

CIRCULAR:-

A reference is invited to the syllabi relating to the Bachelor of Science (B.Sc) Degree Course **vide** this office Circular No.UG/53 of 2014 dated 15th December, 2014 and the Principals of the affiliated Colleges in Science, are hereby informed that the recommendation made by Ad-hoc Board of Studies in Aviation at its meeting held on 29th March, 2017 has been accepted by the Academic Council at its meeting held on 11th May, 2017 **vide** item 4.65 and that in accordance therewith, the revised syllabus as per the (CBCS) for the B.Sc. Aeronautics - Mechanical (Sem-I to VI) which is available on the University's website (www.mu.ac.in) and that the same has been brought into force with effect from the academic year 2017-18.

MUMBAI- 400032

31st July, 2017

To

[Signature]
25/7/17

REGISTRAR

The Principals of the affiliated Colleges in Science.

A.C/4.65/11/05/2017

No. UG/129 -A of 2017

MUMBAI-400 032

31st July, 2017

Copy forwarded with Compliments for information to:-

- 1) The Co-ordinator, Faculty of Science,
- 2) The Offg. Director, Board of Examinations and Evaluation.
- 3) The Director, Board of Students Development.
- 4) The Chairperson, Ad-hoc Board of Studies in Science.
- 5) The Professor-cum-Director, Institute of Distance and Open Learning (IDOL).
- 6) The Co-Ordinator, University Computerization Centre.

[Signature]
25/7/17

REGISTRAR

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SEMESTER I

Course Code		Credits :3
USARA 101	BASIC AERODYNAMICS	
<p>Unit I -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, profile (parasite) drag, induced drag, centre of pressure, 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.</p>		20 Lectures
<p>Unit II -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.</p>		20 Lectures
<p>Unit III -Flight Stability and Dynamics: International Standard Atmosphere (ISA), application to aerodynamics. Longitudinal, lateral and directional stability (active and passive).</p>		20 Lectures
<p>Reference Book :- Mechanics of flight by A C Kermode</p>		

Course Code		Credits :3
USARA 102	ELECTRICAL FUNDAMENTALS	
<p>Unit I: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.</p> <p>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.</p> <p>Generation of Electricity Production of electricity by the following methods: light, heat, friction, pressure, chemical action, magnetism and motion.</p> <p>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.</p> <p>DC Circuits Ohms Law, Kirchoff's Voltage and Current Laws; Calculations using the above laws to find resistance, voltage and current; Significance of the internal resistance of a supply.</p>		30 Lectures

Unit II: Resistive (R), Capacitive (C) and Inductive (L) Circuits :

Inductance/Inductor

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;

Resistance/Resistor

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 rheostats; Operation of Wheatstone Bridge.

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;

Power

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

Capacitance/Capacitor

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.

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.

Magnetism

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.

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

30 Lectures

Unit III : Motors and Generators:

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.

AC Theory

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 principles.

Transformers

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.

Filters

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

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 delta connections advantages and uses; Permanent Magnet Generators.

AC Motors

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.

30 Lectures

Reference Book :

1. Aircraft Electricity and Electronic by Eismen (Chapter 3,6,10,11,12,13)
2. Examples in electrical Calculation by Admiralty
3. Electrical technology by B L Theraja (Volume 2)

Course Code		Credits :3
USARA 103	ELECTRONIC FUNDAMENTALS	
<p>Unit I –Semiconductors: 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; Diode parameters: peak inverse voltage, maximum forward current, temperature, frequency, leakage current, power dissipation; Operation and function of diodes in the following circuits: clippers, clampers, full and half wave rectifiers, bridge rectifiers, voltage doublers and triplers; Detailed operation and characteristics of the following devices: silicon controlled rectifier (thyristor), light emitting diode, Shottky diode, photo conductive diode, varactor diode, varistor, rectifier diodes, Zener diode.</p>		30 Lectures
<p>Unit II –Transistors : 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 stabilisation; Multistage circuit principles: cascades, push-pull, oscillators, multivibrators, flip-flop circuits. Integrated Circuits: Description and operation of logic circuits and linear circuits; Introduction to operation 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. Description and use of printed circuit boards.</p>		30 Lectures
<p>Unit III – Servomechanisms : Understanding of the following terms: Open and closed loop systems, feed-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.</p>		30 Lectures
<p>Reference Book : 1. Digital Principles and Applications by DONALD P. LEACH, ALBERT PAUL ALVINO, GOUTAM SAHA 2. Aircraft Instruments system by E H J Pallet</p>		

Course Code		Credits :3
USARA 104	MAINTENANCE PRACTICES	
Unit I -Workshop Practices : 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; Operation, function and use of avionic general test equipment. Care of tools, control of tools, use of workshop materials; Dimensions, allowances and tolerances, standards of workmanship; Calibration of tools and equipment, calibration standards. Operation, function and use of avionics general test equipments.		20 Lectures
Unit II-Hardware : 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.		20 Lectures
Unit III–Pipes and safety precautions : Types of solid and blind rivets: specifications and identification, heat treatment. Rivnut, special non blind rivets. Riveted joints, rivet spacing and pitch; Inspection of riveted joints. Bending and belling / flaring aircraft pipes; Inspection and testing of aircraft pipes and hoses Installation and clamping of pipes, Inspection and testing of springs, Aspects of safe working practices including precautions to take when working 0.0with electricity, gases especially oxygen, oils and chemicals. Also, instruction in 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.		20 Lectures
Reference Book :- 1. FAA-H-8083-30(9A) & 15 A 2. Shop Theory (Anderson) 3. A/C powerplant – Kroes and Wild		

Course Code		Credits :4
USARA 105	Communication	
Unit I–Reading, Comprehension skills and vocabulary development : Abstracting and summarizing skills, Concepts of functional and reading vocabulary, Importance of vocabulary and its enhancement, Developing effective conversational skills, Oral and written expression of ideas.		20 Lectures
Unit II–Professional skill Professional skill development, writing: – letter writing, report writing, speaking & listening: – discussion, debates. Seven C’s of effective communication		20 Lectures

Unit III – Human rights:

Human rights constituents with special reference to Fundamental Rights in India

20 Lectures**Reference Book :-**

Human Rights and communication skills by Basantrani

PRACTICALS

Course Code	PRACTICALS	Credits:1
USARA 1P1	ENGINEERING DRAWING	50 marks
Use of Drawing Instruments, Lines & lettering. Construction of parabola, ellipse, hyperbola. First and Third angle projections Technology, orthographic, Isometric oblique perspective.		60 hours

Course Code	PRACTICALS	Credits:1
USARA 1P2	MAINTENANCE PRACTICES	50 marks
<ol style="list-style-type: none"> 1. Identifying different parts of aircraft. And their operation on aircraft. 2. Measure the length using micrometer 3. Measure the length using vernier caliper 4. Single patch riveting 5. Double patch riveting 6. Lap Joint by Riveting. 7. Butt joint by Riveting. 8. Make a rectangular doubler 9. Make a circular doubler 10. To study use of torque wrenches 11. To study use of spanners. 12. To study use of pliers 		60 hours

Course Code	PRACTICALS	Credits:1
USARA 1P3	ELECTRICAL FUNDAMENTALS	50 marks
<ol style="list-style-type: none"> 1. Use of multimeter 2. Measurement of AC voltage 3. Measurement of DC voltage 4. Measurement of resistance 5. Measurement of resistance with color band 6. Measurement of resistance in series 7. Measurement of resistance in parallel 8. Verify ohms law 9. Verify kirchoff's voltage law 10. Verify kirchoff's current law 11. Working of Relays and solenoids 12. Connection of battery cells in series and parallel 13. Familiarization with transformers 14. Measurement of output voltage of DC generator 15. Working of DC motor' 16. Measurement of output voltage of alternator 		60 hours

Course Code	PRACTICALS	Credits:1
USARA 1P4	ELECTRONIC FUNDAMENTALS	50 marks
1) Identification of components of R, L, C and measure values 2) Study of the features and controls of CRO & Multi meter 3) Study of Operating Controls of Voltmeter, Ammeter, Power meter, Ohm meter, DMM for its use 4) Study the characteristics of Electron Tube 5) Identification of Semiconductor devices – Diodes, Transistors and perform their characteristics 6) Study of SCR and its characteristics and waveform 7) Study of Zener diode and its characteristics and waveform 8) Study the working of Half wave, Full wave, Bridge Rectifier and observe the waveform 9) To check UJT transistor and perform its characteristics 10) To observe the performance of choke input and capacitance input filter after the rectification circuit		60 hours

SEMESTER II

Course Code		Credits :3
USARA 201	PHYSICS	
Unit I–Basic Physics : Mass, Centre of Gravity, Work, Energy, Power, Pressure, stress, Torque, Elasticity of Material, Speed, Velocity, Newton’s laws of motion, Principle of the Gyroscope. Friction, Viscosity, Fluid Resistance, Specific Gravity, Pressure & Buoyancy in liquids, kinetic Theory of gases, Speed of sound		20 Lectures
Unit II –Thermodynamics and Laws : Heat & Energy, Conversion, Thermodynamics, Charle’s and Boyle’s laws, Heat Transfer, Specific Heat, Absolute and relative humidity, Vapour locks, calorific values of fuels		20 Lectures
Unit III –Fluid dynamics : Dynamics of fluid, Pascal’s law & its application in Hydraulic press, Hydraulic and Pneumatic system. Bernoulli’s law, Venturi tube theory, Streamline, Laminar and turbulent flow.		20 Lectures
Reference Book :- FAA 9A		

Course Code		Credits :3
USARA 202	AVIATION LEGISLATION	
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 1 and 2.		30 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; Documents to be carried on board; aircraft playcarding (Markings)		30 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.		30 Lectures

(b) Documents: Certificate of airworthiness; Certificate of registration; noise certificate; weight schedule; radio station license and approval	
Reference Book :	
<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 	

Course Code		Credits :3
USARA 203	DIGITAL TECHNIQUES I	
Unit I –Numbering Systems : Numbering systems: binary, octal and hexadecimal; Demonstration of conversions between the decimal and binary, octal and hexadecimal systems and vice versa.		20Lectures
Unit II – Data buses and Data conversions: Operation of data buses in aircraft systems, including knowledge of ARINC and other specifications. Analogue Data, Digital Data; Operation and application of analogue to digital, and digital to analogue converters, inputs and outputs, limitations of various types		20 Lectures
Unit III - Logic Circuits and Microprocessors: Identification of common logic gate symbols, tables and equivalent circuits; Applications used for aircraft systems, schematic diagrams. 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		30 Lectures
Reference Book :		
1. Digital Principles and Applications by DONALD P. LEACH, ALBERTPAUL ALVINO, GOUTAM SAHA		

Course Code		Credits :4
USARA 204	MATERIALS AND HARDWARE I	
Unit I - Aircraft Materials - Ferrous and Non Ferrous : Characteristics, properties and identification of common alloy steels and non ferrous alloys used in aircrafts; Heat treatment and application of alloy steels and non ferrous alloys. Testing of alloys steels and non-ferrous material for hardness, tensile strength, fatigue strength and impact resistance.		30 Lectures
Wooden structures: Construction methods of wooden airframe structures. Characteristics properties and types of wood and glue used in aeroplanes, preservation and maintenance of wooden structure; Types of defects in wood material and wooden structures; The detection of defects in wooden structure; Repair of wooden covering.		

<p>Unit II -Composite materials : Characteristics, properties and identification of common composite and non-metallic materials, other than wood, used in aircraft; Sealant and bonding agents. The detection of defects/deterioration in composite and non-metallic material. Repair of composite and non-metallic material. Types of corrosion and their identification</p>	30 Lectures
<p>Unit III –Fasteners : Screw nomenclature; Thread forms, dimensions and tolerances for standard threads used in aircraft; Bolt types: specification, identification and marking of aircraft bolts, international standards; nuts, studs, Washers. Nuts: self locking, anchor, standard types; Machine screws: aircraft specifications; Studs: types and uses, insertion and removal; Self tapping screws, dowels. Locking devices: Tab and spring washers, locking plates, split pins, palnuts, wire locking, quick release fasteners, keys, circlips, cotter pins.</p>	20 Lectures
<p>Reference Book :- 1. FAA-H-8083-30(9A) & 15 A 2. Shop Theory (Anderson)</p>	

Course Code		Credits :3
USARA 205	MAINTENANCE PRACTICES AND GROUND HANDLING	
<p>Unit I –MAINTENANCE PRACTICES : Testing, cleaning and inspection of bearings; Lubrication requirement of bearings. Defect of bearings & their causes. Swaging of end fittings, inspection & testing of control cables Bowden cables, aircraft flexible control systems. Inspection of gears, backlash, Inspection of belts & pulleys, chains & sprockets Inspection of screw jacks, lever devices, push-pull rod systems. 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.</p>		20 Lectures
<p>Unit II – Aircraft Weight and Balance and storage: Centre of Gravity/Balance limits calculation: use of relevant documents; preparation of aircraft for weighing Aircraft weighing Aircraft taxiing/towing and associated safety precautions; Aircraft jacking, chocking, securing and associated safety precautions; Aircraft storage methods; Refueling/ defueling procedures; De-icing/anti-icing procedures. Different methods of aircraft leveling</p>		20 Lectures
<p>Unit III – Disassembly, Inspection, Repair and Assembly Techniques: Types of defects and visual inspection techniques. Corrosion removal, assessment and re-protection. General repair methods, Structural Repair Manual Ageing, fatigue and corrosion control programmes; Non destructive inspection techniques including, penetrant, radiographic, eddy current, ultrasonic and boroscope methods. Disassembly and re-assembly techniques. Abnormal Events: Inspections following lightning strikes and HIRF penetration. Inspections following abnormal events such as heavy landings and flight through turbulence.</p>		20 Lectures
<p>Reference Book :- 1. FAA 9A 2. CAIP volume</p>		

PRACTICALS

Course Code	PRACTICALS	Credits :1
USARA 2P1	PHYSICS	50 marks
<ol style="list-style-type: none"> 1. To measure the length, breadth and height of rectangular block using Vernier caliper 2. To measure the outer and inner diameter of the pipe using Vernier caliper 3. To measure the inner and outer radius using radius gage 4. To measure the gap between electrodes of spark plug using thickness gauge 5. To measure the pressure using Manometer 6. To measure specific gravity of given fluid using hydrometer. 7. To measure the inner diameter of the pipe using telescopic gauge 8. To show magnetic lines of forces never intersect each other using bar magnet 9. Show the nature of airflow using venturi tube (Bernoulli's theorem) 10. Show Newton's laws of motion 11. Identification of poles, equator, meridian, latitude and longitude with globe 		80 hours

Course Code	PRACTICALS	Credits :1
USARA 2P2	DIGITAL TECHNIQUES	50 marks
<ol style="list-style-type: none"> 1. To Study the working of AND gate 2. To Study the working of OR gate 3. To Study the working of NAND gate 4. To Study the working of NOR gate 5. To Study the working of NOT gate 6. Observe the working of flip flop 7. Clock 8. seven segment decoder circuit 9. Multiplexer IC 10. De-multiplexer IC 11. A-D/D-A converter IC 		80 hours

Course Code	PRACTICALS	Credits :2
USARA 2P3	GROUND HANDLING	100 marks
<p>AIRCRAFT GROUND HANDLING & WEIGHT AND BALANCE:-</p> <ol style="list-style-type: none"> 1) Cabin door- Upper, lower, opening, closing and locking 1) Carry out weight and balance of aircraft 2) carry out taxing and towing of aircraft 3) Carry out jacking up and lowering of aircraft 4) use Proper procedure for parking of aircraft 5) Carry out refueling of aircraft 6) Carry out defueling of aircraft 7) use ground hydraulic supply 8) carry out Procedure for lashing and mooring of aircraft 10) familiarization with marshalling of aircraft 		80 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.

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
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 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.

SEMESTER V

Course Code		Credits :4
USARA 501	AIRFRAME SYSTEMS	
<p>Unit I - Hydraulic Power and Pneumatic/Vacuum Systems: 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>Pneumatic/Vacuum Systems: System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.</p>		30 Lectures
<p>Unit II –Ice and rain protection 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>		30 Lectures
<p>Unit III –Oxygen System : Oxygen system: Purpose of the system; Safety portable & fixed Oxygen systems; low pressure and high pressure oxygen system & 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 & CVR; Fire Extinguishers.</p> <p>Lights :External: navigation, anti-collision, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.</p>		30 Lectures
<p>Reference Book :- A & P Technician Airframe textbook (Jeppesen)</p>		

Course Code		Credits :4
USARA 502	LANDING GEAR	
<p>Unit I –General – 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>		30 Lectures
<p>Unit II – Brakes – 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>		30 Lectures

Unit I –General – 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.	30 Lectures
Reference Book :- A & P Technician Airframe textbook (Jeppesen)	

Course Code		Credits :3
USARA 503	Snag rectification	
Unit I –AIRCRAFT ELECTRICITY The snags in the aircraft systems pertaining to syllabus covered in Semester 1 to Semester 4 for Aircraft Electrical systems. The snag analysis, reason finding and rectification required.		30 Lectures
Unit II –AIRCRAFT INSTRUMENT The snags in the aircraft systems pertaining to syllabus covered in Semester 1 to Semester 4 for Aircraft Instrument systems. The snag analysis, reason finding and rectification required.		30 Lectures
Unit III –RADIO NAVIGATION The snags in the aircraft systems pertaining to syllabus covered in Semester 1 to Semester 4 for Aircraft Radio communication systems and aircraft Digital Technology. The snag analysis, reason finding and rectification required.		30 Lectures
Reference Books: 1. Aircraft instruments by E.H.J. Pallet, 2. Aircraft electricity by Eismen 3. Aircraft communication and navigation system by MIKE TOOLEY		

Course Code		Credits :4
USARA 504	CABIN ATMOSPHERE CONTROL	
Unit I – Fire Protection : Fire extinguishing 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.		30 Lectures
Unit II – Pressurization 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.		30 Lectures
Unit III –Air Conditioning Air conditioning systems; Air cycle and vapour cycle machines		30 Lectures

Distribution systems; Flow, temperature and humidity control system.	
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Reference Book :-

1. A & P Technician Airframe Textbook –Jeppesen
2. Aviation Maintenance Technician handbook – FAA -9A, 15A, 12A

PRACTICALS

Course Code	PRACTICALS	Credits :1
USARA 5P1	AIRFRAME SYSTEM	60 marks
<ol style="list-style-type: none"> 1. Servicing of hydraulic reservoir 2. Operation of Hydraulic shut off valve 3. Charging of hydraulic accumulator 4. Discharging of hydraulic accumulator 5. Check for hydraulic leak 6. Servicing of pneumatic system installed on aircraft 7. Check for anti-icing methods used on aircraft 8. Study how Anti-icing of windshield is done 9. Check for various components and servicing of those components used for anti-icing purpose on the aircraft. 10. Servicing of oxygen cylinder 11. Servicing of oxygen mask 12. Carryout snag analysis and rectification of Hydraulic quantity low 13. Carryout snag analysis and rectification for Low oxygen pressure 		50 hours

Course Code	PRACTICALS	Credits :1
USARA 5P2	LANDING GEAR	60 marks
<ol style="list-style-type: none"> 1. Locate and identify various parts of aircraft landing gear 2. Carryout greasing of various parts of aircraft landing gear 3. Swap landing gear wheel on aircraft 4. Servicing of oleo pneumatic shock strut 5. Identify the information given on tire 6. Inspection of brake system 7. check the operation of antiskid system installed on aircraft 8. Replace the tires on the aircraft wheel. 9. Carryout analysis and rectification of Landing Gear warning light ON 		40 hours

Course Code	PRACTICALS	Credits :1
USARA 5P3	SNAG RECTIFICATION ELECTRICITY	60 marks
<ol style="list-style-type: none"> 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. 2. Practicals on defect rectification on aircraft power supply distribution system such as voltage regulators malfunctioning, adjustment of voltage on aircraft etc. 3. Practicals on defect rectification on navigation, anti-collision and landing lights etc. 4. Practicals on inverter circuits, primary, secondary and standby inverter 		50 hours

<p>5. Practicals on removal, inspection and fitting of anti-collision lights.</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>	
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Course Code	PRACTICALS	Credits :1
USARA 5P4	RADIO NAVIGATION	60 marks
<p>1) Familiarization of test equipment signal generator, frequency counter</p> <p>2) Study of radio altimeter and its test procedure</p> <p>3) Familiarization of ATC system components and its test procedure</p> <p>4) Study of ADF system components and its test procedure</p> <p>5) Identification of ILS components and study its test procedure</p> <p>6) Study of GPWS components and testing</p> <p>7) Study of W/R system components and its procedure</p> <p>8) Study of ESDS requirements and precaution during ground handling</p> <p>9) Operational test of VHF com system on Local frequency contact precaution and procedure</p> <p>10) Operational test of VOR Nav. system</p> <p>11) Operational/Self test operation of ILS components</p>		50 hours

Course Code	PRACTICALS	Credits :1
USARA 5P5	INSTRUMENT SYSTEM (SNAG RECTIFICATION)	60 marks
<p>Pitot –static system related snag.</p> <p>Capacitance type Fuel quantity system related snag.</p> <p>Stall warning system related snag.</p> <p>EGT System snags.</p> <p>N1 & N2 rpm related system snags.</p> <p>Fuel flow system related snags.</p> <p>EPR related system snags.</p> <p>Auto pilot system related snags.</p> <p>Engine oil system related snags.</p> <p>DR</p> <p>Compass, RR compasses related snags.</p> <p>Gyro related snags on aircraft.</p>		50 hours

SEMESTER 6

Course Code		Credits :4
USARA 6P1	ELECTRICAL SYSTEM	150 marks
1	Starter-generator brush wear check	250 hours
2	Starter generator removal	
3	Starter generator installation	
4	Dc power distribution functional check	
5	Removal and installation of static discharger wick	
6	Inspection & functional test of static discharger wick	
7	Auxiliary battery removal and installation	
8	Removal and installation of voltage regulator	
9	Inspection of no:-4 gauge electrical cables	
10	Inverter removal and installation	
11	Removal and installation of power relays	
12	Removal and installation and functional check of landing light	
13	Removal and installation of navigation light and strobe light	
14	Removal and installation of anti-collision light	
15	Removal surface electrical resistivity check	
16	Routine maintenance of GPU (battery trolley)	
17	Wire identification.	

Course Code		Credits :4
USARA 6P2	INSTRUMENT SYSTEM	150 marks
1	Operational check of wing low fuel warning light system	250 hours
2	Fuel quantity indicator calibration	
3	Removal & installation of thermo-couple harness	
4	Resistance and insulation check of thermo-couple harness and it's leads	
5	Adjusting and testing of egt indicating system	
6	Removal and installation of static port	
7	Functional test of oil pressure transmitter	
8	Oil pressure transmitter test & adjustment	
9	Oil pressure switch & transmitter removal & installation	
10	Pitot system leakage check	
11	Altitude pressure switch functional test	
12	Calibration of flux valve – direct sync	
13	Fuel flow transmitter removal and installation	
14	Fuel flow indicator adjustment	
15	Compensation of magnetic compass	

16	Static system leakage check	
17	Stall warning system functional test	
18	Opening & closing of main door	
19	Battery connection and voltage check	

Course Code		Credits :4
USARA 6P3	RADIO NAVIGATION	100 marks
1	Power supply system requirements for Radio Communication and Navigation system	200 hours
2	Electrical Circuit Breakers	
3	Auxiliary Power Supply System as emergency power supply	
4	Visual inspection of the F.M. Transceiver type RT-18D and its mounting rack	
5	Insulation property check of the R.F. co-axial cable	
6	Inspection of the rack mounted ATC Transponder	
7	Maintenance checks and inspection of the Nose Radome	
8	Inspection of the VOR/LOC/GS Navigation Receiver type VIR-30	
9	Details of the Radio Communication equipments as installed on the Lear Jet aircraft	
10	Details of the Navigation equipments as installed on the Lear Jet aircraft	
11	Details of the Navigation antennas as installed on the Lear Jet aircraft	
12	Details of the Radio Communication antennas as installed on the Lear Jet aircraft	
13	Basic devices used as interface devices between pilots and communication equipments	
14	Polarization of Navigation antennas	
15	Methods to reduce damage due to electrostatic charges while working on electric components	

Course Code		Credits :8
USARA 6PP	AEROPROJECT	300 marks
Project on either one of these		
1	Innovative Project on electrical system of the aircraft	
2	Innovative Project on Instrument system of the aircraft	
3	Innovative Project on Radio Navigation 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 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.