN 81-297-0277-0, 2004.

Miller T.G. JR., "Environmental Science", Wadsworth publishing co.

Odum, E.P., Odum, H.T. & Andrews, J. 1971.Fundamentals of Ecology. Philadelphia: Saunders.

Sengupta, R. 2003. Ecology and economics: An approach to sustainable development. OUP.

Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi

Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.

Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent

Rao, M.N. & Datta, A.K. 1987. Waste Water Treatment. Oxford and IBH Publishing Co. Pvt. Ltd.

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Avionics Lab **Subject Code: BSCARM-504-18**

1. VHF / HF Communications LRU replacement and Communication Check.
2. Use of various test equipment for avionics system maintenance.
3. VHF Navigation LRU replacement and system tests.
4. Inspection / testing of ELT
5. CVR switching and recording
6. Antenna replacement and system testing
7. Radio Standing Wave ratio Measurement Tests.
8. Function Testing of ATC / TCAS system components.
9. Operation test of Weather Radar system.
10. Intercommunication / Passenger Address Component function testing.
11. ILS / VOR Systems function testing using appropriate test equipment e.g. Nav 401/402
12. Radio Altimeter system test utilizing appropriate (555) test set.
13. DME / VOR Functional Testing utilizing appropriate test set.
14. ADF component functions and tests.
15. Functional check of inertial navigation system
16. Operational testing of Flight Director System’s and auto pilot system.
17. Locate Autothrottle systems components and bite test.
18. Perform BITE on Central Maintenance system.

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Corrosion and NDT Techniques Lab **Subject Code: BSCARM-505-18**

1. Identify different types of corrosion, factors contribute to corrosion, areas prone for corrosion, corrosive agents avoidance of corrosion
2. Detection of corrosion, defects and recording
3. Various Corrosion preventive technique – practice
4. Surface cleaning, rework and protection technique of ferrous and non-ferrous (Magnesium and Aluminum alloys) metallic surface
5. Accidental spillage of corrosive agents, cleaning and restoration
6. Ultrasonic Thickness testing
7. Liquid Penetrant testing
8. Eddy current
9. Magnetic Particle
10. Visual Inspection
11. Radiography testing
12. Guided wave testing

Semester VI

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Aircraft Stores **Subject Code: BSCARM-601-18**

Objectives

The objective of this course is to familiarize students on the different types of stores, store procedure, documents used in store, receiving and issuing procedure of components, Procedure of certification of spare parts and aircraft competent, Procedure of demanding, issuing and practices of reading and understanding the spare parts catalogue, Storage Conditions, temperature, humidity, Light, Oxygen. The course also includes Special procedure to be followed for storing of fuel, lubricants and special Petroliam and quality control requirements.

Out come

After undergoing this course the students shell be able to understand about different types of stores, store procedure, documents used in store, receiving and issuing procedure of components, Procedure of certification of spare parts and aircraft components.

		Hours
Unit I	Knowledge of various documents used in store procedure; Release note, Rejection note, Release note and Rejection note signatory, Receiving and issuing procedure of components.	**8**
Unit II	Different types of stores; Bonded store and Quarantine store. Procedure of storing of different types of components and maintenance of records, stock register and posting of spare parts.	**8**
Unit III	Storage Conditions; Rooms, Storing of tyres and tubes, Temperature, humidity, Light, Oxygen, Ozone, Deformation and contamination	**8**
Unit IV	Procedure of certification of spare parts and aircraft competent.	**8**
Unit V	Special procedure to be followed for storing of fuel, lubricants and special petroleum and quality control requirements, documents used and approval thereof.	**8**
Unit VI	Procedure of demanding, issuing and practice of reading and understanding the spare parts catalogue.	**10**
Unit VII	Storing procedure for Hoses; Storage, shelf life, service life of different types of Hoses and other rubber parts, seals, “O” rings and their self life, service life. Procedure to be followed for Life development of Hoses and Rubber parts.	**10**

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Aircraft (Hydraulic) Component Maintenance Subject Code: BSCARM-602-18

Objectives

This course enables students to develop their skills in Procedure of removing ,servicing, defect rectification, operation and re-install hydraulic components such as engine driven pump, accumulator, reservoir, shut off valve, filter, pressure regulator, pressure relief valve and check valve. In addition the course also covers the Procedure of charging of oleo strut and bleeding the hydraulic brakes system and performing the operational check including the Trouble shooting of various defect and rectification for the snag free operation of the aircraft.

Out come

After undergoing this course the students shell be able to carry out removal ,service, defect rectification, operation and re-install the hydraulic components and able to charging the oleo struts, bleed the hydraulic brakes system and trouble shoot the various defect and carry out rectification.

		Hours
Unit I	Procedure of removing, servicing, defect rectification, operation and re-installation of hydraulic engine driven pump and stand by hydraulic pump and performing the functional check.	**6**
Unit II	Procedure of removing, servicing, defect rectification and re-installation of hydraulic accumulator and performing the functional check.	**6**
Unit III	Procedure of removing, servicing, defect rectification and re-installation of hydraulic engine reservoir and performing the functional check.	**6**
Unit IV	Procedure of removing, servicing, defect rectification, operation and re-installation of hydraulic shut off valve and performing the functional check.	**6**
Unit V	Procedure of removing, servicing, defect rectification, operation and re-installation of hydraulic filter and performing the functional check.	**6**
Unit VI	Procedure of removing, servicing, defect rectification, operation and re-installation of hydraulic pressure relief valve and check valve and performing the functional check.	**6**
Unit VII	Procedure of removing, servicing, defect rectification, operation and re-installation of hydraulic pressure regulator and performing the functional check.	**6**
Unit VIII	Procedure of charging of oleo strut and performing the operational check.	**6**
Unit IX	Procedure of bleeding the hydraulic brakes system and performing the operational check.	**6**
Unit X	Troubleshooting of various defect and rectification.	**6**

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Typical Piston Engine maintenance **Subject Code: BSCARM-603-18**

Objectives

This course enables students to develop their skills in understanding the procedures of removing, servicing, defect rectification, operation and re-install of piston engine components such as induction, carburetor and direct fuel injection, exhaust system components, magneto, carring out of magneto timing, valve timing, the compression check, rigging of engine controls ignition leads and spark plugs from cylinders and oil tanks ,servicing and flushing of oil tanks. Inspection of all the oil hoses and their installation as well as Inspection and testing of ignition leads and ground running the engine..

Out come

After undergoing this course the students shell be able to carry out removal, service, defect rectification, operation and re-install the engine components and able to carry out the valve timing, magneto timing, compress check, rigging of engine controls and ground running the engine.

		Hours
Unit I	Procedure of visual inspection of engine after the removal of cowling; various oil leaks, fuel leaks ,loose nuts and bolts, broken welded portion on exhaust, burning of exhaust pipes etc.	**4**
Unit II	Procedure of removing the induction, carburetor and direct fuel injection system components and its servicing and re installation.	**4**
Unit III	Procedure of removing and installation of magneto, carrying out of engine timing, magneto timing, checking the magneto timing and adjusting of magneto timing. Inspection and testing of ignition leads.	**4**
Unit IV	Procedure of removal of ignition leads and spark plugs from cylinders, using proper tools and equipment, servicing of sparking plug and re –installation.	**4**
Unit V	Procedure of removing and installation of oil tanks, servicing and flushing of oil tanks. Inspection of all the oil hoses and their installation.	**4**
Unit VI	Procedure of carrying out the compression check of cylinders by different methods and recording them in the relevant log books.	**4**
Unit VII	Procedure of carrying out the valve timing, adjusting the valve clearance and checking the valve clearance, servicing of hydraulic valve lifter (zero lash lifter) and re –installation.	**4**

Unit VIII	Procedure of removal servicing and installation of exhaust system components.	**4**
Unit IX	Procedure of rigging of engine controls such as throttle and mixture controls.	**4**
Unit X	Procedure to carry out run out check on crank shaft.	**4**
Unit XI	Procedure of preparing the engine for ground run, ground running the engine and checking of all engine performance data.	**4**
Unit XII	Trouble shooting of different types of defects.	**8**
Unit XIII	Recording all the engine parameter and data in the relevant engine log book.	**8**

Core Course – B.ScHonours (Aircraft Maintenance)

Subject: Aircraft (Hydraulic) Component Maintenance Lab Subject Code: BSCARM-604-18

1. Removing, servicing, defect rectification, operation and re-installing of hydraulic engine driven pump and stand by hydraulic pump and performing the functional check.
2. Removing, servicing, defect rectification and re-installing of hydraulic accumulator and performing the functional check
3. Removing, servicing, defect rectification and re-install of hydraulic reservoir and performing the functional check
4. Removing, servicing, defect rectification, operation and re-installation of hydraulic shut off valve and performing the functional check
5. Removing, servicing, defect rectification, operation and re-installation of hydraulic filter and performing the functional check.
6. Removing, servicing, replacing, operation and re-installation of hydraulic pressure relief valve and check valve and performing the functional check.
7. Removing, servicing, defect rectification, operation and re-installation of hydraulic pressure regulator and performing the functional check.
8. Charging of oleo strut and performing the operational check.
9. Bleeding the hydraulic brakes system and performing the operational check.
10. Troubleshooting of various defect and rectification.

Core Course – B.Sc Honours (Aircraft Maintenance)

Subject: Typical Piston Engine Maintenance Lab Subject Code: BSCARM-605-18

1. Remove cowling; check various oil leaks ,fuel leaks ,loose nuts and bolts,broken welded portion on exhaust, burning of exhaust pipes etc.
2. Remove the induction, carburetor and direct fuel injection system components and its servicing and re installation
3. Remove and install, magneto, carrying out of engine timing magneto timing, checking the magneto timing and adjusting of magneto timing. Inspection and testing of ignition leads
4. Remove ignition leads and spark plugs from cylinders, using proper tools and equipment, servicing of sparking plug and re install.
5. Remove and install oil tanks, servicing and flushing of oil tanks. Inspection of all the oil hoses and their installation.
6. Carry out the compression check of cylinders by different methods and recording them in the relevant log books.
7. Carry out the valve timing, adjusting the valve clearance and checking the valve clearance servicing of hydraulic valve lifter (zero lash lifter) and re –installation.
8. Removal, servicing and installation of exhaust system components
9. Carryout rigging of engine controls such as throttle and mixture controls.
10. Carry out run out check on crank shaft.
11. Preparing the engine for ground run, ground running the engine and checking of all engine performance data.
12. Trouble shooting of different types of defects.
13. Recording all the engine parameter and data in the relevant engine log book.