

SEMESTER III

Course Code		Credits :4
USARA 301	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> <p>Social Psychology</p>		30 Lectures

<p>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 Recognizing 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
USARA 302	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: ACARS-ARINC Communication and Addressing and Reporting System</p>		20 Lectures

ECAM-Electronic Centralized 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
USARA 303	DIGITAL TECHNIQUES II	
Unit I –Fibre Optics and Electronic Displays : Advantages and disadvantages of fibre optic data transmission over electrical wire propagation; Fibre optic data bus; Fibre optic related terms; Terminations; Couplers, control terminals, remote terminals; Application of fibre optics in aircraft systems Principles of operation of common types of displays used in modern aircraft, including Cathode Ray Tubes, Light Emitting Diodes and Liquid Crystal Display.		30 Lectures
Unit II- Software Management Control: Awareness of restrictions, airworthiness requirements and possible catastrophic 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 personnel antistatic protection devices, 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		30 Lectures
Reference Book : 1. Digital Principles and Applications by DONALD P. LEACH, ALBERTPAUL ALVINO,GOUTAM SAHA		

Course Code		Credits :3
USARA 304	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: Dzusfastner, camlocfastner, airlock fastners. 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
USARA 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
USARA 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
USARA 3P3	Welding	100 marks
<p>AIRCRAFT MATERIAL-WELDING :-</p> <ol style="list-style-type: none"> 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 11) Fillet Welding 12) Gas Welding 13) Arc Welding 14) Position Welding (Gas & Arc) – Flat, Vertical, Horizontal, Overhead 15) Pipe Welding (Gas & Arc) 16) Brazing 17) Silver Soldering 		80 hours

SEMESTER IV

Course Code		Credits :3
USARA 401	INSTRUMENT SYSTEM I	
<p>Unit I–Instruments system : Classification; Atmosphere; Terminology; Pressure measuring devices and systems; Pitot static systems; Altimeters; Vertical speed indicators; Airspeed indicators; Machmeters; Altitude reporting/alerting systems; Air data computers; Instrument pneumatic systems; Direct reading pressure and temperature gauges; Temperature indicating systems; Fuel quantity indicating systems; Gyroscopic principles; Artificial horizons; Slip indicators; Directional gyros; Ground Proximity Warning Systems; Compass systems; Flight Data Recording systems; Electronic Flight Instrument Systems; Instrument warning systems including master warning systems and centralised warning panels; Stall warning systems and angle of attack indicating systems; Vibration measurement and indication.</p>		30 Lectures
<p>Unit II –Autoflight: Fundamentals of automatic flight control including working principles and current terminology; Command signal processing; Modes of operation: roll, pitch and yaw channels;</p>		20 Lectures
<p>Unit III –Autoflight: Yaw dampers; Automatic trim control; Autopilot navigation aids interface; Autothrottle systems. Automatic Landing Systems: principles and categories, modes of operation, approach, glideslope, land, go around, system monitors and failure conditions</p>		20 Lectures
<p>Reference Book :-</p> <ol style="list-style-type: none"> 1. Aircraft Instrument system by Pallett 2. Automatic flight control by Pallett 		

Course Code		Credits :3
USARA 402	THEORY OF FLIGHT AND FLIGHT CONTROL:	
<p>Unit I:Aeroplane Aerodynamics and Flight Controls : Primary controls: aileron, elevator, rudder, spoiler; Trim control; Active load control; High lift devices; Lift dump, speed brakes; System operation: manual, hydraulic, pneumatic; Artificial feel, Yaw damper, Mach trim, rudder limiter, gust locks. Stall protection systems. System operation: electrical, fly by wire. Operation and effect of: — roll control: ailerons and spoilers; — pitch control: elevators, stabilators, variable incidence stabilisers and canards; — yaw control, rudder limiters.</p>		30 Lectures
<p>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.</p>		20 Lectures
<p>Unit III- Flight Controls: 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 anti balance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels; Lights (ATA 33) External: navigation, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency</p>		20 Lectures
<p>Reference Book :- 1. Mechanics of flight by A C Kermode. 2. Aviation Maintenance Technician handbook – FAA -15A</p>		

Course Code		Credits :3
USARA 403	COMMUNICATION/NAVIGATION	
<p>Unit I:Fundamentals of radio wave : 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;</p>		30 Lectures

<ul style="list-style-type: none"> — Emergency Locator Transmitters; — Cockpit Voice Recorder; 	
<p>Unit II: Navigation: Working principle of : Very High Frequency omni directional range (VOR);</p> <ul style="list-style-type: none"> — Automatic Direction Finding (ADF); — Instrument Landing System (ILS); — Microwave Landing System (MLS); — Flight Director systems; Distance Measuring Equipment (DME); — Very Low Frequency and hyperbolic navigation (VLF/Omega); — Doppler navigation; — Area navigation, RNAV systems; 	30 Lectures
<p>Unit III: Navigation:</p> <ul style="list-style-type: none"> — 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; — ARINC communication and reporting 	30 Lectures
<p>Reference Book :</p> <ol style="list-style-type: none"> 1. Aircraft Communications and Navigation Systems by MIKE TOOLEY AND DAVID WYATT 2. E.H.J. Pallet 	

Course Code		Credits :3
USARA 404	PROPULSION	
<p>Unit I - Turbine Engines : Constructional arrangement and operation of turbojet, turbofan, turbo shaft and turbopropeller engines; Electronic Engine control and fuel metering systems (FADEC).</p>		20 Lectures
<p>Unit II -Engine Indicating Systems : Exhaust gas temperature/Interstage turbine temperature systems; Engine speed; Engine Thrust Indication: Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems; Oil pressure and temperature; Fuel pressure, temperature and flow; Manifold pressure; Engine torque; Propeller speed.</p>		20 Lectures

Unit III –Starting and Ignition Systems : Operation of engine start systems and components; Ignition systems and components; Maintenance safety requirements	30 Lectures
Reference Book : 1. Aircraft gas turbine engine by Treager 2. Gas turbine engine by Otis	

Course Code		Credits :3
USARA405	POWER DISTRIBUTION	
Unit I –Power Distribution: Aircraft electrical power distribution systems, general requirements of power distribution systems, need for protective devices , electrical load , electrical load analysis, a simple electrical system, Main power distribution systems, single engine aircraft, twin engine aircraft, power distribution on composite aircraft, large aircraft electrical systems, The split –bus system, parallel electrical systems ,split parallel system , DC electrical systems , power distribution hierarchy, Control of power distribution systems, current trans-formers		20 Lectures
Unit II – Design and maintenance : Maintenance of aircraft electrical systems, requirements for electrical systems, general requirements , requirements for transport aircraft, typical schematic diagrams, Identification systems for locating electrical components aircraft lights, position lights, anti- collusion lights ,landing lights , instrument lights , warning lights, landing gear circuits ,large aircraft electrical systems, lighting circuits ,Flight compartment lights passenger compartment lights ,general lighting systems landing gear control circuits ,built in test equipments electronic control units ,equipment cooling, static dischargers. Maintenance and troubleshooting of electrical system, general requirements, inspection schedule, Multi meter trouble shooting ,volt meter troubleshooting , voltmeter and composite aircraft , ohmmeter trouble shooting, troubleshooting with built in test equipment, centralized fault display system, electro static discharge sensitive equipments System.		20 Lectures
Unit III – Aircraft Electrical Power Batteries Installation and Operation; DC power generation; AC power generation; Emergency power generation; Voltage regulation; Inverters, transformers, rectifiers; Circuit protection; External/Ground power.		20 Lectures
Reference Books: 1. Aircraft Electricity and Electronic by Eismen (Chapter 3,6,10,11,12,13) 2. Aircraft Electrical system by EHJ Pallet (Chapter 1,2,3,4,5,10)		

PRACTICALS

Course Code	PRACTICALS	Credits :1
USARA 4P1	Instruments	40 marks
INSTRUMENT AUTOPILOT:- 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 venturi 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 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 18) Positional familiarization of servo alternators 19) Familiarization of AFCS control panel		50hours

Course Code	PRACTICALS	Credits :1
USARA 4P2	Radio Navigation	40 marks
1) Study of transistor amplifiers and its gain characteristics 2) Study the working of phase shift oscillator and observe waveform 3) Observe the working of Modulation / Demodulation circuit 4) Study of VHF system components and its test procedure 5) Familiarization of transmission lines, antenna, inspection requirements 6) Study of ELT working, its precaution and inspection 7) Study of VOR system components and its test procedures 8) Navigation system location and controls familiarization 9) Operational check of ELT system – Inspection and precautions 10) Communication system location and controls familiarization		50 hours

Course Code	PRACTICALS	Credits :1
USARA 4P3	GAS turbine engine	40 marks
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		50 hours

<ol style="list-style-type: none"> 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 	
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Course Code	PRACTICALS	Credits :1
USARA 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 		50hours

Course Code	PRACTICALS	Credits :1
USARA 4P5	Power Distribution	40 marks
<ol style="list-style-type: none"> 1. To study the working of current transformer. 2. Troubleshooting with voltmeter. 3. Troubleshooting with ohmmeter 4. Continuity check (testing) of component with the help of ohmmeter 5. Familiarization with basic power distribution system 6. To study the operation and maintenance of output voltage of generator 7. Show the working of Single phase transformer rectifier unit 8. Show the working of 3 phase transformer rectifier unit. 		40 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.