

Course Code	SUBJECT SEMESTER III (Avionics) Theory	Credits
USARA 301	MAINTENANCE PRACTICES (II)	Credits 3 Lectures 70
<p>Unit I – 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, protective sleeving techniques including heat shrink wrapping, shielding. EWIS installations, inspection, repair, maintenance and cleanliness standards Sheet Metal --- Marking out and calculation of bend allowance; Sheet metal working, including bending and forming; Inspection of sheet metal work.</p>		20 Lectures
<p>Unit II – 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. Riveting: Riveted joints, rivet spacing and pitch; Tools used for riveting and dimpling; Inspection of riveted joints.</p>		25 Lectures
<p>Unit III – Maintenance Procedures 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 Abnormal Events (a) Inspections following lightning strikes and HIRF penetration. (b) Inspections following abnormal events such as heavy landings and flight through turbulence.</p>		25 Lectures
<p>Reference Book :- 1) Airframe & Power plant Mechanics (General Handbook EA-AC 65-9A) 2) Shop Theory --- J. A Enderson & Tatro 3) Civil Aircraft Inspection Procedure (CAP 459)</p>		

Course Code	SUBJECT SEMESTER III (Avionics) Theory	Credits
USARA 302	AVIATION LEGISLATION (I)	Credits 3 Lectures 70
Unit I: Regulatory framework. Role of ICAO; the aircraft act and rule made there under; role of DGCA; relationship between CAR-21, CAR-M, CAR-145, CAR-66, the aircraft rules (applicable to aircraft maintenance and release); aeronautical information circulars (applicable to aircraft maintenance and release); CAR section 2 volume I.		25 Lectures
Unit II: CAR- 66, CAR 145 and Aircraft operations CAR 66 Certifying staff maintenance Detailed understanding of CAR-66. CAR 145 – Approved maintenance organizations Detailed understanding of CAR 145 and CAR M subpart F. Aircraft Operations Commercial air transport/ Commercial operations Air operators certificate; Operator’s responsibilities, in particular regarding continuing airworthiness and maintenance.		25 Lectures
Unit III : Aircraft Certification (a) General -certification rule: such a FAA and EACS 23/25/27/29; Type certification; Supplemental type certification; CAR – 21 Design/Production organization approvals. Aircraft modifications and repairs approval and certification permit to fly requirements. (b) Documents: Certificate of airworthiness; Certificate of registration; noise certificate; weight schedule; radio station license and approval		20 Lectures
Reference Book :- 1. CAR by DGCA 2. CAR 66 by DGCA 3. CAR 145 by DGCA 4. CAR 21 by DGC		

Course Code	SUBJECT SEMESTER III (Avionics) Theory	Credits
USARA 303	DIGITAL AND COMPUTER TECHNIQUES	Credits 3 Lectures 70
<p>Unit I -</p> <p>a) Electronic Instrument Systems --- Typical systems arrangements and cockpit layout of electronic instrument systems.</p> <p>b) Numbering Systems --- Numbering systems: binary, octal and hexadecimal; Demonstration of conversions between the decimal and binary, octal and hexadecimal systems and vice versa.</p> <p>c) Data Conversion --- Analogue Data, Digital Data; Operation and application of analogue to digital, and digital to analogue converters, inputs and outputs, limitations of various types.</p> <p>d) Data Buses --- Operation of data buses in aircraft systems, including knowledge of ARINC and other specifications.</p> <p>e) Logic Circuits --- Identification of common logic gate symbols, tables and equivalent circuits; Applications used for aircraft systems, schematic diagrams. Interpretation of logic diagrams.</p>		25 Lectures
<p>Unit II -</p> <p>a) Basic Computer Structure 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). 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.</p> <p>b) Microprocessors – 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.</p> <p>c) Integrated Circuits - Operation and use of encoders and decoders Function of encoder types Uses of medium, large and very large scale integration.</p> <p>d) Multiplexing - - Operation, application and identification in logic diagrams of multiplexers and demultiplexers.</p> <p>e) Fibre Optics – Advantages and disadvantages of fiber optic data</p>		20 Lectures

<p>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.</p>	
<p>Unit III - a) Electronic Displays --- Principles of operation of common types of displays used in modern aircraft, including Cathode Ray Tubes, Light Emitting Diodes and Liquid Crystal Display. b) Electrostatic Sensitive Devices --- Special handling of components sensitive to electrostatic discharges; Awareness of risks and possible damage, component and personnel anti-static protection devices. c) Software Management Control – Awareness of restrictions, airworthiness requirements and possible catastrophic effects of unapproved changes to software programmes d) Electromagnetic Environment – 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 e) Typical Electronic/Digital Aircraft Systems– General arrangement of typical electronic/digital aircraft systems and associated BITE(Built In Test Equipment) testing such as: (a) For B1 and B2 only: ACARS-ARINC Communication and Addressing and Reporting System EICAS-Engine Indication and Crew Alerting System FBW-Fly by Wire FMS-Flight Management System IRS-Inertial reference system (b) For B1, B2 and B3: ECAM-Electronic Centralised Aircraft Monitoring EFIS-Electronic Flight Instrument System GPS-Global Positioning System TCAS-Traffic Collisions Avoidance system Integrated modular Avionics Cabin System Information system</p>	<p>25 Lectures</p>
<p>Reference Book :- 1) Aircraft Instruments and Integrated System --- E.H.J. Pallett 2) Digital Principles and Applications by DONALD P. LEACH, ALBERTPAUL ALVINO, GOUTAM SAHA 3) Aviation electronics --- Keith W.Bose</p>	

Course Code	SUBJECT SEMESTER III (Avionics) Theory	Credits
USARA 304	AIRCRAFT MATERIALS	Credits 2 Lectures 50
<p>Unit I -</p> <p>a) Aircraft Materials — Ferrous Characteristics, properties and identification of common alloy steels used in aircraft; Heat treatment and application of alloy steels; Testing of ferrous materials for hardness, tensile strength, fatigue strength and impact resistance.</p> <p>b) Aircraft Materials — Non-Ferrous Characteristics, properties and identification of common non-ferrous materials used in aircraft; Heat treatment and application of non-ferrous materials; Testing of non-ferrous material for hardness, tensile strength, fatigue strength and impact resistance. Aircraft rivets -- Types of solid and blind rivets: specifications and identification, heat treatment</p>		20 Lectures
<p>Unit II -</p> <p>a) Aircraft Materials - Composite Composite and non-metallic other than wood and fabric. Characteristics, properties and identification of common composite and nonmetallic materials, other than wood, used in aircraft; Sealant and bonding agents.</p> <p>(b) The detection of defects/deterioration in composite and non-metallic material.</p> <p>c) Repair of composite and non-metallic material and Non- Metallic</p>		20 Lectures
<p>Unit III -</p> <p>Wooden and fabric. -- structures Construction methods of wooden and fabric. airframe structures; Characteristics, properties and types of wood and fabric glue used in aero planes Preservation and maintenance of wooden and fabric structure; Types of defects in wood and fabric material and wooden structures;</p> <p>b) Plastics -- Different types of plastics used in aircraft Thermoplastics and Thermosetting plastics. Cleaning ,Storage and Handling Plastics</p> <p>c) Corrosion --- Chemical fundamentals; Formation by, galvanic action</p>		10 Lectures

process, microbiological, stress; Types of corrosion and their identification; Causes of corrosion; Material types, susceptibility to corrosion.	
Reference Book :- 1) Aircraft Materials and Processes ---- George F. Titterton 2) Aviation Maint. Technician Hand Book-General -9A ---- FAA 3) Advanced Composites --- Cindy Foreman 4) Civil Aircraft Inspection Procedures (CAP 459)- -- CAIP I	

Course Code	SUBJECT SEMESTER III (Avionics)_Theory	Credits
USARA 305	THEORY OF FLIGHT & FLIGHT CONTROLS	Credits 3 Lectures 70
Unit I - 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, electrical, fly-by-wire; Artificial feel, Yaw damper, Mach trim, rudder limiter, gust locks systems; Balancing and rigging; Stall protection/warning system		25 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.		25 Lectures
Unit III - 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 Automatic trim control; Autopilot navigation aids interface; Auto throttle systems. Automatic Landing Systems: principles and categories, modes of operation, approach, glideslope, land, go around, system monitors and failure conditions		20 Lectures
Reference Book :- 1) Mechanics of Flight ----- AC Kermode 2) Aviation Maint Technician Hand Book-General -9A -- FAA 3) FAA H- 8083-31 Aviation Maint. Technician Handbook-Airframe 15A 4) Automatic Flight control by Pallett		

Course Code	SUBJECT SEMESTER III (Avionics) Practicals	Credits
USARA 3P1	AIRCRAFT MATERIALS & MAINTENANCE PRACTICES (II)	Credits 2 Lectures 50
<p>NOTE:-- Students will have to perform minimum 20 practicals from following list of Practicals: {From Unit I minimum 8 Practical's & from Unit II minimum 8 Practicals}</p> <p>Unit I -- MAINTENANCE PRACTICES (Students will have to perform minimum 8 practicals from following list of Practicals)</p> <ol style="list-style-type: none"> 1. Inspection and testing of springs 2. Demonstration of DPI, MPI, FPI. 3. Demonstration of Electric Arc, Gas welding 4. Demonstration of Soldering./ Demonstration of Brazing 5. Use Precaution & operation of hand tools used in workshop 6. Use Precaution & operation of power tools used in workshop 7. Operation and use of precision measuring tools; 8. Demonstration of Single/Double patch riveting 9. Identification of types of rivets: specifications and identification, 10. Demonstration of Lap / But Joint by Riveting. 11. Testing, cleaning, inspection & lubrication of bearings 12. Inspection of gears, including backlash check 13. Inspection of belts & pulleys, chains & sprockets 14. Inspection of screw jacks, lever devices, push-pull rod systems. 		25 lectures
<p>Unit II -- AIRCRAFT MATERIALS (Students will have to perform minimum 8 practicals from following list of Practicals)</p> <ol style="list-style-type: none"> 1) Identification of common alloy steels and nonferrous alloys used in aircrafts; 2) Characteristics, properties and identification of common composite 		25 lectures

material

- 3) Characteristics, properties and identification of Sealant and bonding agents
- 4) The detection of defects/deterioration in composite and non-metallic material
- 5) Identification of various types of corrosion.
- 6) Thread forms, dimensions and tolerances for standard threads used in aircraft
- 7) Identification of various types of bolts used in aircraft.
- 8) Identification of various types of nuts used in aircraft.
- 9) Identification of various types of washers used in aircraft.
- 10) Insertion and removal of various types studs in aircraft.
- 11) Fitment and removal of split pins, pal nuts, wire locking, quick release fasteners, keys, circlips, and cotter pins.

Course Code	SUBJECT SEMESTER III (Avionics) Practicals	Credits
USARA 3P2	DIGITAL AND COMPUTER TECHNIQUES	Credits 2 Lectures 50
<p>NOTE:-- Students will have to perform minimum 16 practicals from following list of Practicals</p> <ol style="list-style-type: none"> 1) Perform the addition of two numbers on microprocessor 8085 kit. 2) Perform the subtraction of two numbers on microprocessor 8085 kit. 3) Perform the operation of complement of number on 8085 kit. 4) Introduction to the parts of computer. 5) Operation and identification of electrostatic discharge devices. 6) Awareness of airworthiness requirements to use software programs. 7) Understanding of ARINC data bus. 8) To study the working of A to D converter/ D to A converter. 9) Identification of various ESD warnings. 10) To perform the operation of grounding and bonding. 11) Study of ARINC 429/629 BUS. 12) Study of Fiber optic cable. 13) Pamphlet Design in MS-WORD 2007 14) Article Design in MS-WORD 2007 15) Comparative Worksheet Design in MS-EXCEL 2007 16) Comparative Different Slides in MS-POWERPOINT 2007 with Different Transitions 17) Usage of Record Sets, Passing & Returning of Record Set from a procedure, Usage of Command Object – Parameter Collection 18) Class creation and Usage, Usage of ActiveX components – both ActiveX DLL and ActiveX EXE, Package and Deployment Wizard 19) Interactive Discussion on VB 6.0 		50 lectures

Course Code	SUBJECT SEMESTER_III (<u>Avionics</u>) Practicals	Credits
USARA 3P3	THEORY OF FLIGHT & FLIGHT CONTROLS	Credits 2 Lectures 50
<p>NOTE:-- Students will have to perform minimum 12 practicals from following list of Practicals</p> <ol style="list-style-type: none"> 1) Operational check of aileron, elevator, rudder, 2) Operational check of Flap, Slat 3) Manual/Electrical Trim control check 4) Operation check of Ground/ Flight spoilers 5) Check of Artificial feel, Yaw damper, 6) Operational check of Mach trim, Rudder limiter 7) Stall protection/warning system check 8) Operational check of aileron, elevator, rudder, 9) Operational check of Flap, Slat 10) Manual/Electrical Trim control check 11) Operation check of Ground/ Flight spoilers 12) Check of Artificial feel, Yaw damper, 13) Operational check of Mach trim, Rudder limiter 14) Stall protection/warning system check 		50 lectures