

SEMESTER III

Course Code		Credits :4
USARM301	AVIATION LEGISLATION AND HUMAN FACTORS	
<p>Unit I–CAR- M, applicable National and international requirements</p> <p>CAR-M Detailed understanding of CAR 21 provisions related to continuing airworthiness Detailed understanding of CAR – M</p> <p>Applicable National and international requirements (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.;</p> <p>(b) Continuing airworthiness; Test flights; ETOPS, maintenance and dispatch requirements; RVSM, maintenance and dispatch requirements RNP, MNPS Operations All Weather Operations,</p>		30 Lectures
<p>Unit II -Safety Management System and Fuel Tank Safety</p> <p>Safety Management System State Safety Programme Basic Safety Concepts Hazards & Safety Risks SMS Operation SMS Safety performance Safety Assurance 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)</p> <p>Fuel Tank Safety Special Federal Aviation Regulations (SFARs) from 14 CFR SFAR 88 of the FAA and of JAA TGL 47 Concept of CDCCL, Airworthiness Limitations Items (ALI)</p>		30 Lectures
<p>Unit III– Human Factors</p> <p>General The need to take human factors into account; Incidents attributable to human factors/human error; ‘Murphy’s’ law.</p> <p>Human Performance and Limitations Vision; Hearing; Information processing; Attention and perception; Attention and perception; Memory; Claustrophobia and physical access.</p>		30 Lectures

<p>Social Psychology Responsibility: individual and group; Motivation and de-motivation; Peer pressure; ‘Culture’ issues; Team working; Management, supervision and leadership</p> <p>Factors Affecting Performance Fitness/health; Stress: domestic and work related; Time pressure and deadlines; Workload: overload and under load; Sleep and fatigue, shift work; Alcohol, medication, drug abuse.</p> <p>Physical Environment Noise and fumes; Illumination; Climate and temperature; Motion and vibration; Working environment.</p> <p>Tasks Physical work; Repetitive tasks; Visual inspection; Complex systems.</p> <p>Communication Within and between teams; Work logging and recording; Keeping up to date, currency; Dissemination of information.</p> <p>Human Error Error models and theories; Types of error in maintenance tasks; Implications of errors (i.e. accidents) Avoiding and managing errors.</p> <p>Hazards in the Workplace Recognising and avoiding hazards; Dealing with emergencies.</p>	
<p>Reference Book :</p> <ol style="list-style-type: none"> 1. CAR by DGCA 2. CAR 66 by DGCA 3. CAR 145 by DGCA 4. CAR 21 by DGCA 5. CAR M by DGCA 6. ICAO Doc. 9683 	

Course Code		Credits :3
USARM302	INSTRUMENTS	
<p>Unit I:Basics: Pitot static: altimeter, air speed indicator, vertical speed indicator; Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator;Compasses: direct reading, remote reading; Angle of attack indication, stall warning systems</p>		20 Lectures
<p>Unit II – System: General arrangement of typical electronic/digital aircraft systems and associated BITE (Built In Test Equipment) testing such as:</p>		20 Lectures

ACARS-ARINC Communication and Addressing and Reporting System ECAM-Electronic Centralised Aircraft Monitoring EFIS-Electronic Flight Instrument System EICAS-Engine Indication and Crew Alerting System FBW-Fly by Wire, FMS-Flight Management System	
Unit III :System: GPS-Global Positioning System IRS-Inertial reference system TCAS-Traffic Collision Avoidance system Integrated modular Avionics Cabin System Information system	20 Lectures
Reference Book : Aircraft Instruments system by E H J Pallet	

Course Code		Credits :3
USARM 303	DIGITAL TECHNIQUES II	
Unit I –Fibre Optics and Electronic Displays : Advantages and disadvantages of fibre optic data transmission overelectrical wire propagation; Fibre optic data bus; Fibre optic related terms;Terminations; Couplers, control terminals, remote terminals;Application of fibre optics in aircraft systemsPrinciples of operation of common types of displays used in modernaircraft, including Cathode Ray Tubes, Light Emitting Diodes and LiquidCrystal Display.		30 Lectures
Unit II- Software Management Control: Awareness of restrictions, airworthiness requirements and possiblecatastrophic effects of unapproved changes to software programmes.		20 Lectures
Unit III – Electrostatic Sensitive Devices: Special handling of components sensitive to electrostatic discharges;Awareness of risks and possible damage, component and personnelantistatic protection devices, Influence of the following phenomena on maintenance practices forelectronic system: EMC-Electromagnetic Compatibility EMI-Electromagnetic InterferenceHIRF-High Intensity Radiated Field Lightning/lightning protection		30 Lectures
Reference Book : 1. Digital Principles and Applications by DONALD P. LEACH, ALBERTPAUL ALVINO,GOUTAM SAHA		

Course Code		Credits :3
USARM304	HARDWARE	
Unit I -Springs and Bearings : Types of springs, materials, characteristics and applications. Purpose of bearings, loads, material, construction; Types of bearings and their application. Gear types		30 Lectures

and their application; Gear ratios, reduction and multiplication gear systems, driven and driving gears, idler gears, mesh patterns; Belts and pulleys, chains and sprockets.	
Unit II-Control Cables : Types of cables; End fittings, turnbuckles and compensation devices; Pulleys and cable system components; Bowden cables; Aircraft flexible control systems. Electrical Cable types, construction and characteristics; High tension and co-axial cables; Crimping; Connector types, pins, plugs, sockets, insulators, current and voltage rating, coupling, identification codes	20 Lectures
Unit III-Quick release fasteners: Dzus fastener, camloc fastener, airlock fasteners. Pins : Cotter pin, split pin etc	20 Lectures
Reference Book :- 1. FAA-H-8083-30(9A) & 15 A 2. Shop Theory (Anderson)	

Course Code		Credits :3
USARM 305	ENVIRONMENTAL STUDIES	
Unit I-Environmental concepts : Environment: definition and composition, atmosphere, biosphere, ecological system and ecology, food chain, exploitation of natural resources in sustainable manner, Global warming, Acid rain.		20 Lectures
Unit II-Disaster and Waste management: What is disaster, concept of disaster, cause of disaster, major natural disaster, cyclones, Tsunami, disaster management, forms of waste, classification of waste, sources of waste their effects and waste management		20 Lectures
Unit III – Sustainable Development: Natural resources, ever increasing power requirement, renewable resources, Sustainability, conservation, Environmental clearance for establishing and operating Industries in India. Wildlife protection act,		20 Lectures
Reference Book :- Environmental Management – Smita Salunke		

PRACTICALS

Course Code	PRACTICALS	Credits :1
USARM 3P1	INSTRUMENTS	50 marks
INSTRUMENT:- 1) Identification of various elements of Instrument Mechanism 2) Disassembly, cleaning, inspection and assembly of ASI 3) Disassembly, cleaning, inspection and assembly of Altimeter 4) Showing properties of gyro 5) Disassembly, cleaning, inspection and assembly of Directional Gyro 6) Disassembly, cleaning, inspection and assembly of RPM Indicator 7) Familiarization of Learjet cockpit instruments 8) Familiarization of Instrument related components and their locations 9) Checking of Insulation Resistance with Meggar 10) Use of Soldering Iron in Electrical Instrument		80 hours

Course Code	PRACTICALS	Credits :1
USARM 3P2	DIGITAL TECHNIQUES	50 marks
1) Study of microprocessor 8085. 2) Study of ARINC 429/629 BUS. 3) Study of Fiber optic cable. 4) Pamphlet Design in MS-WORD 2007 5) Article Design in MS-WORD 2007 6) Comparative Worksheet Design in MS-EXCEL 2007 7) Comparative Different Slides in MS-POWERPOINT 2007 with Different Transitions 8) Usage of Record Sets, Passing & Returning of Record Set from a procedure, Usage of Command Object – Parameter Collection 9) Trapping ADO Errors, Class & its methods, Encapsulation – using properties in VB 10) Class creation and Usage, Usage of ActiveX components – both ActiveX DLL and ActiveX EXE, Package and Deployment Wizard 11) Interactive Discussion on VB 6.0 12) Interactive Discussion on AUTOCAD 2010		80 hours

Course Code	PRACTICALS	Credits :2
USARM 3P3	Welding	100 marks
AIRCRAFT MATERIAL-WELDING :- 1) Familiarization of Gas Welding & Precautions 2) Leftward & Rightward Welding 3) Butt Welding 4) Lap Joint 5) T Joint 6) Familiarization to Electric Arc Welding and Precautions 7) Grinding 8) Arc Welding Practice 9) Butt Joint 10) Slotted Welding		80 hours

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| <ul style="list-style-type: none">11) Fillet Welding12) Gas Welding13) Arc Welding14) Position Welding (Gas & Arc) – Flat, Vertical, Horizontal, Overhead15) Pipe Welding (Gas & Arc)16) Brazing17) Silver Soldering | |
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SEMESTER IV

Course Code		Credits :3
USARM 401	CABIN ATMOSPHERE CONTROL	
Unit I–Fire Protection : Fire extinction Principles, fire extinguisher mediums & their proper use, Fire warning devices, Thermal switches, Thermocouple system, continuous loop fire warning systems, spot detection, smoke detection, fire zones, Routine maintenance, inspection.		20 Lectures
Unit II –Pressurisation Atmosphere; Description of a cabin pressure system; Structural Requirements for pressure cabins; Cabin pressure and rate of change controls; Safety; Discharge and Relief Valves; Recirculation systems; Humidification. Precautions to be observed on ground tests; Understanding the pressure altitudes; cabin altitude; Differential pressure; Operations of pressure controllers; Outflow valve; Safety Valve; Cabin rate of climb indicator; Manual pressure control valve; Negative pressure relief valve; Fault finding.		20 Lectures
Unit III –Air Conditioning Air conditioning systems; Air cycle and vapour cycle machines Distribution systems; Flow, temperature and humidity control system.		20 Lectures
Reference Book :- 1. A & P Technician Airframe Textbook –Jeppesen 2. Aviation Maintenance Technician handbook – FAA -9A, 15A, 12A		

Course Code		Credits :3
USARM 402	THEORY OF FLIGHT AND INSTRUMENTS	
Unit I:Aeroplane Aerodynamics and Flight Controls : Operation and effect of: — 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 de- vices; Operation and effect of trim tabs, balance and antibalance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels;		30 Lectures
Unit II:High Speed Flight : Speed of sound, subsonic flight, transonic flight, supersonic flight, Mach number, critical Mach number, compressibility buffet, shock wave, aerodynamic heating, area rule; Factors affecting airflow in engine intakes of high speed aircraft; Effects of sweepback on critical Mach number, mach tuck.		20 Lectures

<p>Unit II:Autopilot: Fundamentals of automatic flight control including working principles and current terminology; Command signal processing; Modes of operation: roll, pitch and yaw channels; Yaw dampers; Stability Augmentation System in helicopters; Automatic trim control; Autopilot navigation aids interface; Autothrottle systems. Automatic Landing Systems: principles and categories, modes of operation, approach, glideslope, land, goaround, system monitors and failure conditions</p>	20 Lectures
<p>Reference Book :</p> <ol style="list-style-type: none"> 1. Mechanic of flight – (A C Karmode) 2. Automatic Flight control by Pallett 	

Course Code		Credits :3
USARM 403	GAS TURBINE ENGINE - I	
<p>Unit I –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, turboshaft, turboprop. 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.</p>		30 Lectures
<p>Unit II –Parts of Gas Turbine Engine: Inlet Compressor inlet ducts, Effects of various inlet configurations; Ice protection 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. Combustion Section Constructional features and principles of operation. 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. Exhaust Constructional features and principles of operation; Convergent, divergent and variable area nozzles; Engine noise reduction; Thrust reversers</p>		20 Lectures

<p>Unit III –Systems: Bearings and Seals Constructional features and principles of operation. Lubricants & fuels Properties and specifications; Fuel additives; Safety precautions Lubrication Systems System operation/lay-out and components. Fuel Systems Operation of engine control and fuel metering systems including electronic engine control (FADEC);Systems lay-out and components.</p>	30 Lectures
<p>Reference Book :</p> <ol style="list-style-type: none"> 1. Aircraft gas turbine engine by Treager 2. Gas turbine engine by Otis 	

Course Code		Credits :3
USARM 404	PISTON ENGINE - I	
<p>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. Power calculation and measurement; Factors affecting engine power; Mixtures/leaning, pre-ignition Crank case, crank shaft, cam shafts, sumps; Accessory gearbox; Cylinder and piston assemblies; Connecting rods, inlet and exhaust manifolds; Valve mechanisms; Propeller reduction gearboxes. Types of engine, Requirements, terms and definition.</p>		30 Lectures
<p>Unit II -Engine Fuel Systems : Carburetors Types, construction and principles of operation; Icing and heating Fuel injection systems Types, construction and principles of operation. Operation of engine control and fuel metering systems.</p>		20 Lectures
<p>Unit III –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. Construction and operation of: induction systems including alternate air systems; Exhaust systems, engine cooling systems — air and liquid. Principles and purpose of supercharging and its effects on engine parameters; Construction and operation of supercharging/turbocharging systems; System terminology; Control systems; System protection.</p>		30 Lectures
<p>Reference Book :- 12A, AC powerplant Kroes and Wild</p>		

Course Code		Credits :3
USARM 405	PROPELLER	
Unit I –Fundamentals: Blade element theory; High/low blade angle, reverse angle, angle of attack, rotational speed; Propeller slip; Aerodynamic, centrifugal, and thrust forces; Torque; Relative airflow on blade angle of attack; Vibration and resonance. Construction methods and materials used in wooden, composite and metal propellers; Blade station, blade face, blade shank, blade back and hub assembly;		30 Lectures
Unit II – Propeller pitch: Fixed pitch, controllable pitch, constant speed propeller; Propeller/spinner installation Speed control and pitch change methods, mechanical and electrical/electronic; Feathering and reverse pitch;Overspeed protection. Synchronising and synchrophasing equipment.		20 Lectures
Unit III – Propeller maintenance: Fluid and electrical de-icing equipment. Static and dynamic balancing; Blade tracking; Assessment of blade damage, erosion, corrosion, impact damage, delamination; Propeller treatment/repair schemes; Propeller engine running. Propeller preservation and depreservation		20 Lectures
Reference Book :- Aviation maintenance Technician handbook power plant – FAA 12A		

PRACTICALS

Course Code	PRACTICALS	Credits :1
USARM 4P1	Aircraft Systems	40 marks
<ol style="list-style-type: none"> 1. Different types of fire extinguishers how to use them, recharging, weighing and certification 2. Locate and identify the following : i) Safety valve ii) Discharge valve iii) Relief Valve 3. Removal of heat exchanger. 4. Installation of heat exchanger. 5. Maintenance of components of air-conditioning system. 6. Simulation of removal of fire extinguisher bottle from aircraft 7. Carry out snag analysis and rectification of Cabin pressure low 8. Carry out snag analysis and rectification of Cabin temperature high 		40 hours

Course Code	PRACTICALS	Credits :1
USARM 4P2	INSTRUMENTS	40 marks
<p>INSTRUMENT AUTOPILOT:-</p> <ol style="list-style-type: none"> 1) Disassembly, cleaning, inspection and assembly of VSI 2) Disassembly, cleaning, inspection and assembly of Gyro Horizon Indicator 3) Disassembly, cleaning, inspection and assembly of Turn & Bank Indicator 4) Disassembly, cleaning, inspection and assembly of Hydraulic Pressure Gauge 5) Calibration of Air Speed Indicator 6) Showing the nature of airflow with the help of venture tube 7) Operation of primary control surfaces by the movement of pilot's control 8) Tracing of pitot and static system pipelines and preparing a detailed schematic diagram 9) Simulated removal and installation of ASI / Mach Indicator combined on co-pilot's instrument panel 10) Simulated removal and installation of Altimeter on co-pilot's instrument panel 11) Simulated removal and installation of Vertical Speed Indicator on co-pilot's instrument panel 12) Simulated removal and installation of Cabin VSI on co-pilot's instrument panel 13) Inspection of cabling & wiring and system handling in a/c 14) Familiarization of aircraft autopilot basic functioning 15) Positional familiarization of AFCS inputs 16) Familiarization with location and operation of AFCS computers 17) Visual familiarization and working of outer loop control interface 18) Positional familiarization of servo alternators 19) Familiarization of AFCS control panel 20) Operation of altitude HOLD mode (Simulated) 21) Operation of HDG HOLD mode (Simulated) 22) Operation of NAV HOLD mode (Simulated) 23) Operation of pitch control knob (Simulated) 24) Operation of pitch control knob (Simulated) 		50 hours

Course Code	PRACTICALS	Credits :1
USARM 4P3	GAS TURBINE ENGINE	40 marks
<ol style="list-style-type: none"> 1. identifying the following parts on aircraft Jet Engine – Air Intake, Compressor Combustion Chamber, Turbine, Exhaust 2. Types of Combustion Chamber – Can, Can Annular, Annular 3. Types of Compressor – Axial, Centrifugal Compressor 4. Types of Turbine Blades 5. Fuel flow Transmitter – Location , type of signal generated and end location, gauge in cockpit 6. L H and RH manifold identification, location and end connection 7. Fuel nozzle- total numbers, type, distinguish between simplex and duplex nozzles 8. Fuel cooled oil cooler (FCOC)- Location, mounting, safety and configuration 9. Locate and trace all the supply, scavenge and breather lines of oil system on the engine 		50 hours

Course Code	PRACTICALS	Credits :1
USARM 4P4	PISTON ENGINE	40 marks
<ol style="list-style-type: none"> 1. Familiarization of Piston engine components: Crankcase, Crankshaft, Camshaft, Bearings, Connecting Rod, Piston, Piston Rings. 2. Spark Plug – Checking, Cleaning & Fouling of Plug 3. Operation of 4 Stroke Engine 4. Operation of 2 Stroke Engine 5. Identifying the different types of carburetors 6. Propeller Locking, Carburetor Locking 7. Working of magneto 		50 hours

Course Code	PRACTICALS	Credits :1
USARM 4P5	PROPELLER	40 marks
<p>PROPELLER AND ITS CONTROL:-</p> <ol style="list-style-type: none"> 1) Familiarization with propeller blade elements 3) Propeller construction 4) Propeller blade station numbering 5) familiarization with fixed pitch, controllable and constant speed propeller 6) Feathering and reverse pitch propeller 7) Propeller synchronization 8) Icing protection of propeller 9) Propeller hub and blade inspection 10) Storage and preservation of propeller 11) Blade tracking 12) Over speed protection of propeller 13) Propeller pitch changing mechanism 		50 hours

INFRASTRUCTURE:

a) The basic Infrastructure required to start the Course in the Organization, at the start of the Course.

Infrastructure: As per University norms.

Basic Workshop: Having Lathe Machine, Drilling machines, Grinders, Surface table, bench vices etc.

Land area: Sufficient land for building a Hanger for parking the Institution owned aircrafts and Tarmac for giving run up and taxi check of those aircrafts.

The Cost of the above infrastructure and Basic Workshop is Rs. 25,00,000/- (approx. as on date) excluding the cost of land.

b) After starting the Course, the Equipments required in the Organization at the start of Second semester

Laboratory / Workshop:

- i) Electrical Workshop
- ii) Instrument Workshop
- iii) Radio Navigation Workshop
- iv) Computer Workshop
- v) RT (Radio Telephony) – Communication
- *vi) Welding Shop. (1 Lakhs)
- *viii) Machine Shop (5 Lakhs)

Note: All the shops to be well equipped to carry out practical of the students. The

Cost of the above infrastructure is Rs. 80,55,000/- (approx. as on date) + 6 lakhs

c) After starting the Course, the Infrastructure required in the Organization at the start of Third semester i.e. Second year will be as follows:-

- i) Hanger and Tarmac: For parking aircrafts, their run-up and taxiing for functional checks of the various systems.
- ii) Aircrafts: 1) Light aircraft (weight below 5700 kg) & Piston engine
2) Heavy aircraft (weight above 5700 kg) & Jet engine
- iii) Workshops: 1) Engine Workshop
2) Airframe Workshop

The Cost of the above is Rs. 2,93,00,000/- (approx. as on date)

Total cost for all three years a) + b) + c) = Rs. 3,98,55,000/- + 6 Lakhs

Faculty Qualifications and requirements:

Chief Instructor : a) One each, having BAMEL (Basic Aircraft Maintenance Engineering Licence) and at least five years of Aviation Experience of which at least two years in the field of Instruction **OR**

b) Engineering Graduate with at least two years of Practical experience in Aviation Industry of which at least one year in the field of Instruction.

Instructors :

Year	New Appointments	Total Appointments
1 st year	03	03
2 nd year	03	06
3 rd year	03	09

Non Teaching

Office staff : 02 Jr. Clerk
Peon : 03

* Additional workshops

External Theory examination 60

Marks

i) Duration – These examinations shall be of 2 Hours duration for each paper.

ii) Theory Question Paper Pattern:-

- There shall be four questions each of 15 marks. On each unit there will be one question and the fourth one will be based on entire syllabus.

- All questions shall be compulsory with internal choice within the questions.

(Each question will be of 20 to 23 marks with options.)

- Question may be subdivided into sub-questions a, b, c... and the allocation of marks depend on the weightage of the topic.