# Anihersity of Alumhai



No. UG/37of 2020-21

## CIRCULAR:-

Attention of the Principals of the Affiliated Colleges and Directors of the recognized Institutions in Science & Technology Faculty is invited to the syllabus uploaded Academic Authority Unit which was accepted by Academic Council at its meeting held on June, 2016 vide item No. 4.65 the relating to the revised syllabus for the B. Sc. Aeronautics – Avionics (Sem. I to VI).

They are hereby informed that the recommendations made by the Ad-hoc Board of Studies in Aviation at its online meeting held on 11<sup>th</sup> May, 2020 vide item No. 2 and subsequently made by the Board of Deans at its meeting held on 26<sup>th</sup> June, 2020 vide item No. 13 (8) have been accepted by the Academic Council at its meeting held on 23<sup>rd</sup> July, 2020 vide item No. 4.73 and that in accordance therewith, the revised syllabus as per the (CBCS) of B.Sc. Aeronautics (Avionics) (Sem. I to VI) has been brought into force with effect from the academic year 2020 -21 accordingly. (The same is available on the University's website www.mu.ac.in).

MUMBAI – 400 032 November, 2020

(Dr. Vinod Patil)
I/c REGISTRAR

To

The Principals of the Affiliated Colleges and Directors of the recognized Institutions in Science & Technology Faculty. (Circular No. UG/334 of 2017-18 dated 9<sup>th</sup> January, 2018.)

## A.C/4.73/23/07/2020

No. UG/37-A of 2020-21

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1 Movember, 2020

Copy forwarded with Compliments for information to:-

1) The Dean, Faculty of Science & Technology,

2) The Chairman, Ad-hoc Board of Studies in Aviation,

3) The Director, Board of Examinations and Evaluation,

4) The Director, Board of Students Development,

5) The Co-ordinator, University Computerization Centre,

(Dr. Vinod Patil)
I/c REGISTRAR

AC	
Item No	

### **UNIVERSITY OF MUMBAI**



Program: -B.Sc. Aeronautics

Course: - Avionics
Syllabus for Semester I TO VI

(Choice Based and Credit System with effect from the Academic year 2020-21)

### Cover Page

AC	
Item No.	

### **UNIVERSITY OF MUMBAI**



### **Syllabus for Approval**

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Sr. No.	Heading	Particulars
1	Title of the Course	B.Sc. Aeronautics (Avionics)
2	Eligibility for Admission	10+2 with Physics, Mathematics and English
3	Passing Marks	45% for General Category 40% for Reserve Category
4	Ordinances / Regulations ( if any)	O-5962 Circular No.UG/147 of 2012-13 dated 14 <sup>th</sup> March,2013. O-5963
5	No. of Years / Semesters	3 Years / 6 Semesters
6	Level	U.G. ( Strike out which is not applicable)
7	Pattern	Semester ( Strike out which is not applicable)
8	Status	Revised (Strike out which is not applicable)
9	To be implemented from Academic Year	From Academic Year 2020- 2021

Date:	Signature:

Name of BOS Chairman / Dean : Wg.Cdr. S.C.Mehta / Dr. Majumdar

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## UNIVERSITY OF MUMBAI SYLLABUS (Revised) for the FY B.Sc.

Program: B.Sc. (Aeronautics)

(Avionics)

(Choice Based and Credit System with effect from the academic year 2020-2021)

	Evaluation scheme						
Semester	Course Code	Course Title	Credits	Lecture one hour duratio n	Practical code	Credits	Lecture one hour duration
ı	USARA 101	BASIC AERODYNAMICS	3	70	USARA 1P1	2	50
	USARA 102	WORKSHOP TECHNOLOGY	3	70	USARA 1P2	2	50
	USARA 103	ELECTRICAL FUNDAMENTALS (I)	3	70	USARA 1P3	2	50
	USARA 104	ENGINEERING DRAWING	2	50			
	USARA 105	HUMAN FACTORS / COMMUNICATION SKILL	3	70			
	USARA 1P1	BASIC AERODYNAMICS & WORKSHOP TECHNOLOGY- PRACTICAL	2				
	USARA 1P2	ELECTRICAL FUNDAMENTALS (I)- PRACTICAL	2				
	USARA 1P3	ENGINEERING DRAWING-PRACTICAL	2				
			20				

			Evaluation scheme		
Theory		Internal Marks	Semester end examination marks	Total Marks	Duration of examination
USARA 101		25	75	100	2.5 HOURS
USARA 102		25	75	100	2.5 HOURS
USARA 103		25	75	100	2.5 HOURS
USARA 104		25	75	100	2.5 HOURS
USARA 105		25	75	100	2.5 HOURS
LICADA 1D1	Unit 1	-	50	100	2.5 HOURS
USARA 1P1	Unit 2	-	50	100	2.5 HOURS
USARA 1P2		-	50	50	2.5 HOURS
USARA 1P3		-	50	50	2.5 HOURS
				700	

### **B.Sc.** AERONAUTICS (Avionics) SYLLABUS (THEORY)

Course Code	SUBJECT SEMESTER I (Avionics) Theory	Credits
USARA 101	BASIC AERODYNAMICS	Credits 3 Lectures 70
-	odynamics:  If the Atmosphere International Standard Atmosphere (ISA), o aerodynamics.	
	mics Airflow around a body, Boundary layer, laminar and w, free stream flow, relative airflow, upwash and downwash, gnation.	25
The terms: camber, chord, mean aerodynamic chord, profile (parasite) drag, induced drag, center 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.		Lectures
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.		25 Lectures
Unit III -Flight Stability and Dynamics: Introduction to aircraft, major aircraft components, aircraft systems and their functions, reference lines, station and zone identification systems International Standard Atmosphere (ISA), application to aerodynamics. Longitudinal, lateral and directional stability (active and passive).		20 Lectures
Reference Bo	ook :	

- 1. Mechanics of Flight ----- AC Kermode
- 2. Aviation Maint. Technician Hand Book-General -9A --- FAA
- 3. Aviation Maint. Technician Hand Book-Airframe -15A --- FAA

Course Code	SUBJECT SEMESTER I (Avionics) Theory	Credits	
USARA 102	WORKSHOPTECHNOLOGY	Credits 3 Lectures 70	
Unit I - Basics of Workshop Practice  Aspects of safe working practices including precautions to be taken up while working with electricity, gases especially Oxygen, Acetylene, oils and chemicals. 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. Care of tools, control of tools and use of workshop materials. Limits, fits and tolerances, Standards of workmanship, Calibration of tools and equipment, Calibration Standards, Common hand tool types, Common power tool types, Drill sizes for bolt holes, classes of fits, Common system of fits and clearances, Schedule of fits and clearances for aircraft and engines; Limits for bow, twist and wear, Standard methods for checking shafts, bearings and other parts.			
Screw thread for standard screws, Bolt International screws: aircr tapping screw	Basic Aircraft Hardware  as, screw nomenclature; thread forms. Dimensions and tolerances threads used in aircraft, measuring screw threads; bolts, studs and types: specification, identification and marking of aircraft bolts, standards. Nuts: self-locking, anchor, standard types; Machine aft specifications; Studs: types and uses, insertion and removal; Self ws dowels, Tab and spring washers, locking plates, split pins, palcking, Quick release fasteners, Keys, circlips, cotter pins, Types of	25 Lectures	

### Unit III --- Locking devices

Locking devices Tab and spring washers, locking plates, split pins, palnuts, wire locking, quick release fasteners, keys, circlips, cotter pins Aircraft rivets Types of solid and blind rivets: specifications and identification, heat treatment. Types of cables; End fittings, turnbuckles and compensation devices; Pulleys and cable system components; Bowden cables; Aircraft flexible control systems.

20 Lectures

### Reference Book:

- 1) Airframe & Power plant Mechanics (General Handbook EA-AC 65-9A)
- 2) Shop Theory --- J. A Enderson & Tatro
- 3) Aviation Maint. Technician Handbook-Airframe 15A (Vol-I & II)

Course Code	SUBJECT SEMESTER I (Avionics) Theory	Credits
USARA 103	ELECTRICAL FUNDAMENTALS (I)	Credits 3 Lectures 70
Aspects of with electrical defecting the resistance, Generation methods: limotion. Electrical general test	Static Electricity and Conduction:  safe working practices including precautions to take when working city Static electricity and distribution of electrostatic charges; includes of attraction and repulsion; Units of charge, Coulomb's Law; in of electricity in solids, liquids, gases and a vacuum.  Terminology The following terms, their units and factors item: potential difference, electromotive force, voltage, current, conductance, charge, conventional current flow, electron flow.  of Electricity Production of electricity by the following ght, heat, friction, pressure, chemical action, magnetism and repulsion are equipment's equipment's Operation, function and use of electrical equipment.	20 Lectures
Construction acid cells, and paralle materials a DC Circuit	DC Sources of Electricity on and basic chemical action of: primary cells, secondary cells, lead nickel cadmium cells, other alkaline cells; Cells connected in series l; Internal resistance and its effect on a battery; Construction, and operation of thermocouples; Operation of photo-cells.  s Ohms Law, Kirchhoff's Voltage and Current Laws; as using the above laws to find resistance, voltage and current;	25 Lectures

Significance of the internal resistance of a supply.

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

### Unit III -- 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

25 Lectures

#### 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

#### Reference Book:

- 1. Electrical technology by B L Theraja
- 2. Aircraft Electricity and Electronic by Eismen
- 3. Examples in electrical Calculation by Admirality

Course Code	SUBJECT SEMESTER I (Avionics) Theory	Credits
USARA 104	ENGINEERING DRAWING	Credits 2 Lectures 50
their uses, D Diagrams ar dimensions, Types of lin	of Engineering Drawing, Introduction to drawing instrument and Drawing sheet layout and sizes, Identifying title block information and Standards Drawing types and diagrams, their symbols, tolerances and projections; es and their applications, Dimensioning terminology, Quadrant and First angle and third angle projection method and their comparison	15 Lectures
method  Orthograph by first angl orthographic Isometric V isometric ax	g Curves Ellipse, parabola and hyperbola only focus diretrix  nic Projection Orthographic Projection of given pictorial view e & Third angle method of projection, Types of sections, sectional c projection (only full sectional orthographic view)  liew Introduction of isometric view with example of cube, es, scale, isometric projection and isometric view, drawing isometric ple solids and its dimension in	20 Lectures
Free hand sheaded nut a presentation Specification	ree Hand Sketches  ketching – FV and TV of standard machine parts - Hexagonal and bolt, foundation bolt, Microfilm, microfiche and computerised s; Wiring diagrams and schematic diagrams.  In 100 of the Air Transport Association (ATA) of America; and other applicable standards including ISO, AN, MS, NAS and	15 Lectures

### Reference Book:

- 1) Engineering Drawing -- N D Bhat
- 2) Machine Drawing ---- AC Parkinsons
- 3) Airframe & Power plant Mechanics (General Handbook EA-AC 65-9
- 4) Civil Aircraft Inspection Procedure (CAP 459)

Course Code	SUBJECT SEMESTER I ( <u>Avionics</u> ) Theory	Credits
USARA 105	HUMAN FACTORS/COMMUNICATION SKILL	Credits 3 Lectures 70
Unit I I	HUMAN FACTORS	
<ol> <li>General The need to take human factors into account; Incidents attributable to human factors/human error; 'Murphy's' law.</li> <li>Human Performance and Limitations Vision; Hearing; Information processing; Attention and perception; Memory; Claustrophobia and physical access.</li> <li>Social Psychology Responsibility: Social Psychology Responsibility individual and group Motivation and de-motivation; Peer pressure; 'Culture' issues; Team working; Management, supervision and leadership</li> <li>Factors Affecting Performance Fitness/health; Stress: domestic and work related; Time pressure and deadlines; Workload: overload and underload; Sleep and fatigue, shiftwork; Alcohol, medication, drug abuse.</li> </ol>		25 Lectures
Unit II - H	HUMAN FACTORS	
1 '	Environment Noise and fumes; Illumination; Climate and re; Motion and vibration; Working environment.	
b) Tasks - systems.	Physical work; Repetitive tasks; Visual inspection; Complex	25
1 '	unication Within and between teams; Work logging and , Keeping up to date, currency; Dissemination of information.	Lectures
· ·	Error Error models and theories; Types of error in ce tasks; Implications of errors (i.e. accidents) Avoiding and errors.	

e) Hazards in the Workplace Recognising and avoiding hazards; Dealing with emergencies.	
Unit III – COMMUNICATION SKILL	
<ul> <li>a) Reading, Comprehension skills and vocabulary development:</li> <li>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.</li> <li>b) Professional skill Professional skill development, writing: – letter writing, report writing, speaking &amp; listening: – discussion, debates. Seven C's of effective communication</li> </ul>	20 Lectures
c) Human rights: Human rights constituents with special reference to Fundamental Rights in India	
Reference Book :-	
<ol> <li>Human Factors Training Manual ICAO Doc 9683</li> <li>EASA Module-09 Human Factors AIRCRAFT TECH BOOK CO.</li> </ol>	
3) Human Rights and communication skills by Basant Rani	

### B.Sc. AERONAUTICS (<u>Avionics</u>) (<u>PRACTICALS</u>)

Course Code	SUBJECT SEMESTER I (Avionics) Practicals	Credits
USARA 1P1	BASIC AERODYNAMICS & WORKSHOP TECHNOLOGY	Credits 2 Lectures 50
list of Practicals Practicals Unit I (Students Practicals) 1) To under effect of b 2) Identify 3) Identify 4) Identify 5) Identify 6) Identify 6) Identify 8) Visual 9) Assessi	will have to perform minimum 7 practicals from following list of erstand the shape of airfoils and wing and how they affect lift and drag, oundary layer on flow around the body. Ving aircraft reference lines, station and zone numbers cation of major structural members of fixed wing aircraft. Cation of type of Fuselage and method of pressure sealing. Cation of Pressure bulkheads and unpressurised bulkheads cation of components of flight control surfaces and landing gear and	25 lectures
(Students Practicals) 1) Demoderand check 2) Demoderand check 3) Demoderand check 4) Demoderand check 4) Demoderand check 4) Emoderand check 4) Demoderand check 5	will have to perform minimum 7 practicals from following list of instration of safety precautions while using fluids, gases, electricity, fire demicals & identification of different type of Fire & Fire Extinguishers. Instration of hand tools and equipment and their correct use. Instration of correct use of measuring equipment (tools) like meters, Vernier caliper, instration of correct use of Dial Indicator, bevel protector, combination instration and use of torque wrench for given torque value.	25 lectures

- 6) Demonstration of the use of calipers, feeler, fillet, radius limit, telescopic gauge for inspection of one simple assembly.
- 7) Use hand & power tools to drilling (example: rivet holes drilling).
- 8) Demonstration of the Inspection and lubrication of aircraft control cable.
- 9) Demonstration of the wire and cotter pin licking practice.
- 10) Demonstration of the Inspection and lubrication of aircraft control cable.
- 11) Demonstration of the wire and cotter pin licking practice.

Course Code	SUBJECT SEMESTER I (Avionics) Practicals	Credits
USARA 1P2	ELECTRICAL FUNDAMENTALS (I)	Credits 2 Lectures 50
NOTE: following  1) To ver 2) To descircuit 3) To ide valida 4) Demo measu 5) To der circuit 6) To stu 7) To ide its val 8) Conne measu 9) To De 10) To 11) To 12) To voltme 13) Wo	Students will have to perform minimum 12 practicals from list of Practical's:  ify the ohm law & Kirchhoff law using resistive network.  sign electrical circuit using electrical appliances like fuse, switch, breaker, socket, bulb, contactor and verify its operation ntify various types of resister on the basis of colour code and the using DMM/AMM.  Instration of the resister in series/parallel /in combination and the value of resister through AMM/DMM.  Instration of Wheatstone bridge.  In the various type of capacitor using colour code and validate the by using LCR Q meter.  In the various type of capacitor using colour code and validate the by using LCR Q meter.  In the value of Capacitor through capacitor meter.  In the value of Capaci	50 lectures

Course Code	SUBJECT SEMESTER I ( <u>Avionics)</u> Practicals	Credits
USARA 1P3	ENGINEERING DRAWING	Credits 2 Lectures 50
	udents will have to perform minimum 12 practicals from t of Practicals:	
1) Types of	lines, lettering, dimensioning of simple orthographic view	
2) Engineer	ring curves (minimum 3 problems)	
3) Projection	on of points ( all possible positions)	
4) Projection	on of lines (minimum 3 problems)	
5) Projection	on of planes (minimum 3 problems)	
6) Projection	on of solids (minimum 3 problems)	50
7) Projection	on of section of solids (minimum 3 problems)	50 lectures
8) Develops	ment of lateral surface of solids (minimum 3 problems)	100001200
9) Orthogra	phic projection (2 Problems)	
10) Sectio	nal orthographic projection (2 Problems)	
11) Isome	tric views (simple solid 2 problem)	
12) Isome	tric views (machine component 2 problem)	
· ·	and sketches (Hexagonal headed nut and bolt, foundation bolt, eys, couplings)	
14)Free han	d sketches (springs, screws, threaded forms)	

		Evaluati	ion scho	eme			
Semester	Course	Course Title	Credi	Lecture	Practical	Credits	Lecture
	Code		ts	one	code		one hour
				hour			duration
				duratio			
				n			
Ш	USARA	ELECTRICAL	3	70	USARA	2	50
	201	FUNDAMENTALS (II)			2P1		
	USARA	ELECTRONIC	3	70	USARA	2	50
	202	FUNDAMENTALS			2P2		
	USARA	MAINTENANCE	3	70	USARA	2	50
	203	PRACTICES (I)			2P3		
	USARA	AIRCRAFT	3	70			
	204	STRUCTURE					
	USARA	ENVIRONMENTAL	2	50			
	205	STUDIES					
	USARA	ELECTRICAL	2				
	2P1	FUNDAMENTALS (II)					
	USARA	ELECTRONIC	2				
	2P2	FUNDAMENTALS					
	USARA	AIRCRAFT	2				
	2P3	STRUCTURE &					
		MAINTENANCE					
		PRACTICES					
			20				

		Evaluation scheme			
Theor	ry	Internal Marks	Semester end examination marks	Total Marks	Duration of examination
USARA 201		25	75	100	2.5 HOURS
USARA 202		25	75	100	2.5 HOURS
USARA 203		25	75	100	2.5 HOURS
USARA 204		25	75	100	2.5 HOURS
USARA 205		25	75	100	2.5 HOURS
UAARA 2P1		-	50	50	2.5 HOURS
USARA 2P2		-	50	50	2.5 HOURS
USARA 2P3	Unit 1	-	50	100	2.5 HOURS
	Unit 2	-	50	100	2.5 HOURS
				700	

Course Code	SUBJECT SEMESTER II (AVIONICS) Theory	Credits
USARA 201	ELECTRICAL FUNDAMENTALS (II)	Credits 3 Lectures 70
Construand factor generate speed a wound b. AC The Instanta values a	otor/Generator Theory Basic motor and generator theory; action and purpose of components in DC generator; Operation of, tors affecting output and direction of current flow in DC ors; Operation of, and factors affecting output power, torque, and direction of rotation of DC motors; Series wound, shunt and compound motors; Starter Generator construction.  eory Sinusoidal waveform: phase, period, frequency, cycle; aneous, average, root mean square, peak, peak to peak current and calculations of these values, in relation to voltage, current wer Triangular/Square waves; Single/3 phase principles.	25 Lectures
relationshi and series phase angl power and b) Transform under load markings; of power i	Ye (R), Capacitive (C) and Inductive (L) Circuits – Phase p of voltage and current in L, C and R circuits, parallel, series parallel; Power dissipation in L, C and R circuits; Impedance, te, power factor and current calculations; True power, apparent reactive power calculations.  Formers - Transformer construction principles and operation; ter losses and methods for overcoming them; Transformer action and no-load conditions; Power transfer, efficiency, polarity Calculation of line and phase voltages and currents; Calculation in a three phase system; Primary and Secondary current, voltage, power, efficiency; Auto transformers.	25 Lectures
pass, high b) AC Ger produced; field type	- Operation, application and uses of the following filters: low pass, band pass, band stop.  nerators - Rotation of loop in a magnetic field and waveform Operation and construction of revolving armature and revolving AC generators; Single phase, two phase and three phase; Three phase star and delta connections advantages and uses;	20 Lectures

Permanent Magnet Generators.

c) 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.

### Reference Book:-

- 1) Aircraft Electrical System --- E.H.J.Pallett
- 2) Aircraft Electricity & Electronics ---- Thomas K Eismin
- 3) Aviation Maint. Technician Hand Book-General -9A ---- FAA

Course Code	SUBJECT SEMESTER II (Avionics) Theory	Credits
USARA 202	ELECTRONIC FUNDAMENTALS	Credits 3 Lectures 70
(a) Diode paralle (thyris diodes (b) Materi characteris characteris conditions clipped double follow diode,	emiconductors Diodes symbols; Diode characteristics and properties; Diodes in series and el; Main characteristics and use of silicon controlled rectifiers itors), light emitting diode, photo conductive diode, varistor, rectifier e; Functional testing of diodes.  Itals, electron configuration, electrical properties; P and N type als: effects of impurities on conduction, majority and minority iters; PN junction in a semiconductor, development of a potential a PN junction in unbiased, forward biased and reverse biased itons; Operation and function of diodes in the following circuits: rs, clampers, full and half wave rectifiers, bridge rectifiers, voltage ers and triplers; Detailed operation and characteristics of the ing devices: silicon controlled rectifier (thyristor), light emitting Shottky diode, photo conductive diode, varactor diode, varistor, er diodes, Zener diode.	25 Lectures
a) Transic character transisters b) Testing their used circuits continued the continue	stor symbols: Component description and orientation; Transistor eristics and properties. Construction and operation of PNP and NPN ors; Base, collector and emitter configurations; gof transistors Basic appreciation of other transistor types and es. Application of transistors: classes of amplifier (A, B, C); Simple including: bias, decoupling, feedback and stabilisation; Multistage principles: cascades, push-pull, oscillators, multi vibrators, flip-flop exted Circuits Description and operation of logic circuits and circuits/operational amplifiers. Description and operation of logic	20 Lectures

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.

d) Printed Circuit Boards - Description and use of printed circuit boards.

#### Unit III – Servomechanisms

- a) Servomechanisms Understanding of the following terms: Open and closed loop systems, feedback, follow up, analogue transducers; Principles of operation and use of the following synchro system components/ features: resolvers, differential, control and torque, transformers, inductance and capacitance transmitters.
- a) Understanding of the following terms: Open and closed loop, follow up, servomechanism, analogue, transducer, null, damping, feedback, dead and; 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.

Reference Book :-

- 1) Aircraft Radio System ---- J. Powell
- 2) Electronic Communication System --- George Kennedy
- 3) Digital Principles and Applications by DONALD P. LEACH, ALBERTPAUL ALVINO, GOUTAM SAHA

25 Lectures

SUBJECT SEMESTER II (Avionics) Theory	Credits
MAINTENANCE PRACTICES (I)	Credits 3 Lectures 70
hand tool types; Common power tool types; Operation and use of measuring tools; Operation, function and use of electrical general test at; Operation, function and use Avionic General Test Equipment on equipment and methods. Fits and Clearances Drill sizes for bolt uses of fits; Common system of fits and clearances; Schedule of fits neces for aircraft and engines; Limits for bow, twist and wear Aircraft Mechanism & Linkages Types of rigid and flexible pipes and their is used in aircraft. Standard unions for aircraft hydraulic, fuel, oil, a system pipes.	20 Lectures
aprings, materials, Gear types and their application; Gear ratios, and multiplication gear systems, driven and driving gears, idler gears, erns; Belts and pulleys, chains and sprockets Types of cables; end rnbuckles and compensation devices; Pulleys and cable system its; Bowden cables; Aircraft flexible control systems. Purpose of loads, material, and construction; types of bearings and their in,	25 Lectures
Different methods of welding, brazing and soldering. Inspection of razed and soldered joints. Adhesive bonding methods and inspection joints. Bonding methods and inspection of bonded joints. Composite netallic - Bonding practices; Environmental conditions Inspection	25 Lectures
	MAINTENANCE PRACTICES (1)  Tools hand tool types; Common power tool types; Operation and use of measuring tools; Operation, function and use of electrical general test to operation, function and use Avionic General Test Equipment on equipment and methods. Fits and Clearances Drill sizes for bolt uses of fits; Common system of fits and clearances; Schedule of fits neces for aircraft and engines; Limits for bow, twist and wear Aircraft Mechanism & Linkages Types of rigid and flexible pipes and their is used in aircraft. Standard unions for aircraft hydraulic, fuel, oil, is system pipes.  Apprings, materials, Gear types and their application; Gear ratios, and multiplication gear systems, driven and driving gears, idler gears, erns; Belts and pulleys, chains and sprockets Types of cables; end ribuckles and compensation devices; Pulleys and cable system its; Bowden cables; Aircraft flexible control systems. Purpose of loads, material, and construction; types of bearings and their in,  Different methods of welding, brazing and soldering. Inspection of razed and soldered joints. Adhesive bonding methods and inspection joints. Bonding methods and inspection of bonded joints. Composite

- 1) Aviation Maint. Technician Hand Book-General -9A ---- FAA
- 2) EASA Module-07A Maintenance Practices --- AIRCRAFT TECH BOOK C
- 3) Civil Aircraft Inspection Procedures (CAP 459)-- CAIP I Basic

Course Code	SUBJECT SEMESTER II (Avionics) Theory	Credits
USARA 204	AIRCRAFT STRUCTURE	Credits 3 Lectures 70
Unit I - a) Genera	l Concepts	
primary, se	ness requirements for structural strength; Structural classification, econdary and tertiary; Fail safe, safe life, damage tolerance concepts; station identification systems;	25 Lectures
fatigue; Di	in, bending, compression, shear, torsion, tension, hoop stress, rains and ventilation provisions; System installation provisions; strike protection provision. Aircraft bonding	
	amiliarization of Fuselage types; Familiarization of Wing Structure; ation of Control Surface	
bulkheads, reinforcem	on methods of: stressed skin fuselage, formers, stringers, longerons, frames, doublers, struts, ties, beams, floor structures, ent, methods of skinning, anti-corrosive protection, wing, e and engine attachments;	20 Lectures
Unit III -		
	ssembly techniques: riveting, bolting, bonding f surface protection, such as chromating, anodising, painting; eaning.	25 Lectures
	ymmetry: methods of alignment and symmetry checks.	
Reference 1) FAA H	Book:- - 8083-31 Aviation Maint. Technician Handbook-Airframe (Vol-I)	

2) FAA H- 8083-31 Aviation Maint. Technician Handbook-Airframe (Vol II)

3) Civil Aircraft Inspection Procedures (CAP 459)-- CAIP I

Course Code	SUBJECT SEMESTER II (Avionics) Theory	Credits
USARA 205	ENVIRONMENTAL STUDIES	Credits 2 Lectures 50
Unit I–En Environm ecologica in sustain	15 Lectures	
What is disaster,	Disaster and Waste management: disaster, concept of disaster, cause of disaster, major natural cyclones, Tsunami, disaster management, forms of waste, tion of waste, sources of waste their effects and waste ent.	20 Lectures
Natural re Sustainab	-Sustainable Development: esources, ever increasing power requirement, renewable resources, fility, conservation, Environmental clearance for establishing and Industries in India. Wildlife protection act,	15 Lectures
Referenc 1) Enviro	e Book :- nmental ManagementSmite Saluki	

Course Code	SUBJECT SEMESTER II (Avionics) Practicals	Credits
USARA 2P1	ELECTRICAL FUNDAMENTALS (II)	Credits 2 Lectures 50
	Students will have to perform minimum 12 practicals from list of Practical's:	
1) Familia	arization with transformers	
2) Measur	rement of output voltage of DC generator	
3) Measur	rement of output voltage of alternator	
	ly the constructional part of DC Generator/Motor & Perform pection and operation of DC Generator/motor	
5) To test	the armature in Growler and through millimeter / test lamp.	
	arize the constructional part of AC generator and motor & the inspection and operation of AC Generator/Motor.	
· ·	onstrate the reversing the direction of rotation and speed of AC motor/DC motor.	
	iliarize the current and voltage transformer and demonstrate and testing by simple circuit.	50 lectures
9) To Ider LCR Q	ntify the various type of Inductor and measurement its value by meter,	
	ction of the Inductor in series, parallel and in combination and e the value of inductor through Inductor meter.	
, .	phase and three phase power supply distribution using star and onnection	
· ·	ruct series LCR circuit and determine its (a) Resonant ncy, Quality Factor,	
	ruct parallel LCR circuit and determine its (a) Anti-resonant acy and (b) Quality factor Q	
14) Use of	transformer in power distribution and measurements.	
	filters circuit to study function of low pass, high pass, band d band stop	

Course Code	SUBJECT SEMESTER II (Avionics) Practicals	Credits
USARA 2P2	USARA 2P2 ELECTRONIC FUNDAMENTALS	
followin	Students will have to perform minimum 08 practicals from g list of Practicals:	
1) Ider	tification of components of R, L, C and measure values	
2) Stud	y of the features and controls of CRO & Multi meter	
· ·	ly of Operating Controls of Voltmeter, Ammeter, Power meter, Ohm er, DMM for its use	
4) Stud	y the characteristics of Electron Tube	
· 1	tification of Semiconductor devices – Diodes, Transistors and perform characteristics	50 lectures
6) Stud	y of SCR and its characteristics and waveform	
7) Stud	y of Zener diode and its characteristics and waveform	
· ·	ly the working of Half wave, Full wave, Bridge Rectifier and observe waveform	
9) To (	heck UJT transistor and perform its characteristics	
	observe the performance of choke input and capacitance input filter the rectification circuit	

Course Code	SUBJECT SEMESTER II (Avionics) Practicals	Credits		
USARA 2P3	AIRCRAFT STRUCTURE & MAINTENANCE PRACTICES	Credits 2 Lectures 50		
NOTE: Students will have to perform minimum 20 practicals from following list of Practicals: {From Unit I minimum 8 Practicals & from Unit II minimum 8 Practicals}				
UNIT-I MAINTENANCE PRACTICES (I) (Students will have to perform minimum 06 practicals from following list of Practicals)				
1) Identification of various rivets and use of any one riveting technique				
2) Identification of various fasteners and locking devices used in aircraft.				
3) Single patch riveting				
4) Double patch riveting		25 Lectures		
5) Lap Joint by Riveting.				
Butt joint by Riveting.				
6) Make a rectangular doubler				
7) Make a circular doubler				
8) Demonstration of simple soldering tasks.				
9) Demonstration of electric arc welding.				
10) Demonstration of oxy Acetylene welding.				
11) Survey of corrosion prone area and suggestion for remedial action.				
12) Demon	stration of the wire and cotter pin licking practice.			

#### UNIT-II AIRCRAFT STRUCTURE

(Students will have to perform minimum 06 practicals from following list of Practicals)

- 1) Safety, handling precautions, selection of appropriate tools and manuals.
- 2) Use zonal numbers to record location. Use parts catalogue & component location manual to locate components.
- 3) Identifying different parts of aircraft. And their operation on aircraft.
- 4) Visual inspection of various types of surface defects of aircraft structure using simple aids like magnifying glass, light and mirror.
- 5) Use zonal and station numbers to record defect location
- 6) Identification and inspection of flight control system
- 7) Inspection for lightning strike protection
- 8) Identification of types of rivets: specifications and identification,
- 9) Demonstration of Lap / But Joint by Riveting.
- 10) Demonstration of the Inspection and lubrication of aircraft control cable
- 11) Survey of corrosion prone area and suggestion for remedial action.

25 Lectures

## UNIVERSITY OF MUMBAI SYLLABUS (Revised) for the SY B.Sc.

Program: B.Sc.( Aeronautics)

(Avionics)

(Choice Based and Credit System with effect from the academic year 2020-2021)

Evaluation scheme							
Semes ter	Course Code	Course Title	Cred its	Lectu re one hour durati on	Practical code	Cred its	Lectu re one hour durati on
III	USARA 301	MAINTENANCE PRACTICES ( II )	3	70	USARA 3P1	2	50
	USARA 302	AVIATION LEGISLATION (I)	3	70	USARA 3P2	2	50
	USARA 303	DIGITAL AND COMPUTOR TECHNIQUES	3	70	USARA 3P3	2	50
	USARA 304	AIRCRAFT MATERIALS	2	50			
	USARA 305	THEORY OF FLIGHT & FLIGHT CONTROLS	3	70			
	USARA 3P1	AIRCRAFT MATERIALS & MAINTENANCE PRACTICES(II)	2				
	USARA 3P2	DIGITAL AND COMPUTOR TECHNIQUES	2				
	USARA 3P3	THEORY OF FLIGHT & FLIGHT CONTROLS	2				
			20				

**Evaluation scheme** Semester Total Duration of end Theory **Internal Marks** examination Marks examination marks USARA 301 25 75 100 2.5 HOURS USARA 302 75 2.5 HOURS 25 100 USARA 303 75 25 100 2.5 HOURS USARA 304 2.5 HOURS 25 75 100 2.5 HOURS USARA 305 100 25 75 Unit 1 50 2.5 HOURS USARA 3P1 100 50 2.5 HOURS Unit 2 50 50 2.5 HOURS USARA 3P2 2.5 HOURS USARA 3P3 50 50 700

Course Code	SUBJECT SEMESTER III (Avionics) Theory	Credits
USARA 301	MAINTENANCE PRACTICES (II)	Credits 3 Lectures 70
Unit I – Electrical and bonding operated; Co-axial contingues their techniques sleeving techniques sleeving techniques sheet Metaworking, in	20 Lectures	
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.		
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.		25 Lectures
Reference 1) Airfram 2) Shop Tl		

Course Code	SUBJECT SEMESTER III (Avionics) Theory	Credits
USARA 302	AVIATION LEGISLATION (I)	Credits 3 Lectures 70
Role of IO relationsh (applicab	ry framework. CAO; the aircraft act and rule made there under; role of DGCA; hip between CAR-21, CAR-M, CAR-145, CAR-66, the aircraft rules le to aircraft maintenance and release); aeronautical information (applicable to aircraft maintenance and release); CAR section 2	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		
Reference	e Book :-	

CAR by DGCA
 CAR 66 by DGCA
 CAR 145 by DGCA
 CAR 21 by DGC

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

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.	
Unit III - a) Electronic Displays Principles of operation of common types of displays used in modern aircraft, including Cathode Ray Tubes, Light	
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	25 Lectures
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	Lectures

# Reference Book :-

1) Aircraft Instruments and Integrated System --- E.H.J. Pallett

Integrated modular Avionics Cabin System Information system

- 2) Digital Principles and Applications by DONALD P. LEACH, ALBERTPAUL ALVINO, GOUTAM SAHA
- 3) Aviation electronics --- Keith W.Bose

Course Code	SUBJECT SEMESTER III (Avionics) Theory	Credits
USARA 304	AIRCRAFT MATERIALS	Credits 2 Lectures 50
Character aircraft; I Testing of and impact b) Aircraft Character materials materials fatigue stratigue stratigue stratigue stratigue	istics, properties and identification of common alloy steels used in leat treatment and application of alloy steels; ferrous materials for hardness, tensile strength, fatigue strength et resistance.  If Materials — Non-Ferrous  istics, properties and identification of common non-ferrous used in aircraft; Heat treatment and application of non-ferrous. Testing of non-ferrous material for hardness, tensile strength, rength and impact resistance.  ivets Types of solid and blind rivets: specifications and tion, heat treatment	20 Lectures
Composit Character nonmetal bonding a (b) The do material.	the materials - Composite the and non-metallic other than wood and fabric. The stricts, properties and identification of common composite and lic materials, other than wood, used in aircraft; Sealant and agents. The stricts of defects deterioration in composite and non-metallic of composite and non-metallic material and Non-Metallic	20 Lectures
fabric. air and fabric wooden a and wood b) Plastic Thermose	and fabric structures Construction methods of wooden and frame structures; Characteristics, properties and types of woode glue used in aero planes Preservation and maintenance of and fabric structure; Types of defects in wood and fabric material ten structures; es Different types of plastics used in aircraft Thermoplastics and etting plastics. Cleaning ,Storage and Handling Plastics  Sion Chemical fundamentals; Formation by, galvanic action	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
Primary cor control; Hig manual, hyd damper, Ma	ght Controls  atrols: aileron, elevator, rudder, spoiler; Trim control; Active load th lift devices; Lift dump, speed brakes; System operation: draulic, pneumatic, electrical, fly-by-wire; Artificial feel, Yaw ch trim, rudder limiter, gust locks systems; Balancing and ll protection/warning system	25 Lectures
Speed of so number, crit aerodynami	ligh Speed Flight und, subsonic flight, transonic flight, supersonic flight, Mach cical Mach number, compressibility buffet, shock wave, c heating, area rule; Factors affecting airflow in engine intakes of chircraft; Effects of sweepback on critical Mach number.	25 Lectures
Unit III - A Fundamenta current terr roll, pitch Automatic t Autopilot na Landing Sys	utopilot: als of automatic flight control including working principles and ninology; Command signal processing; Modes of operation: and yaw channels; Yaw dampers; Stability Augmentation rim control; avigation aids interface; Auto throttle systems. Automatic stems: principles and categories, modes of operation, approach, 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	
USARA 3P1		
following list Unit II mini Unit I M (Students w Practicals)  1. Inspection 2. Demonstration 3. Demonstration 4. Demonstration 5. Use Precent Operation 8. Demonstration 9. Identification 10.Demonstration 11.Testing, 12.Inspection 13.Inspection	audents will have to perform minimum 20 practicals from st of Practicals: {From Unit I minimum 8 Practical's & from mum 8 Practicals}  AINTENANCE PRACTICES ill have to perform minimum 8 practicals from following list of on and testing of springs ration of DPI, MPI, FPI. ration of Electric Arc, Gas welding tration of Soldering./ Demonstration of Brazing caution & operation of hand tools used in workshop caution & operation of power tools used in workshop in and use of precision measuring tools; ration of Single/Double patch riveting ation of types of rivets: specifications and identification, ration of Lap / But Joint by Riveting. cleaning, inspection & lubrication of bearings on of gears, including backlash check on of belts & pulleys, chains & sprockets on of screw jacks, lever devices, push-pull rod systems.	25 lectures
(Students was list of Practal) Identifications aircrafts;	AIRCRAFT MATERIALS  Vill have to perform minimum 8 practicals from following ticals)  ation of common alloy steels and nonferrous alloys used in ristics, 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 COMPUTOR TECHNIQUES	Credits 2 Lectures 50
	tudents will have to perform minimum 16 practicals from st of Practicals	
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) Introduc	etion to the parts of computer.	
5) Operation	on and identification of electrostatic discharge devices.	
6) Awaren	ess of airworthiness requirements to use software programs.	
7) Underst	anding of ARINC data bus.	
8) To study	y the working of A to D converter/ D to A converter.	
9) Identific	eation of various ESD warnings.	
10) To pe	rform the operation of grounding and bonding.	50
11) Study of	F ARINC 429/629 BUS.	lectures
12) Study of	f Fiber optic cable.	
13) Pamphle	et Design in MS-WORD 2007	
14) Article l	Design in MS-WORD 2007	
15) Compar	ative Worksheet Design in MS-EXCEL 2007	
	ative Different Slides in MS-POWERPOINT 2007 with Transitions	
	of Record Sets, Passing & Returning of Record Set from a , Usage of Command Object – Parameter Collection	
	reation and Usage, Usage of ActiveX components – both DLL and ActiveX EXE, Package and Deployment Wizard	
19) Interacti	ve Discussion on VB 6.0	

Course Code	SUBJECT SEMESTER_III ( <u>Avionics</u> ) Practicals	Credits
USARA 3P3	THEORY OF FLIGHT & FLIGHT CONTROLS	Credits 2 Lectures 50
	tudents will have to perform minimum 12 practicals from st of Practicals	
1) Operation	nal check of aileron, elevator, rudder,	
2) Operation	nal check of Flap, Slat	
3) Manual/I	Electrical Trim control check	
4) Operation	n check of Ground/ Flight spoilers	
5) Check of	Artificial feel, Yaw damper,	
6) Operation	nal check of Mach trim, Rudder limiter	50
7) Stall prot	tection/warning system check	lectures
8) Operatio	nal check of aileron, elevator, rudder,	
9) Operation	nal check of Flap, Slat	
10) Manu	al/Electrical Trim control check	
11) Opera	ntion check of Ground/ Flight spoilers	
12) Checl	of Artificial feel, Yaw damper,	
13) Opera	ntional check of Mach trim, Rudder limiter	
14) Stall 1	protection/warning system check	

	Evaluation scheme							
Semes ter	Course Code	Course Title	Cred its	Lectu re one hour durati on	Practical code	Cred its	Lectu re one hour durati on	
IV	USARA 401	AIRCRAFT INSTRUMENT SYSTEM ( I )	3	70	USARA 4P1	2	50	
	USARA 402	ENGINE & SYSTEM	3	70	USARA 4P2	2	50	
	USARA 403	COMMUNICATION/NAVIGATI ON SYSTEM	3	70	USARA 4P3	2	50	
	USARA 404	POWER DISTRIBUTION	3	70				
	USARA 405	PROPULSION	2	50				
	USARA 4P1	AIRCRAFT INSTRUMENT SYSTEM ( I )	2					
	USARA 4P2	COMMUNICATION/NAVIGATI ON SYSTEM	2					
	USARA 4P3	POWER DISTRIBUTION & PROPULSION	2					
			20					

Evaluation scheme					
Theory		Internal Marks	Semester end examination marks	Total Marks	Duration of examination
USARA 401		25	75	100	2.5 HOURS
USARA 402		25	75	100	2.5 HOURS
USARA 403		25	75	100	2.5 HOURS
USARA 404		25	75	100	2.5 HOURS
USARA 405		25	75	100	2.5 HOURS
USARA 4P1		-	50	50	2.5 HOURS
USARA 4P2		-	50	50	2.5 HOURS
USARA 4P3	Unit 1	-	50	100	2.5 HOURS
USAKA 4P3	Unit 2	- -	50	100	2.5 HOURS
		•		700	

# ${\sf SEMESTER\,IV}\;(\underline{\sf Avionics})\;{\sf THOERY}$

Course Code	SUBJECT SEMESTER IV (Avionics)Theory	Credits
USARA 401	AIRCRAFT INSTRUMENT SYSTEM (I)	Credits 3 Lectures 70
Classification systems; Pin Airspeed in data comput Instrument pauges; Ten Gyroscopic gyros; Groun Recording system warning system panels; Stall Vibration m	oneumatic systems; Direct reading pressure and temperature apperature indicating systems; Fuel quantity indicating systems; principles; Artificial horizons; Slip indicators; Directional and Proximity Warning Systems; Compass systems; Flight Data ystems; Electronic Flight Instrument Systems; Instrument tems including master warning systems and centralised warning warning systems and angle of attack indicating systems; easurement and indication.	25 Lectures
associated E ACARS-AR ECAM-Electr EFIS-Electr	Ingement of typical electronic/digital aircraft systems and BITE (Built In Test Equipment) testing such as:  RINC Communication and Addressing and Reporting System etronic Centralized Aircraft Monitoring onic Flight Instrument System ine Indication and Crew Alerting System	25 Lectures
Unit III - A Fundamenta and curren operation: Augmentatic interface; A and categori	UTOPILOT: als of automatic flight control including working principles t terminology; Command signal processing; Modes of roll, pitch and yaw channels; Yaw dampers; Stability on Automatic trim control; Autopilot navigation aids auto throttle systems. Automatic Landing Systems: principles les, modes of operation, approach, glideslope, land, go around, itors and failure conditions	20 Lectures
Reference B 1) Mechanic	ook :- es of Flight AC Kermode	

- 2) Automatic Flight control by Pallett3) Aviation Maint Technician Hand Book-General -15A FAA

Course Code	SUBJECT SEMESTER IV (Avionics) Theory	Credits
USARA 402	ENGINE & SYSTEM	Credits 3 Lectures 70
Operating p Piston displ order. Engine Cor Accessory g and exhaust Carburetors heating.	NGINE – tals Mechanical, thermal and volumetric efficiencies; rinciples — 2 stroke, 4 stroke, Otto and Diesel; acement and compression ratio; Engine configuration and firing instruction Crank case, crank shaft, cam shafts, sumps; gearbox; Cylinder and piston assemblies; Connecting rods, inlet manifolds; Valve mechanisms; Propeller reduction gear boxes. Types, construction and principles of operation Icing and on systems Types, construction and principles of operation.	25 Lectures
JET ENGIN Fundamenta Brayton cyc velocity, acc Construction shaft, turbon features and Operation: Methods of variable stat Combustio Turbine Se types; Blad turbine blad Exhaust Con divergent ar Engine nois	als Potential energy, kinetic energy, Newton's laws of motion, ele; The relationship between force, work, power, energy, celeration; and arrangement and operation of turbojet, turbofan, turbo prop Compressors Axial and centrifugal types; Constructional deperating principles and applications; Fan balancing; Causes and effects of compressor stall and surge; air flow control: bleed valves, variable inlet guide vanes, tor vanes, rotating stator blades; Compressor ratio.  In Section Constructional features and principles of operation.  In Section Operation and characteristics of different turbine blade et o disk attachment; Nozzle guide vanes; Causes and effects of the stress and creep.  Instructional features and principles of operation; Convergent, and variable area nozzles; the reduction	25 Lectures
Systems lay operation;	STON & JET ENGINE /-out and components. Constructional features and principles of us engine control and fuel metering systems	20 Lectures

Starting systems, -- Starting and Ignition Systems Operation of engine control and fuel metering systems including electronic engine control (FADEC);

Fire Protection Systems , Engine Indication Systems Auxiliary Power Units (APUs) -- Purpose, operation, protective systems.

### Reference Book :-

- 1) Aircraft Piston Engines -- Herschel Smith
- 2) Aircraft power plant -12A --- Kroes and Wild
- 3) The Jet Engine' by ROLLS ROYCE
- 4) Aircraft Gas Turbine Technology by IRWINE TREAGER

Course Code	SUBJECT SEMESTER III (Avionics) Theory	Credits
USARA 403	COMMUNICATION/NAVIGATION SYSTEM	Credits 3 Lectures 70
Fundamenta communicat Working pri Very High F High Freque	als of radio wave:  Is of radio wave propagation, antennas, transmission lines, ion, receiver and transmitter; nciples of following systems: frequency (VHF) communication; ncy (HF) communication; Audio; Locator Transmitters; Cockpit Voice Recorder;	25 Lectures
Automatic D Microwave I Flight Direct Very Low Fr		25 Lectures
Unit III: Nav Flight Manag Global Position Inertial Navig Air Traffic Con Traffic Alert Weather avoi		20 Lectures
Reference Bo	1 0	

- 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) Theory	Credits
USARA 404	POWER DISTRIBUTION	Credits 3 Lectures 70
Aircraft electrical sy DC electrical	ver Distribution: ctrical power distribution systems, general requirements of power systems, need for protective devices, electrical load, electrical s, a simple electrical system, Main power distribution systems, a eaircraft, twin engine aircraft, power distribution on composite ge aircraft electrical systems, The split –bus system, parallel systems split parallel system, all systems, power distribution hierarchy, Control of power systems, current trans-formers	25 Lectures
Maintenance systems, general lighting circular appropriate and aircraft light lights, warralighting circular appropriate appropriate appropriate and aircraft light equipment's Maintenance inspection so the propriate appropriate approp	esign and maintenance: e of aircraft electrical systems, requirements for electrical neral requirements, requirements for transport aircraft, typical iagrams, Identification systems for locating electrical components its, position lights, anti- collusion lights, landing lights, instrument ing lights, landing gear circuits, large aircraft electrical systems, the systems landing gear control circuits, built in test is electronic control units equipment cooling, static dischargers. e and troubleshooting of electrical system, general requirements, chedule, Multi meter trouble shooting, volt meter troubleshooting and composite aircraft, ohmmeter trouble shooting, trouble th built in test equipment, centralized fault display system, electro arge sensitive equipment's System.	25 Lectures
Unit III – A Batteries Ingeneration;	Aircraft Electrical Power  stallation and Operation; DC power generation; AC power  Emergency power generation; Voltage regulation; Inverters, s, rectifiers; Circuit protection; External/Ground power.	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 IV (Avionics) Theory	Credits
USARA 405	PROPULSION	Credits 2 Lectures 50
turboshaft and t	ne Engines: arrangement and operation of turbojet, turbofan, urbo propeller engines; ne control and fuel metering systems (FADEC).	20 Lectures
Exhaust gas tem Engine speed; I turbine discharg and temperature	e Indicating Systems: aperature/ Interstage turbine temperature systems; Engine Thrust Indication: Engine Pressure Ratio, engine are pressure or jet pipe pressure systems; Oil pressure are; Fuel pressure, temperature and flow; Manifold are torque; Propeller speed.	15 Lectures
Operation of englishing Ignition systems Maintenance sat Reference Book	ing and Ignition Systems: gine start systems and components; and components; fety requirements < :- urbine engine by Treager	15 Lectures

- 2) Gas turbine engine by -- Otis

Course Code	SUBJECT SEMESTER IV (Avionics) Practicals	Credits
USARA 4P1	AIRCRAFT INSTRUMENT SYSTEM(I)	Credits 2 Lectures 50
following I 1) Disasse 2) Disasse Indicator 3) Disasse Indicator 4) Disasse Gauge 5) Calibrat 6) Showin 7) Operation control 8) Tracing schematic 12) Inspect 13) Famili 14) Positic 15) Famili 16) Positic	Students will have to perform minimum 15 practicals from ist of Practicals embly, cleaning, inspection and assembly of VSI embly, cleaning, inspection and assembly of Gyro Horizon embly, cleaning, inspection and assembly of Turn & Bank embly, cleaning, inspection and assembly of Hydraulic Pressure ion of Air Speed Indicator gethe nature of airflow with the help of venturi tube on of primary control surfaces by the movement of pilot's of pitot and static system pipelines and preparing a detailed ediagram ion of cabling & wiring and system handling in a/c arization of aircraft autopilot basic functioning onal familiarization of AFCS inputs arization with location and operation of AFCS computers arization of AFCS control panel	50 lectures

Course Code	SUBJECT SEMESTER IV (Avionics) Practicals	Credits
USARA 4P2	COMMUNICATION/NAVIGATION SYSTEM	Credits 2 Lectures 50
following li 1) Study o 2) Study tl 3) Observe 4) Study o 5) Familia 6) Study o 7) Study o 8) Navigat 9) Operati	tudents will have to perform minimum 8 practicals from st of Practicals  f transistor amplifiers and its gain characteristics he working of phase shift oscillator and observe waveform the the working of Modulation / Demodulation circuit f VHF system components and its test procedure rization of transmission lines, antenna, inspection requirements f ELT working, its precaution and inspection f VOR system components and its test procedures ion system location and controls familiarization onal check of ELT system – Inspection and precautions ation system location and controls familiarization	50 lectures

Course Code	SEMESTER IV SUBJECT (Avionics) Practicals	Credits
USARA 4P3	POWER DISTRIBUTION & PROPULSION	Credits 2 Lectures 50
following Unit II m Unit I (Students list of Pr 1) To stu 2) Troub	Students will have to perform minimum 14 practicals from a list of Practicals: {From Unit I minimum 6 Practical's & from inimum 6 Practicals}  POWER DISTRIBUTION  Swill have to perform minimum 6 practicals from following acticals)  dy the working of current transformer.  leshooting with voltmeter.	30
<ul><li>4) Contin</li><li>5) Famili</li><li>6) To stu</li><li>7) Show</li><li>8) Show</li><li>9) Famili</li></ul>	nuity check (testing) of component with the help of ohmmeter darization with basic power distribution system dy the operation and maintenance of output voltage of generator the working of Single phase transformer rectifier unit the working of 3 phase transformer rectifier unit.  The arization with single engine power distribution system PROPULSION	lectures
(Students list of Prof. 1) Identif 2) Intake 3) Types 4) Types 5) Types 6) Types 7) Fuel s	s will have to perform minimum 6 practicals from following	20 lectures

# UNIVERSITY OF MUMBAI

SYLLABUS (Revised) for the T.Y. B.Sc.

Program: B.Sc.(Aeronautics)

(Avionics)

(Choice Based and Credit System with effect from the academic year 2020-2021)

	Evaluation scheme						
Seme ster	Course Code	Course Title	Cred its	Lect ure one hour durat ion	Practica 1 code	Cred its	Lect ure one hour durat ion
V	USARA 501	AIRFRAME SYSTEM ( I )	3	70	USARA 5P1	2	50
	USARA 502	LANDING GEAR , WHEELS & BRAKES	3	70	USARA 5P2	2	50
	USARA 503	AIRFRAME SYSTEM ( II )	3	70	USARA 5P3	2	50
	USARA 504	DIGITAL TECHNIQUES II	3	70			
	USARA 505	AIRCRAFT FUEL AND FUEL SYSTEM	2	50			
	USARA 5P1	AIRFRAME SYSTEM (I) & AIRFRAME SYSTEM (II)	2				
	USARA 5P2	LANDING GEAR , WHEELS & BRAKES	2				
	USARA 5P3	DIGITAL TECHNIQUES II	2				
			~~				

		Evaluation scheme			
			Semester		
Theory	7	Internal Marks	end	Total	Duration of
Theory	/	internal warks	examination	Marks	examination
			marks		
USARA 501		25	75	100	2.5 HOURS
USARA 502		25	75	100	2.5 HOURS
USARA 503		25	75	100	2.5 HOURS
USARA 504		25	75	100	2.5 HOURS
USARA 505		25	75	100	2.5 HOURS
USARA 5P1	Unit 1	-	50	100	2.5 HOURS
USAKA 3P1	Unit 2	-	50	100	2.5 HOURS
USARA 5P2		-	50	50	2.5 HOURS
USARA 5P3		-	50	50	2.5 HOURS
				700	

Course Code	SUBJECT SEMESTER V (Avionics) Theory	Credits
USARA 501	AIRFRAME SYSTEM(I)	Credits 3 Lectures 70
		Lectures 70
System lay- Pressure ger generation;	DRAULIC POWER out; Hydraulic fluids; Hydraulic reservoirs and accumulators; neration: electric, mechanical, pneumatic; Emergency pressure Pressure Control; Power distribution; Indication and warning erface with other systems. Filters.	30 Lectures
System lay-	eumatic/Vacuum Systems: out; Sources: engine/APU, compressors, reservoirs, ground sure control; Distribution; Indications and warnings; Interfaces ystems.	20 Lectures
Oxygen systems; low Installation	Oxygen System: tem: Purpose of the system; Safety portable & fixed Oxygen ov pressure and high pressure oxygen system & components; and replacement of Oxygen lines. General familiarization with femergency equipment on modern aircraft	20 Lectures
Reference B 1) Aviation	ook :- Maint Technician Hand Book-Airframe -15A FAA	

2) A & P Technician Air Frame Text Book ---- Jeppesen

3) Civil Aircraft Inspection Procedure (CAP 459)---( CAIP II )

Subject code	SUBJECT SEMESTER V ( <u>Avionics</u> ) Theory	Credits
USARA 502	LANDING GEAR , WHEELS& BRAKES	Credits 3 Lectures 70
extension as	deneral —  ar arrangement, shock strut, electrical and hydraulic landing gear and retraction, emergency extension system, nose wheel centering a nose wheel steering, shimmy dampers.	25 Lectures
Unit II – Wheels and tyres 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.		25 Lectures
brake syste brakes, mu	Brakes  t brake system, power operated brake system, power boosted  m, power brake control valve, nose wheel brakes, single disc  lti disc brakes, segmented rotor brakes, expander tube brake  bection and maintenance of brakes, bleeding of brake.	20 Lectures

# Reference Book:-

- 1) Aviation Maint Technician Hand Book-Airframe -15A --- FAA
- 2) A & P Technician Air Frame Text Book ---- Jeppesen
- 3) Civil Aircraft Inspection Procedure (CAP 459)---( CAIP II )

Course Code	SUBJECT SEMESTER V ( <u>Avionics</u> ) Theory	Credits
USARA 503	AIRFRAME SYSTEM (II)	Credits 3 Lectures 70
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.		25 Lectures
Atmospher Requirement controls; Sa Humidificat Precautions altitudes; ca controllers;	Pressurization e; Description of a cabin pressure system; Structural ints for pressure cabins; Cabin pressure and rate of change afety; Discharge and Relief Valves; Recirculation systems; ation. It to be observed on ground tests; Understanding the pressure abin altitude; Differential pressure; Operations of pressure Outflow valve; Safety Valve; Cabin rate of climb indicator; assure control valve; Negative pressure relief valve; Fault	25 Lectures
Air cycle r component	Air Conditioning machines and vapour cycle air conditioning systems. Systems s & their functions n systems; Flow, temperature and humidity control system.	20 Lectures
2) A & P T	Book:- Maint Technician Hand Book-Airframe -15A FAA Cechnician Air Frame Text Book Jeppesen Ceraft Inspection Procedure (CAP 459)( CAIP II )	

Course Code	SUBJECT SEMESTER V (Avionics) Theory	Credits
USARA 504	DIGITAL TECHNIQUESII	Credits 3 Lectures 70
Advantages electrical wi Termination of fibre opti of displays	and disadvantages of fibre optic data transmission over tre propagation; Fibre optic data bus; Fibre optic related terms; as; Couplers, control terminals, remote terminals; Application cs in aircraft systems Principles of operation of common types used in modern aircraft, including Cathode Ray Tubes, Light odes and Liquid Crystal Display.	25 Lectures
Awareness	ftware Management Control: of restrictions, airworthiness requirements and possible effects of unapproved changes to software programmes.	20 Lectures
Special har Awareness antistatic pr maintenance Compatibili	Electrostatic Sensitive Devices: adling of components sensitive to electrostatic discharges; of risks and possible damage, component and personnel rotection devices, Influence of the following phenomena on e practices for electronic system: EMC-Electromagnetic ty EMI-Electromagnetic Interference HIRF-High Intensity eld Lightning/lightning protection	25 Lectures

Reference Book:
1) Digital Principles and Applications by DONALD P. LEACH, ALBERTPAUL ALVINO, GOUTAM SAHA

Course Code	SUBJECT SEMESTER V (Avionics) Theory	Credits
USARA 505	AIRCRAFT FUEL AND FUEL SYSTEM	Credits 2 Lectures 50
Aromatic I Octane and Types of A Turbine En	Aviation Fuel. Volatility, Vapor Lock. Carburetor Icing. Fuels, Detonation, Surface Ignition and Preignition, d Performance Number Rating, Fuel Identification Purity Aviation Fuel Reciprocating Engine Fuel—AVGAS Ingine Fuels Basic Fuel System Requirements, Fuel System Ince, Fuel System Lightning Protection.	15 Lectures
Fuel Syste b) Fuel Ta Expansion Tank Vent c) Fuel Sy Filter, Fue d) Fuel Sy	ow, Flow Between Interconnected Tanks Unusable Fuel Supply m Hot Weather Operation.  anks. Fuel Tank Tests. Fuel Tank Installation, Fuel Tank Space. Fuel Tank Sump, Fuel Tank Filler Connection. Fuel as and Carburetor Vapor Vents, Fuel Tank Outlet stem Components. Fuel Valves and Controls, Fuel Strainer or 1 System Drains.  Stem lay-out; Fuel tanks; Supply systems; Fuel Pumps Fuel mes and Fittings	20 Lectures
Gravity Fe Injection S Large Rec Jet Transp	Fuel Systems Small Single-Engine Aircraft Fuel Systems.  Seed Systems, Pump Feed Systems, High-Wing Aircraft With Fuel System Small Multiengine (Reciprocating) Aircraft Fuel Systems.  Siprocating-Engine Aircraft Fuel Systems  Ort Aircraft Fuel Systems Refueling Pressure Fueling Systems ing; Longitudinal balance fuel systems.	15 Lectures

Dumping, venting and draining; Cross-feed and transfer; Fuel Indications and warnings;	
Reference Book:- 1) Aviation Maint Technician Hand Book-Airframe -15A FAA 2) A & P Technician Air Frame Text Book Jeppesen 3) Civil Aircraft Inspection Procedure (CAP 459) (CAIP II)	

Course Code	SUBJECT SEMESTER V (Avionics) Practicals	Credits		
USARA 5P1	AIRFRAME SYSTEM (I) & AIRFRAME SYSTEM (II)	Credits 2 Lectures 50		
following l II minimun UNIT 1	tudents will have to perform minimum 20 practicals from ist of Practicals:{From Unit I minimum 8 Practicals & from Unit n 8 Practicals}  AIRFRAME SYSTEM(I)  will have to perform minimum 8 practicals from following eticals)			
<ol> <li>Servicing of hydraulic reservoir</li> <li>Operation of Hydraulic shut off valve</li> <li>Charging of hydraulic accumulator</li> <li>Discharging of hydraulic accumulator</li> <li>Check for hydraulic leak</li> <li>Charging &amp; Discharging of hydraulic accumulator</li> <li>Operational check of hydraulic system</li> <li>Carryout snag analysis and rectification of Hydraulic system</li> <li>Pressure controller servicing</li> <li>Carryout snag analysis and rectification for pneumatic system</li> <li>Servicing of oxygen system</li> <li>Carryout snag analysis and rectification for oxygen system</li> <li>Leak testing of gaseous oxygen system</li> </ol>				
(Students) list of Pract 1) Check of 2) Operation 3) Fire ext 4) carry out	AIRFRAME SYSTEM (II)  will have to perform minimum 8 practicals from following eticals)  operation of fire / smoke detection and warning system.  onal check of temperature indicating system inguishing systems System tests.  It leak check of vapour cycle system  It purging of vapour cycle system	25 lectures		

- 6) carry out leak check of aircraft Pressurisation system
- 7) Find the location of different Pressurisation system components
- 8) carry out troubleshooting of pressurization system
- 9) Carry out snag analysis and rectification of Cabin pressure low
- 10) Carry out snag analysis and rectification of Cabin temperature high
- 11) Locate and identify the following:
  - a. Safety valve
  - b. Discharge valve

Relief Valve

Course Code	SUBJECT SEMESTER V (Avionics) Practicals	Credits		
USARA 5P2	A LANDING GEAR , WHEELS & BRAKES			
NOTE Students will have to perform minimum 8 practicals from following list of Practicals)				
1) Locate a	and identify various parts of aircraft landing gear			
2) Servicin	g of main gear shock strut			
3) Servicin	g of main gear shock strut (Alternate Method)			
4) Nose W	heel Removal / Installation			
5) Landing	Gear Lubrication (MLG and NLG)			
6) Servicing of Anti-skid system check				
7) Servicin	g hydraulic accumulator			
8) Servicin	g of hydraulic reservoir	50		
9) Inspecti	on of emergency air bottle	lectures		
10) Carryo	ut greasing of various parts of aircraft landing gear			
11) Identify the information given on tire				
12) Inspection of brake system.				
13) Landing gear wheel change on aircraft				
14) Identify the information given on tire				
15) Servicing of oleo pneumatic shock strut				
16) Antiskid system and its component location				
17) Replace	e the tires on the aircraft wheel.			
18) Carryo	ut analysis and rectification of Landing Gear warning light ON			

Course Code	SUBJECT SEMESTER V (Avionics) Practicals	Credits
USARA 5P3	DIGITAL TECHNIQUES	Credits 2 Lectures 50
following li 1) Study of 2) Study of 3) Study of 4) Pamphle 5) Article I 6) Compara 7) Compara Differen 8) Usage of procedur 9) Trapping propertie 10) Class cr	Students will have to perform minimum 8 practicals from st of Practicals) microprocessor 8085.  ARINC 429/629 BUS. Fiber optic cable. t Design in MS-WORD 2007 D	50 lectures

Evaluation scheme								
Semester	Course Code	Course Title	Credits	Lecture one hour duration	Practical code	Credi ts	Lect ure one hour durat ion	
VI	USARA 601	AIRCRAFT ELECTRICITY & INSTRUMENT SNAG ANALYSIS & RECTIFICATION	3	70	USARA 6P1	2	50	
	USARA 602	AIRCRAFT RADIO NAVIGATION SNAG ANALYSIS & RECTIFICATION	3	70	USARA 6P2	2	50	
	USARA 603	ENGINE IGNITION SYSTEM: JET ENGINE AND PISTON ENGINE	3	70	USARA 6P3	2	50	
	USARA 604	GROUND HANDLING & DOCUMENTION	3	70	USARA 6P4	2	60	PROJECT
	USARA 6P1	AIRCRAFT ELECTRICIT/ INSTRUMENT SNAG ANALYSIS & RECTIFICATION	2					
	USARA 6P2	RADIO NAVIGATION SNAG ANALYSIS & RECTIFICATION	2					
	USARA 6P3	GROUND HANDLING & DOCUMEN	2					

	USARA 6P4	INNOVATIVE PROJECT ON ELECTRICAL SYSTEM OR INSTRIUMENT SYSTEM OR RADIO NAVIGATION SYSTEM	2	Project evaluation as per guide lines attached
SSSSSSS			20	

Evaluation scheme								
Theory		Internal Marks	Semester end examination marks	Total Marks	Duration of examination			
USARA 601		25	75	100	2.5 HOURS			
USARA 602		25	75	100	2.5 HOURS			
USARA 603		25	75	100	2.5 HOURS			
USARA 604		25	75	100	2.5 HOURS			
USARA 6P1	Unit 1	-	50	100	2.5 HOURS			
USAKA OP I	Unit 2	-	50		2.5 HOURS			
USARA 6P2		-	50	50	2.5 HOURS			
USARA 6P3		-	50	50	2.5 HOURS			
USARA 6P4			100	100	2.5 HOURS	Project evaluation as per guide lines attached		
· ·	·		·	700	The state of the s	·		

Course Code	SUBJECT SEMESTER VI (Avionics) Theory	Credits		
USARA 601	AIRCRAFT ELECTRICITY & INSTRUMENT SNAG ANALYSIS & RECTIFICATION			
RECTIFI The Snags 1 to Semes finding and Batteries I AC power Power dist	AIRCRAFT ELECTRICITY ANALYSIS & CATION in the aircraft systems pertaining to syllabus covered in Semester ster 5 for Aircraft Electrical systems. The snag analysis, reason directification required. Installation and Operation; DC power generation; generation; Emergency power generation; Voltage regulation; ribution; Inverters, transformers, rectifiers; Circuit protection. Fround power;	25 lectures		
The snags Semester	AIRCRAFT INSTRUMENT SNAG ANALYSIS & RECTIFICATION in the aircraft systems pertaining to syllabus Covered in to Semester 5 for Aircraft Instrument systems. The snag eason finding and rectification required.	25 lectures		
Unit III — The snags in the aircraft Systems pertaining to syllabus covered in Semester 1 to Semester 5 for Aircraft system Flight Control Surfaces 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; Other aircraft system indication				

Reference Book
1) --- Aircraft Instruments and Integrated System E.H.J. Pallett
2)FAA H- 8083-31 Aviation Maint. Technician Handbook-Airframe

Course Code	SUBJECT SEMESTER VI (Avionics) Theory	Credits			
USARA 602					
UNIT I: RAD	UNIT I: RADIO NAVIGATION SNAG ANALYSIS & RECTIFICATION				
The snags in the aircraft systems pertaining to syllabus covered in Semester 1 to Semester 5 for Aircraft Radio communication systems  Communications Navigation Systems  Fire and smoke detection and warning systems;  Primary controls: aileron, elevator, rudder, spoiler;  Trim control; Active load control;  High lift devices; Lift dump, speed brakes;  System operation  The snag analysis, reason finding and rectification required.		25 Lectures			
Unit II – The snags in the aircraft systems pertaining to syllabus covered in Semester 1 to Semester 5 for Aircraft systems The snag analysis and rectification. Stall protection/warning system. Pressure Control; Power distribution; Indication and warning systems; Interface with other systems. Ice formation, classification and detection;		25 Lectures			
	Auto Flight warning devices	20 Lectures			
Reference B	ook :-				

- 1) FAA H- 8083-31 Aviation Maint. Technician Handbook-Airframe
  2) Aircraft Instruments and Integrated System E.H.J. Pallet

Course Code	SUBJECT SEMESTER VI (Avionics) Theory	Credits		
USARA 603	ENGINE IGNITION SYSTEM : JET ENGINE AND PISTON ENGINE.			
Unit I: Jet engine ignition systems  Main ignition systems, Continuous duty circuit, Auto ignition, precautions to be observed while handling ignition system, Joule ratings, Intermittent duty low tension ignition system with low DC voltage input.		20 Lectures		
High tens system, H	Jet engine ignition systems ion intermittent duty AC ignition system, AC versus DC input ligh tension ignition system, Igniter plugs, maintenance of igniter puble shooting of ignition system.	20 Lectures		
Unit III: Piston engine ignition systems  Types of ignition systems, Extended duty low tension ignition system, High tension ignition system, spark igniters, Glow plug igniters, maintenance of spark plugs, Trouble shooting of ignition system—		30 lectures		

### Reference Book:-

- Aircraft Gas Turbine Power Plants by C.E. Otis & Peter A. Vosbury
   Aircraft Gas Turbine Engine Technology by Irwin E. Treager

Course Code	SUBJECT SEMESTER VI (Avionics) Theory	Credits
USARA 604	GROUND HANDLING & DOCUMENTION	Credits 3 Lectures 70
Unit I – Need of ground handling tasks during the normal day to day operation of an aircraft & Necessary safety precautions. Different Terms used in Ground handling and Aviation. Aircraft Weight and Balance-Centre of Gravity/Balance limits calculation, use of relevant documents ,Preparation of aircraft for weighing, Aircraft weighing,		25 lectures
<ul> <li>2) Aircraft</li> <li>3) Various</li> <li>4) Aircraft</li> <li>5) Identify</li> <li>6) Aircraft</li> <li>7) Aircraft</li> <li>8) Servicin</li> <li>9) What is</li> </ul>	support and safety equipment taxiing / Towing and associated safety precautions, marshalling & Taxing Signals. parking procedure ing different Aircraft fuel & Refueling /defueling procedures, jacking, securing and associated safety precautions, Handling & storage methods, ag of Aircraft oxygen system Hot Start, Hung Start, Fail or no start? e starting precautions (jet & piston Engines)	25 Lectures
1) Airca 2) Airca 3) Air s 4) Grou 5) Eleca	and Maintenance of different Ground Equipment raft Tow bars raft jacks tarter unit and Hydraulic power unit trical Ground power unit ger Facility	20 Lectures
2) A & P T	Book:- Maint Technician Hand Book- General -9A FAA Technician Air Frame Text Book Jeppesen Tecraft Inspection Procedure (CAP 459)( CAIP II )	

Course Code	SUBJECT SEMESTER VI (Avionics) Practicals	Credits
USARA 6P1	AIRCRAFT ELECTRICIT/INSTRUMENT SNAG ANALYSIS& RECTIFICATION	Credits 2 Lectures 50
following I Unit II min UNIT – I – (Students) Iist of Prac 1. Starter g 2. Remova 3. Battery 4. Remova 5. Remova 6. Remova 7. Remova 8. Checkin servicea	Students will have to perform minimum 15 practicals from ist of Practicals: {From Unit I minimum 6 Practical's & from imum 6 Practicals}  ELECTRICIT SNAG ANALYSIS will have to perform minimum 6 practicals from following eticals) generator removal/installation. al and installation of static discharger wick removal and installation on aircraft. al and installation of voltage regulator al, inspection and installation of anti-collision lights. al and installation of navigation light and strobe light and installation and functional check of landing light g of electrolyte level and specific gravity of lead acid battery ability check of battery.  The analysis of the practicals from following in the practicals from following exicals	25 Lectures
(Students) list of Pract 1. To analy 2. To analy rectificat 3. To find 4. To analy 5. To analy 6. To analy rectificat 7. To analy 8. To analy	yze Pitot static system related snag and rectification Leak test yze Capacitance type Fuel quantity system related snag and its ation stall warning system related snag and its rectification yze the EGT System snags and how to rectify it yze the N1 & N2 rpm related system snags and how to rectify it yze the snag related to fuel flow system related and its	25 Lectures

Course Code	SUBJECT SEMESTER VI (Avionics) PRACTICALS	Credits
USARA 6P2	RADIO NAVIGATION SNAG ANALYSIS & RECTIFICATION	Credits 2 Lectures 50
1. Function 2. Procedur 3. Operation 4. Operation 5. Operation 6. Operation 7. Operation 8. Snag rect 9. Rectificat 10. Operation 11. Testing	tudents will have to perform minimum 10 practicals from st of Practicals  al check of ADF system of aircraft.  e for testing emergency locator beacon nal check of ILS (instrument landing system) n test of ATC( aircraft Traffic control system) nal check of DME (Distance Measuring Equipment) system. n check of radio altimeter. nal check of VHF (Very High Frequency Omni range) system. tification: - Jamming of VHF channel. tion of snag: - Audio low, intermittent,. onal check of GPWS of W/R system of ESDS requirements and precaution during ground handling	50 Lectures

Course Code	SUBJECT SEMESTER VI (Avionics) PRACTICALS	Credits
USARA 6P3	GROUND HANDLING & DOCUMEN	Credits 2 Lectures 50
following I 1. Carry of 2. Carry of 3. Carry of 4. Use Pro 5. Carry of 6. Carry of 7. Carry of 8. Familian 9. Testing, 10.Inspecti 11.Inspecti 12.Inspecti 13.Prepara 14.Procedu 15.Procedu	tudents will have to perform minimum 14 practicals from ist of Practical's ut weight and balance of aircraft at taxing and towing of aircraft at jacking up and lowering of aircraft per procedure for parking of aircraft at defueling of aircraft at defueling of aircraft at Procedure for lashing and mooring of aircraft at Procedure for lashing and mooring of aircraft cleaning, inspection & lubrication of bearings on of gears, including backlash check on of belts & pulleys, chains & sprockets on of screw jacks, lever devices, push-pull rod systems. At the procedure of aircraft taxiing/towing and associated safety precautions are for aircraft jacking and associated safety precautions.  De-icing/anti-icing procedures.	50 lectures

Course Code	SUBJECT Semester VI (Avionics) Project	Credits
USARA 6P4	INNOVATIVE PROJECT ON ELECTRICAL SYSTEM OR INSTRIUMENT SYSTEM OR RADIO NAVIGATION SYSTEM (100 Marks)	2
Skill Enhancement Project course are included in third year at 6th Semester in which students can independently think and carry out the project work.		60 HOURS

Project Examination: There will be separate examination for Project

Implementation: (100Marks)

# Project Evaluation Scheme:

Presentation	Working of the Project	Quality of The Project	Viva	Documentation
20Marks	40 Marks	10 Marks	10 Marks	20Marks

(Certified Project Document is compulsory for appearing at the time of Project Presentation)

## Project Implementation Guidelines

# I. OBJECTIVES

Develop of the ability to assess the implications of work performed.
☐ Deve Problem definition.
☐ Evaluate project requirements.
☐ Method of collecting information to determine requirements.
Perform and evaluate feasibility studies like cost-benefit analysis, technical
feasibility, time feasibility and Operational feasibility for the project.
Schedule projects using both GANTT and PERT charts.
☐ To decide the future scope and further enhancement of the system.
Generate various reports.

Work effectively as an individual or as a team member to produce correct,
efficient, well-organized and documented programs in a reasonable time.
op of the ability to communicate effectively.

### II. Type of the Project

The majority of the students are expected to work on a real-life project preferably in some industry/ Research and Development Laboratories/Educational Institution/Airline Company. Students are encouraged to work in the areas of undergraduate program. However, it is *not mandatory* for a student to work on a real-life project. The student can formulate a project problem with the help of her/his Guide and submit the project proposal of the same. Approval of the project proposal is mandatory. If approved, the student can commence working on it, and complete it.

#### 1.1 PROJECT REPORT:

Title Page

Copy of the Approved Performa of the Project Proposal

Certificate of Authenticated work

**Abstract** 

Acknowledgement

**Table of Contents** 

Table of Figures

#### CHAPTER 1: INTRODUCTION

- 1.1 Background
- 1.2 Rational / Objectives
- 1.3 Purpose, Scope, and Applicability
- 1.4 Achievements
- 1.5 Organisation of Report

#### CHAPTER 2: SURVEY OF TECHNOLOGIES

Chapter 3. Machine framework or architecture

Chapter 4. Airframe / Engine Design

CHAPTER 5: Final design, IMPLEMENTATION AND TESTING

**CHAPTER 6: RESULTS AND DISCUSSION** 

6.1 Test Reports

6.2 User Documentation

**CHAPTER 7: CONCLUSIONS** 

7.1 Conclusion

7.1.1 Significance of the System

- 7.2 Limitations of the System
- 7.3 Future Scope of the Project

#### **REFERENCES**

#### PROFORMA FOR THE APPROVAL PROJECT PROPOSAL

\_\_\_\_\_\_

(All the text in the report should be in times new roman)

### TITLE OF THE PROJE ${ m CT}$

(NOT EXCEEDING 2 LINES, 24 BOLD, ALL CAPS)
A **Project Report (12 Bold)**Submitted in partial fulfillment of the
Requirements for the award of the Degree of (size-12)

BACHELOR OF SCIENCE (Aeronautical -Mechanical) (14 BOLD, CAPS)
By(12 Bold) Name of The Student (size-15, title case) Seat Number (size-15)

Under the esteemed guidance of (13 bold) Mr./Mrs. Name of The Guide (15 bold, title case) Designation (14 Bold, title case)

COLLEGE LOGO
DEPARTMENT OF Aeronautics(12 BOLD, CAPS)
COLLEGE NAME (14 BOLD, CAPS)
(Affiliated to University of Mumbai) (12, Title case, bold, italic)
YEAR 2023

COLLEGE NAME (14 BOLD, CAPS)
(Affiliated to University of Mumbai) (13, bold, italic)
CITY-MAHARASHTRA-PINCODE(13 bold, CAPS)
DEPARTMENT OF AERONAUTICS (14 BOLD, CAPS)

College Logo

CERTIFICATE (14 BOLD, CAPS, underlined, centered)

This is to certify that the project entitled, "Title of The Project", is bonafied work of NAME OF THE STUDENT bearing Seat. No: (NUMBER) Semester VI AY 2022-2023 submitted in partial fulfillment of the requirements for the award of degree of BACHELOR OF SCIENCE in AERONAUTICS-MECHANICAL from University of Mumbai. (12, times new roman, justified)

Internal Guide (12 bold)

External Examiner
Name and signature
Date: College Seal

\_\_\_\_\_\_

### COMPANY CERTIFICATE (if applicable)

ACKNOWLEDGEMENT (20, BOLD, ALL CAPS, CENTERED)

The acknowledgement should be in times new roman, 12 font with 1.5 line spacing, justified.

## DECLARATION (20 bold, centered, allcaps)

Content (12, justified)

I here by declare that the project entitled, "Title of the Project" done at (place where the project is done), has not been in any case duplicated to submit to any other university for the award of any degree. To the best of my knowledge other than me, no one has submitted to any other university.

The project is done in partial fulfillment of the requirements for the award of degree of BACHELOR OF SCIENCE (aeronautics-mechanical) to be submitted as final semester VI project as part of curriculum.

Name and Signature of the student

### References (14 bold)

Content (12, LEFT)

- [1] Title of the book, Author
- [2] Full URL of online references
- [3] -----

### INFRASTRUCTURE REQUIREMENT

NOTE:---- INFRASTRUCTURE REQUIRED FOR B.SC. AERONAUTICS (AVONICS) WILL REMAINS SAME AS EXCISTING