

## SEMESTER V

Course Code		Credits :3
<b>USARM 501</b>	<b>AIRFRAME SYSTEM</b>	
<p><b>Unit I -Hydraulic Power and Pneumatic/Vacuum Systems:</b>            System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators;            Pressure generation: electric, mechanical, pneumatic; Emergency pressure generation;            Pressure Control; Power distribution; Indication and warning systems;            Interface with other systems. Filters.</p> <p><b>Pneumatic/Vacuum Systems:</b>            System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply;            Pressure control; Distribution; Indications and warnings; Interfaces with other systems.</p>		<b>30 Lectures</b>
<p><b>Unit II–Ice and rain protection</b>            Pneumatic deicing systems, de-icer boots constructions, deicing system components, pneumatic deicing system maintenance, thermal anti icing system, ground deicing of aircraft, wind shield ice control system, rain elimination system</p>		<b>20 Lectures</b>
<p><b>Unit III–Oxygen System :</b>            Oxygen system: Purpose of the system; Safety portable &amp; fixed Oxygen systems; low pressure and high pressure oxygen system &amp; components; Installation and replacement of Oxygen lines. General familiarization with provision of emergency equipment on modern aircraft such as Emergency exits; Megaphone; Signaling Flares; FDR &amp; CVR; Fire Extinguishers.</p> <p><b>Lights: External:</b> navigation, anti-collision, landing, taxiing, ice; <b>Internal:</b> cabin, cockpit, cargo; Emergency.</p>		<b>20 Lectures</b>
<p><b>Reference Book :-</b>            A &amp; P Technician Airframe textbook (Jeppesen)</p>		

Course Code		Credits :3
<b>USARM 502</b>	<b>LANDING GEAR</b>	
<p><b>Unit I –General –</b>            Landing gear arrangement, shock strut, electrical and hydraulic landing gear extension and retraction, emergency extension system, nose wheel centering mechanism, nose wheel steering, shimmy dampers.</p>		<b>20 Lectures</b>
<p><b>Unit II – Brakes –</b>            Independent brake system, power operated brake system, power boosted brake system, power brake control valve, nose wheel brakes, single disc brakes, multi disc brakes, segmented rotor brakes, expander tube brake system, inspection and maintenance of brakes, bleeding of brake.</p>		<b>20 Lectures</b>

<p><b>Unit III – Wheels and tyres</b>  Split wheel, removable and fixed flange wheels, different parts of tyres, aircraft tyre maintenance, rethreading and recapping, tube inspections, mounting and demounting of wheels and tyres,  Antiskid system, landing gear retraction check, rigging and adjustment.</p>	<b>20 Lectures</b>
<p><b>Reference Book :-</b>  A &amp; P Technician Airframe textbook (Jeppesen)</p>	

Course Code		Credits :3
<b>USARM 503</b>	<b>GAS TURBINE ENGINE– II</b>	
<p><b>Unit I –</b>  <b>Power Augmentation Systems</b>  Operation and applications; Water injection, water methanol; Afterburner systems.  <b>Turboprop Engines</b>  Gas coupled/free turbine and gear coupled turbines; Reduction gears; Integrated engine and propeller controls; Overspeed safety devices.  <b>Turbo shaft engines</b>  Arrangements drive systems, reduction gearing, couplings, control systems.  <b>Auxiliary Power Units (APUs)</b>  Purpose, operation, protective systems.  <b>Power plant Installation</b>  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</p>		<b>30 Lectures</b>
<p><b>Unit II –Engine Indication Systems :</b>  Exhaust Gas Temperature/Interstage 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; Vibration measurement and indication; Torque; Power.</p>		<b>20 Lectures</b>
<p><b>Unit III – Starting and Ignition Systems :</b>  Operation of engine start systems and components;  Ignition systems and components; Maintenance safety requirements.  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.</p>		<b>30 Lectures</b>
<p><b>Reference Book :</b></p> <ol style="list-style-type: none"> <li>1. Aircraft gas turbine engine by Treager</li> <li>2. Gas turbine engine by Otis</li> </ol>		

Course Code		Credits :3
<b>USARM 504</b>	<b>PISTON ENGINE- II</b>	
<b>Unit I -Lubrication Systems and Fuel system:</b> System operation/lay-out and components, Properties and specifications of different types of lubricants. System operation/lay-out and components, Properties and specifications of different types of fuel.		<b>20 Lectures</b>
<b>Unit II-Powerplant:</b> 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. <b>Engine Indication Systems</b> Engine speed; Cylinder head temperature; Coolant temperature; Oil pressure and temperature; Exhaust Gas Temperature; Fuel pressure and flow; Manifold pressure.		<b>20 Lectures</b>
<b>Unit III-Engine Monitoring and Ground Operation:</b> 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. Preservation and depreservation for the engine and accessories/ systems		<b>20 Lectures</b>
<b>Reference Book :-</b> 12A, 15A, AC powerplant Kroes and Wild		

Course Code		Credits :3
<b>USARM 505</b>	<b>FLIGHT CONTROLS AND SNAG RECTIFICATION</b>	
<b>Unit I:Flight Controls (ATA 27)</b> 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		<b>30 Lectures</b>
<b>Unit II:Fuel Systems (ATA 28)</b> System lay-out; Fuel tanks; Supply systems; Dumping, venting and draining; Cross-feed and transfer; Indications and warnings; Refuelling and defuelling; Longitudinal balance fuel systems.		<b>30 Lectures</b>

**Unit III :Aircraft Structure Systems (Mechanical)Snag analysis and Rectification:**

The snags in the aircraft systems pertaining to syllabus covered in Semester 1 to Semester 5 for Aircraft structure systems: namely Hydraulics, Pneumatics, Ice &rain protection, Landing gear, Oxygen, Fire protection, Air conditioning & cabin pressurization. The snag analysis and rectification.

**Aircraft Structure Systems (Avionics)Snag analysis and Rectification:**

The snags in the aircraft systems pertaining to syllabus covered in semester 1 to 5 for aircraft structure systems namely Electrical, Instrument, Radio and Digital. The snag analysis and rectification.

**30 Lectures**

**Reference Book :**

Aviation Maintenance Technician handbook – FAA -9A, 15A, 12A

Course Code	<b>PRACTICALS</b>	Credits :1
<b>USARM 5P1</b>	<b>AIRFRAME SYSTEM</b>	40 marks
<ol style="list-style-type: none"> <li>1. Servicing of hydraulic reservoir</li> <li>2. Operation of Hydraulic shut off valve</li> <li>3. Charging of hydraulic accumulator</li> <li>4. Discharging of hydraulic accumulator</li> <li>5. Check for hydraulic leak</li> <li>6. Servicing of pneumatic system installed on aircraft</li> <li>7. Check for antiicing methods used on aircraft</li> <li>8. Study how Antiicing of windshield is done</li> <li>9. Check for various component and servicing of those components used for antiicing purpose on the aircraft.</li> <li>10. Servicing of oxygen cylinder</li> <li>11. Servicing of oxygen mask</li> <li>12. Carryout snag analysis and rectification of Hydraulic quantity low</li> <li>13. Carryout snag analysis and rectification for Low oxygen pressure</li> </ol>		<b>50 hours</b>

Course Code	<b>PRACTICALS</b>	Credits :1
<b>USARM 5P2</b>	<b>LANDING GEAR</b>	40 marks
<ol style="list-style-type: none"> <li>1. Locate and identify various parts of aircraft landing gear</li> <li>2. Carryout greasing of various parts of aircraft landing gear</li> <li>3. Swap landing gear wheel on aircraft</li> <li>4. Servicing of oleo pneumatic shock strut</li> <li>5. Identify the information given on tire</li> <li>6. Inspection of brake system</li> <li>7. check the operation of antiskid system installed on aircraft</li> <li>8. replace the tires on the aircraft wheel.</li> <li>9. Carryout analysis and rectification of Landing Gear warning light ON</li> </ol>		<b>40 hours</b>

Course Code	<b>PRACTICALS</b>	Credits :1
<b>USARM 5P3</b>	<b>GAS TURBINE ENGINE</b>	40 marks
<ol style="list-style-type: none"> <li>1. carry out preflight inspection.</li> <li>2. Carry out simulated start of aircraft engine (in presence of supervisor)</li> <li>3. Locate and trace the various components of aircraft fuel system installed on aircraft.</li> <li>4. Take necessary safety precautions after hot start and hung start</li> <li>5. Replenish engine oil</li> <li>6. Main fuel pump- Purpose, location and mounting method including safety</li> <li>7. Fuel control unit-Identification, location, with reference to axial &amp; circumferential and mounting</li> </ol>		<b>50 hours</b>

8. Over speed governor- function, mounting, locking method and signals	
<p>Carryout snag analysis of following :</p> <p>i) No start, No light up, No EGT rise.</p> <p>ii) Slow start.</p> <p>iii) Hung start.</p> <p>iv) Hung up at low speed – less than 30%.</p> <p>v) Hung up at 50% N2 – High EGT. (Hot start).</p> <p>vi) Stall.</p> <p>vii) Flame out or power loss.</p> <p>viii) Stall – Surge.</p> <p>ix) Parameter fluctuation.</p> <p>x) High Oil Consumption (HOC).</p> <p>xi) Oil from Drain Mast – no other leak.</p> <p>xii) Oil wetting in fan cowl &amp; Accessory Gear Box (AGB).</p>	

Course Code	<b>PRACTICALS</b>	Credits :1
<b>USARM 5P4</b>	<b>PISTON ENGINE</b>	40 marks
<p>Details about Overhaul and Maintenance of the engine – including dismantling, inspection, repair and assembly with table of limits of all important engine parts such as Crankcase. Accessories case assembly, Oil sump, Crank shaft assemblies, Connecting rods, Piston assemblies, Cylinder assemblies, Valve mechanism, Gear train, Lubrication system, Induction system, Cooling and exhaust system.</p>		<b>40 hours</b>

Course Code	<b>PRACTICALS</b>	Credits :1
<b>USARM 5P5</b>	<b>Snag analysis and Rectification</b>	40 marks
<p><b>Snag rectification of snag related to following topics</b></p> <p>1. Practicals on defect rectification of aircraft power supply system such as GPU not Getting connected to aircraft. Low battery voltage, ground relay chattering etc.</p> <p>6. Practicals on servicing of GPU, charging, cleaning, checking of electrolyte level and specific gravity.</p> <p>7. Checking the serviceability, inspection, removal and fitting of landing lights and taxiing lights etc.</p>		<b>60 hours</b>
<p>1. Study of radio altimeter and its test procedure</p> <p>2. Familiarization of ATC system components and its test procedure</p> <p>3. Study of ESDS requirements and precaution during ground handling</p> <p>4. Operational test of VHF com system on Local frequency contact precaution and procedure</p> <p>5. Operational test of VOR Nav. System</p> <p>6. Operational/Self test operation of ILS components</p>		
<p>1. Pitot –static system of aircraft.</p>		

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| <ol style="list-style-type: none"><li>2. Stall warning system on aircraft.</li><li>3. EGT System snags.</li><li>4. N1 &amp; N2 rpm related system snags.</li><li>5. Fuel flow system related snags.</li><li>6. EPR related system snags.</li><li>7. Auto pilot system related snags.</li><li>8. DR</li><li>9. Compass, RR compasses related snags.</li><li>10. Gyro related snags on aircraft.</li></ol> |  |
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## SEMESTER 6

Course Code		Credits :6
<b>USARM 6P1</b>	<b>AIRFRAME</b>	200 marks
<b>1</b>	Servicing of main gear shock strut (Preferred Method)	<b>350 hours</b>
<b>2</b>	Procedure sheet of servicing of main gear shock strut (Alternate Method)	
<b>3</b>	Procedure sheet of servicing of nose gear shock strut (Preferred Method)	
<b>4</b>	Procedure sheet of servicing of nose gear shock strut (Alternate Method)	
<b>5</b>	Procedure sheet for (MLG Wheel Removal)	
<b>6</b>	Procedure sheet for (MLG Wheel Installation)	
<b>7</b>	Procedure sheet of Nose Wheel Removal	
<b>8</b>	Procedure sheet of Nose Wheel Installation	
<b>9</b>	Procedure Sheet of Landing Gear Lubrication (MLG and NLG)	
<b>10</b>	Procedure sheet of Anti-skid system check	
<b>11</b>	Procedure sheet of Aileron brush seal lubrication	
<b>12</b>	Procedure sheet of Lubrication of Rudder Pedal Bushings	
<b>13</b>	Lubrication of flap track rollers	
<b>14</b>	Lubrication of flap and spoiler actuator piston rod felt wiper	
<b>15</b>	Servicing hydraulic accumulator	
<b>16</b>	Servicing of hydraulic reservoir	
<b>17</b>	Charging emergency air bottle	
<b>18</b>	Visual inspection of emergency air bottle	
<b>19</b>	Servicing of oxygen system	
<b>20</b>	Control cable pressure seal replacement	
<b>21</b>	Flared tubing – maintenance practices	
<b>22</b>	Remove wing leading edge	
<b>23</b>	Install wing leading edge	
<b>24</b>	Control cable system inspection	
<b>25</b>	Aileron balance tab rigging	
<b>26</b>	Flap Removal	
<b>27</b>	Flap Installation	
<b>28</b>	Rudder Removal	
<b>29</b>	Rudder Installation	
<b>30</b>	Elevator Removal	
<b>31</b>	Elevator Installation	
<b>32</b>	Remove and Installation of cabin emergency windows	
<b>33</b>	Internal leak check of hydraulic system	
<b>34</b>	Engine driven hydraulic pump removal	
<b>35</b>	Engine driven hydraulic pump- Installation	



36	Engine driven hydraulic pump- Leakage check	
37	Operational check of Eng. driven hyd. Pumps	
38	Hydraulic supply shutoff valve operational check	
39	Functional test of landing gear emergency blow down extension system	
40	Returning the landing gear to normal operation after emergency extension	
41	Disassemble Nose wheel for tire change	
42	Assembly of nose wheel after tyre change	
43	Main landing gear wheel disassembly for tyre change	
44	MLG. Wheel assemble after tyre change	
45	Multiple disc brake – wear check	
46	Multiple disc brake – removal	
47	Multiple Disc brake installation	
48	Bleeding Brake System	

Course Code		Credits :6
<b>USARM 6P2</b>	<b>ENGINE</b>	200 Marks
<b>1</b>	<b>Removal of Fuel Pump Filter</b>	<b>350 hours</b>
<b>2</b>	<b>Cleaning of Fuel Pump Filter</b>	
<b>3</b>	<b>Installation of Fuel Pump Filter</b>	
<b>4</b>	<b>Removal of O.S.G. Servo Fuel Filter</b>	
<b>5</b>	<b>Cleaning of O.S.G.Servo Fuel Filter.</b>	
<b>6</b>	<b>Installation of O.S.G.Servo Fuel Filter</b>	
<b>7</b>	<b>Removal of Fuel Control Unit Filter</b>	
<b>8</b>	<b>Cleaning of Fuel Control Unit Filter</b>	
<b>9</b>	<b>Installation of Fuel Control Unit Filter</b>	
<b>10</b>	<b>Removal of Fuel Flow-meter</b>	
<b>11</b>	<b>Installation of Fuel Flow-Meter</b>	
<b>12</b>	<b>Removal of Oil Filter</b>	
<b>13</b>	<b>Disassembly of Oil Filter</b>	
<b>14</b>	<b>Cleaning of Oil Filter</b>	
<b>15</b>	<b>Assembly of Oil Filter</b>	
<b>16</b>	<b>Inspection/Checks of Oil Filter</b>	
<b>17</b>	<b>Removal of fuel manifold</b>	
<b>18</b>	<b>Installation of fuel manifold</b>	
<b>19</b>	<b>Inspection of fuel manifold</b>	
<b>20</b>	<b>Removal of Fuel Pressurizing and Drain Valve</b>	
<b>21</b>	<b>Installation of Fuel P &amp; D Valve</b>	
<b>22</b>	<b>Inspection/check of Fuel P &amp; D Valve</b>	
<b>23</b>	<b>Removal of Fuel Nozzles</b>	
<b>24</b>	<b>Installation of Fuel Nozzles</b>	

<b>25</b>	Inspection of <b>Fuel Nozzles</b>	
<b>26</b>	Removal of <b>Over Speed Governor</b>	
<b>27</b>	Installation of <b>Over Speed Governor</b>	
<b>28</b>	Inspection of <b>Over Speed Governor</b>	
<b>29</b>	Removal of <b>Fuel pump AND Fuel control Unit</b>	
<b>30</b>	Installation of <b>Fuel pump &amp;Fuel control Unit</b>	
<b>31</b>	Inspection of <b>Fuel pump &amp;Fuel control Unit</b>	
<b>32</b>	Maintenance of Engine Oil Filter	
<b>33</b>	Maintenance of Engine Oil Filter	
<b>34</b>	Throttle Lever Cable Rigging	
<b>35</b>	Starter Generator Removal and Installation	

Course Code		Credits :8
<b>USARM 6PP</b>	<b>AEROPROJECT</b>	300 marks
Project on either one of these		
<b>1</b>	Innovative Project on Airframe system of the aircraft	
<b>2</b>	Innovative Project on Engine system of the aircraft	

## 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 <sup>st</sup> year	03	03
2 <sup>nd</sup> year	03	06
3 <sup>rd</sup> 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.