

University of Mumbai



No. AAMS/ (UG)/ 7 of 2022-23
Mumbai-400 032,
28th April, 2022.

To,
I/c. Director,
Garware Institute of Career
Education and Development,
Vidyanagari, Kalina,
Santacruz (E),
Mumbai – 400 098.

Sub :- B.Sc (Aeronautics)

Ref :- RB/MU-2021/CR-366/Edn-5/200, dated 2nd March, 2022

Sir,

I am to invite your attention to Ordinances, Regulations and Syllabus relating to the B.Sc (Aeronautics) to inform you that the recommendation made by the Advisory Committee & Board of Management of Garware Institute of Career Education & Development at its Meeting held on 5th April, 2017 & resolution passed by the Board of Deans at its meeting held on 9th March, 2020 vide item No. 27 have been accepted by the Academic Council at its meeting held on 23rd July, 2020, vide item no. 7.9 and subsequently approved by the Management Council at its meeting held on 9th April, 2021 vide item No. 06 and that in accordance therewith, in exercise of the powers conferred upon the Management Council under Section 74(4) of the Maharashtra Public Universities Act, 2016 (Mah. Act No. VI of 2017) the Ordinance 6749 & 6750 Regulations 9492 & 9493 and the syllabus of B.Sc (Aeronautics) has been introduced and the same have been brought into force with effect from the academic year 2017-18, accordingly. (The same is available on the University's website www.mu.ac.in).

MUMBAI – 400 032
28th April, 2022


(Sudhir S. Puranik)
REGISTRAR

A.C/7.9/23/07/2020
M.C/06/9/4/2021

No. AAMS/ (UG)/ 7 -A of 2022

28th April, 2022

Copy forwarded with: Compliments for information to:-

- 1) The Chairman, Board of Deans
- 2) The Dean, Faculty of Science & Technology,
- 3) The Director, Board of Examinations and Evaluation,
- 4) The Director, Board of Students Development,
- 5) The Director, Department of Information & Communication Technology,
- 6) The Co-Ordinator, MKCL.


(Sudhir S. Puranik)
REGISTRAR

Copy for information and necessary action :-

1. The Deputy Registrar, College Affiliations & Development Department (CAD),
2. College Teachers Approval Unit (CTA),
3. The Deputy Registrar, (Admissions, Enrolment, Eligibility and Migration Department (AEM),
4. The Deputy Registrar, Academic Appointments & Quality Assurance (AAQA)
5. The Deputy Registrar, Research Administration & Promotion Cell (RAPC),
6. The Deputy Registrar, Executive Authorities Section (EA)
He is requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to the above circular.
7. The Deputy Registrar, PRO, Fort, (Publication Section),
8. The Deputy Registrar, Special Cell,
9. The Deputy Registrar, Fort Administration Department (FAD) Record Section,
10. The Deputy Registrar, Vidyanagari Administration Department (VAD),

Copy for information :-

1. The Director, Dept. of Information and Communication Technology (DICT), Vidyanagari,
He is requested to upload the Circular University Website
2. The Director of Department of Student Development (DSD),
3. The Director, Institute of Distance and Open Learning (IDOL Admin),
Vidyanagari,
4. All Deputy Registrar, Examination House,
5. The Deputy Registrars, Finance & Accounts Section,
6. The Assistant Registrar, Administrative sub-Campus Thane,
7. The Assistant Registrar, School of Engg. & Applied Sciences, Kalyan,
8. The Assistant Registrar, Ratnagiri sub-centre, Ratnagiri,
9. P.A to Hon'ble Vice-Chancellor,
10. P.A to Pro-Vice-Chancellor,
11. P.A to Registrar,
12. P.A to All Deans of all Faculties,
13. P.A to Finance & Account Officers, (F & A.O),
14. P.A to Director, Board of Examinations and Evaluation,
15. P.A to Director, Innovation, Incubation and Linkages,
16. P.A to Director, Department of Lifelong Learning and Extension (DLLE),
17. The Receptionist,
18. The Telephone Operator,

Copy with compliments for information to :-

19. The Secretary, MUASA
20. The Secretary, BUCTU.

AC - 23/7/2020
Item No. 7.9

UNIVERSITY OF MUMBAI



**Proposed Syllabus for the
course of**

B.SC. (Aeronautics)

(Credit Based Semester and Grading System
with effect from the academic year 2017-18)

AC - 23/7/2020
Item No.7.9

UNIVERSITY OF MUMBAI'S



Syllabus for Approval

Sr. No.	Heading	Particulars
1	Title of the Course O. 6749	B.SC. (Aeronautics)
2	Eligibility for Admission O.6750	12 th pass in Science(PCM compulsory)Admissions on the basis of merit.
3	Passing Marks R. 9492	50% passing marks
4	Ordinances / Regulations(if any)	
5	No. of Years / Semesters R. 9493	Three years full time/ 6 semester
6	Level	Bachelor
7	Pattern	Semester
8	Status	New
9	Intake Capacity	60 per batch
10	To be implemented from Academic Year	From academic year 2017-18.

Date:

Signature :

I/c. DIRECTOR

Dr. Shivram S. Garje, I/C. Director, Garware Institute of Career Education & Development

Syllabus Details:

	Subject Code	Core Subject	Assessment Pattern			Teaching Hours			Total Credits
		Topics	Internal Marks 60	External Marks 40	Total Marks 100	Theory Hours	Practical Hours	Total Hours	
Semester - 1	1.1	Air law, Airworthiness requirements & Human Factor-I	60	40	100	70	70	140	4
	1.2	Materials and Hardware - I	60	40	100	70	70	140	4
	1.3	Maintenance Practices - I	60	40	100	70	70	140	4
	1.4	Gas turbine engine fundamentals & Helicopter airframe structure	60	40	100	50	50	100	3
	1.5	Basic Aerodynamics	60	40	100	70	70	140	4
	1.6	Practicals	200	-	200	-	-	-	5
		Total	500	200	700	330	330	660	24
	Semester - 2	2.7	Air Law, Airworthiness Requirements & Human Factors II	60	40	100	60	60	120
2.8		Materials And Hardware -II	60	40	100	50	50	100	3
2.9		Maintenance Practices - II	60	40	100	40	40	80	2
2.10		Electrical Fundamentals-I	60	40	100	40	40	80	2
2.11		Piston Engine-I	60	40	100	50	50	100	3
2.12		Aerodynamics- II	60	40	100	40	40	80	2
2.13		Practicals	300	-	300	-	-	-	6
		Total	660	240	900	280	280	560	22
Semester - 3	3.14	Electrical Fundamentals - II	60	40	100	40	40	80	2
	3.15	Digital Techniques & Electronic Instrument System - I	60	40	100	50	50	100	3
	3.16	Piston Engine - II	60	40	100	60	60	120	4
	3.17	Helicopter Systems-I	60	40	100	60	60	120	4
	3.18	Maintenance Practices – III	60	40	100	50	50	100	3
	3.19	Practicals	200	-	200	-	-	-	6
		Total	500	200	700	260	260	520	22

	Subject Code	Core Subject	Assessment Patterns			Teaching Hours			Total Credits
			Internal Marks	External Marks	Total Marks	Theory Hours	Practical Hours	Total Hours	
Semester - 4		Topics	60	40	100				
	4.20	Engineering Drawing	60	40	100	40	40	80	2
	4.21	Digital Techniques & Electronic Instrument System- II	60	40	100	40	40	80	2
	4.22	Gas Turbine Engines - I	60	40	100	50	50	100	3
	4.23	Propellers	60	40	100	50	50	100	3
	4.24	Electronic Fundamentals	60	40	100	50	50	100	3
	4.25	Practicals	200	-	200	-	-	-	6
		Total	500	200	700	230	230	460	19
Semester - 5	5.26	Gas Turbine Engines - II	60	40	100	100	100	200	6
	5.27	Helicopter Systems II	60	40	100	60	60	120	4
	5.28	Aviation Management	60	40	100	50	50	100	3
	5.29	Practicals	100	-	100	-	-	-	4
		Total	280	120	400	210	210	420	17

	Subject Code	Core Subject	Assessment Patterns			Teaching Hours			
			Internal Marks	External Marks	Total Marks	Theory Hours	Practical Hours	Total Hours	
Semester - 6		Topics	60	40	100				
	6.30	Theory Aircraft Structure Systems (Snag Analysis & Rectification) (Mechanical & Avionics)	60	40	100	20	-	20	2
	6.31	Theory Aircraft Practices (Aircraft Engines, Fuel System- Repair, Maintenance, Ground Handling & Documentation)	60	40	100	20	-	20	2
	6.32	Practical Aircraft Structure Systems (Snag Analysis & Rectification) (Mechanical & Avionics)	-	-	100	-	300	300	6
	6.33	Practical Aircraft Practices (Aircraft Engines, Fuel System- Repair, Maintenance, Ground Handling & Documentation)	-	-	100	-	300	300	6
		Total		120	80	400	40	600	640

UNIVERSITY OF MUMBAI
GARWARE INSTITUTE OF CAREER EDUCATION & DEVELOPMENT

SYLLABUS RELATING TO THE
GRADUATION IN AERONAUTICS COURSE (FULL-TIME)

Preamble:

The training course in the field of Aeronautics is designed to give the students a comprehensive knowledge of aircraft maintenance methodology/systems/procedures, its management and human factors to enable the participants to become skilled and competent professionals in aviation field which confirms their commitment to excellence in an ever-changing vibrant industry.

The course will expose the participants to comprehensive and cutting edge knowledge of aviation related topics, business and good maintenance practices to enable them to develop into accomplished and proficient Maintenance/Flying/Ground/Business professional for the advantage of the industry.

Objective:

- To impart adequate knowledge and develop the skill requirements to meet the demands of the Aviation industry.
- To train the students in theory and practical elements to perform in an excellent manner for advancement in career.
- To provide exposure to Air law, Civil aviation rules, Maintenance and Planning requirements, Documentation procedures, Quality systems and their practical application in an DGCA (Govt. of India) approved aircraft operating environment.
- To take up highly specialised technical jobs.
- To Groom the students to take up executive and supervisory roles.

Career Scope:

Airports are being upgraded and there is a major thrust in the aviation sector. With the Indian airports becoming bigger and busier, new jobs are opening up rapidly. With the extremely lucrative nature of these jobs, the prospects for a career in the aviation industry are extremely bright. Moreover, careers in the aviation industry are much sought after as they are very well paid. This is primarily because careers in the aviation industry require a lot of special skills.

- Maintenance & Repair Organizations.
- Aircraft servicing industry
- Airline management.
- Airport management
- Aircraft Technical support
- Flight attending
- Ground training
- Technical documentation support
- Ground support
- Logistics/spare parts
- Customer relation

SUBJECT-WISE SYLLABUS

Subject Code	Semester I	Total Hours	Session Hours
1.1	<p><u>Air law, Airworthiness requirements & Human Factor-I</u> Introduction, History of Aviation, Aviation in India, Air Corporations, International Convention Procedures of Govt. Airworthiness Control, and Conventional terms used, Definitions and Study of Aircraft Rules and CARs. Familiarisation of documents, Log books, Certificates, Schedules, Stores, Procedures, Release Notes, Bulletins, SBs Modifications, Concessions, Manuals, Technical Literature. Different aspects of aircraft operation Maintenance and ground handling activity. Aircraft jacking, Safety aspect, Fire precaution. - Aircraft Manual - Civil Aviation requirements (Section 2 Airworthiness) - Airworthiness advisory circulars. - AME Notices.</p>	70	40
	<p><u>Human Performance</u> a) <u>General</u> <ul style="list-style-type: none"> • The need to take human factors into account; • Incidents attributable to human factors/human error; • 'Murphy's' law </p>		6
	<p>b) <u>Human Performance and Limitations</u> <ul style="list-style-type: none"> • Vision; • Hearing; • Information processing; • Attention and perception; • Memory; • Claustrophobia and physical access </p>		8
	<p>c) <u>Social Psychology</u> <ul style="list-style-type: none"> • Responsibility: individual and group; • Motivation and de-motivation; • Peer pressure; • 'Culture' issues; • Team working; • Management, supervision and leadership </p>		8
	<p>d) <u>Factors Affecting Performance</u> <ul style="list-style-type: none"> • Fitness/health; • Stress: domestic and work related; • Time pressure and deadlines; • Workload: overload and underload; • Sleep and fatigue, shift work; • Alcohol, medication, drug abuse. </p>		8

Subject Code	Semester I	Total Hours	Session Hours
1.2	<u>Materials And Hardware - 1</u> Aircraft Materials — Ferrous Characteristics, properties and identification of common alloy steels used in aircraft; Heat treatment and application of alloy steels Testing of ferrous materials for hardness, tensile strength, fatigue strength and impact resistance.	70	10
	Aircraft Materials — Non-Ferrous Characteristics, properties and identification of common non-ferrous materials used in aircraft; Heat treatment and application of non-ferrous materials; Testing of non-ferrous material for hardness, tensile strength, fatigue strength and impact resistance.		10
	Aircraft Materials — Composite and Non-Metallic Composite and non-metallic other than wood and fabric 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		10
	Corrosion <ul style="list-style-type: none"> • Chemical fundamentals; • Formation by, galvanic action process, microbiological, stress; • Types of corrosion and their identification; • Causes of corrosion; • Material types, susceptibility to corrosion. 		10
	Fasteners		5
	Screw threads <ul style="list-style-type: none"> • Screw nomenclature; • Thread forms, dimensions and tolerances for standard threads used in aircraft; • Measuring screw threads; 		5
	Bolts, studs and screws <ul style="list-style-type: none"> • 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 		10
	Locking devices Tab and spring washers, locking plates, split pins, pal-nuts, wire locking, quick release fasteners, keys, circlips, cotter pins		10

Subject Code	Semester I	Total Hours	Session Hours
1.3	<u>Maintenance Practices -I</u> Safety Precautions-Aircraft and Workshop <ul style="list-style-type: none"> Aspects of safe working practices including precautions to take when working with electricity, gases especially oxygen, oils and chemicals. 	70	15
	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. Tools		10
	Common hand tool types; <ul style="list-style-type: none"> Common power tool types; Operation and use of precision measuring tools; Lubrication equipment and methods. Operation, function and use of electrical general 		25
	Test Equipment. Avionic General Test Equipment Operation, function and use of avionic general test equipment.		20
1.4	<u>Gas Turbine Engine Fundamentals & Helicopter Airframe Structure.</u> GAS TURBINE ENGINE Fundamentals Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle; The relationship between force, work, power, energy, velocity, acceleration; Constructional arrangement and operation of turbojet, turbofan, turboshaft, turboprop.	50	15
	Airframe Structures. Airworthiness requirements for structural strength; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Zonal and station identification systems; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Drains and ventilation provisions; System installation provisions; Lightning strike protection provision. Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, methods of skinning and anti-corrosive protection. Pylon, stabiliser and undercarriage attachments; Seat installation; Doors: construction, mechanisms, operation and safety devices; Windows and windscreen construction; Fuel storage; Firewalls; Engine mounts; Structure assembly techniques: riveting, bolting, bonding; Methods of surface protection, chromating, anodising, painting; Surface cleaning. Airframe symmetry: methods of alignment and symmetry checks.		35

Subject Code	Semester I	Total Hours	Session Hours
1.5	Basic Aerodynamics Physics of the Atmosphere International Standard Atmosphere (ISA) application to aerodynamics	70	5
	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		25
	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.		20
	Flight Stability and Dynamics Longitudinal, lateral and directional stability (active and passive).		20
1.6	Practicals		

Subject Code	Semester II	Total Hours	Session Hours
	<p><u>Air Law, Airworthiness Requirements</u> Privileges of Licenses AMEs, Categories and Limitations Certificate Log Book entries, Recording of defects, Operational Lives of Components, Compliance of CARs, Mandatory Modifications. Organisation Functions of Flight Crew and Ground personnel Role of approved organisations, Quality Control Organisations and their personnel</p>		40
2.7	<p>Human Performance –II <i>Physical Environment</i></p> <ul style="list-style-type: none"> • Noise and fumes; • Illumination; • Climate and temperature; • Motion and vibration; • Working environment. <p><i>Tasks</i></p> <ul style="list-style-type: none"> • Physical work; • Repetitive tasks; • Visual inspection; • Complex systems. <p><i>Communication</i></p> <ul style="list-style-type: none"> • Within and between teams; • Work logging and recording; • Keeping up to date, currency; • Dissemination of information. <p><i>Human Error</i></p> <ul style="list-style-type: none"> • Error models and theories; • Types of error in maintenance tasks; • Implications of errors (i.e accidents) • Avoiding and managing errors. <p><i>Hazards in the Workplace</i></p> <ul style="list-style-type: none"> • Recognizing and avoiding hazards; • Dealing with emergencies. 	60	20

Subject Code	Semester II	Total Hours	Session Hours
2.8	Materials And Hardware -II Aircraft rivets Types of solid and blind rivets: specifications and identification, heat treatment.	50	10
	Pipes and Unions Identification of, and types of rigid and flexible pipes and their connectors used in aircraft; Standard unions for aircraft hydraulic, fuel, oil, Pneumatic and air system pipes.		5
	Springs Types of springs, materials, characteristics and applications		3
	Bearings Purpose of bearings, loads, material, construction; Types of bearings and their application.		5
	Transmissions Gear types and their application; Gear ratios, reduction and multiplication gear systems, driven and driving gears, idler gears, mesh patterns; Belts and pulleys, chains and sprockets.		10
	Control Cables Types of cables; End fittings, turnbuckles and compensation devices; Pulleys and cable system components; Bowden cables; Aircraft flexible control systems		10
	Electrical Cables and Connectors; 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.		7

Subject Code	Semester II	Total Hours	Session Hours
2.9	Maintenance Practices – II Fits and Clearances 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	40	3
	Electrical Cables and Connectors; 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; Wiring protection techniques: Cable looming and Loom support, cable clamps, protective sleeving techniques including heat shrink wrapping, shielding.		3
	Riveting; Riveted joints, rivet spacing and pitch; Tools used for riveting and dimpling; Inspection of riveted joints.		4
	Pipes and Hoses Bending and belling/flaring aircraft pipes; Inspection and testing of aircraft pipes and hoses; Installation and clamping of pipes.		3
	Springs Inspection and testing of springs. Rod systems.		1
	Bearings Testing, cleaning and inspection of bearings; Lubrication requirements of bearings; Defects in bearings and their causes. 28.11.2003 L 315/100 Official Journal of the European Union		4
	Transmissions Inspection of gears, backlash; Inspection of belts and pulleys, chains and sprockets; Inspection of screw jacks, lever devices, push-pull		3
	Control Cables Swaging of end fittings; Inspection and testing of control cables; Bowden cables; aircraft flexible control systems.		2
	Material handling		2
	Sheet Metal Marking out and calculation of bend allowance; Sheet metal working, including bending and forming; Inspection of sheet metal work.		2
	Composite and non-metallic Bonding practices; Environmental conditions Inspection method		4
	Welding, Brazing, Soldering and Bonding Soldering methods; inspection of soldered joints. Welding and brazing methods; Inspection of welded and brazed joints; Bonding methods and inspection of bonded joints.		3

Subject Code	Semester II	Total Hours	Session Hours
2.9	Aircraft Weight and Balance Centre of Gravity/Balance limits calculation: use of relevant documents; Preparation of aircraft for weighing; Aircraft weighing;	40	3
	Aircraft Handling and Storage Aircraft taxiing/towing and associated safety precautions; Aircraft jacking, chocking, securing and associated safety precautions; Aircraft storage methods; Refuelling/defuelling procedures; De-icing/anti-icing procedures; Electrical ground supplies. Hydraulic ground supplies. Pneumatic ground supplies. Effects of environmental conditions on aircraft handling and operation.		3
2.10	<u>Electrical Fundamentals</u> Electron Theory Structure and distribution of electrical charges within: atoms, molecules, ions, compounds; Molecular structure of conductors, semiconductors and insulators.	40	3
	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		3
	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.		4
	Generation of Electricity Production of electricity by the following methods: Light, heat, friction, pressure, chemical action, magnetism and motion.		5
	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.		7
	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		4

Subject Code	Semester II	Total Hours	Session Hours
2.10	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;	40	5
	Power Power, work and energy (kinetic and potential); Dissipation of power by a resistor; Power formula; Calculations involving power, work and energy.		4
	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.		5
2.11	<u>Piston Engine I</u> Fundamentals Mechanical, thermal and volumetric efficiencies; Operating principles — 2 stroke, 4 stroke, Otto and Diesel; Piston displacement and compression ratio; Engine configuration and firing order.	50	8
	Engine Performance Power calculation and measurement; Factors affecting engine power; Mixtures/leaning, pre-ignition		6
	Engine Construction Crank case, crank shaft, cam shafts, sumps; Accessory gearbox; Cylinder and piston assemblies; Connecting rods, inlet and exhaust manifolds; Valve mechanisms; Propeller reduction gearboxes.		8

Subject Code	Semester II	Total Hours	Session Hours
2.11	Engine Fuel Systems <i>Carburetors</i> Types, construction and principles of operation; Icing and heating. <i>Fuel injection systems</i> Types, construction and principles of operation. <i>Electronic engine control</i> Operation of engine control and fuel metering systems including electronic engine control (FADEC); Systems lay-out and components.	50	8
	Starting and Ignition Systems Starting systems, pre-heat systems; Magneto types, construction and principles of operation; Ignition harnesses, spark plugs; Low and high tension systems.		4
	Induction, Exhaust and Cooling Systems Construction and operation of: induction systems including alternate air systems; Exhaust systems, engine cooling systems — air and liquid.		
	Supercharging/Turbo charging Principles and purpose of supercharging and its effects on engine parameters; Construction and operation of supercharging/turbocharging systems; System terminology; Control systems; System protection.		
	Lubricants and Fuels Properties and specifications; Fuel additives; Safety precautions.		
	Lubrication Systems System operation/lay-out and components.		
2.12	<u>Aerodynamics II</u> Theory of Flight — Rotary Wing Aerodynamics Terminology; Effects of gyroscopic precession; Torque reaction and directional control; Dissymmetry of lift, Blade tip stall; Translating tendency and its correction; Coriolis effect and compensation; Vortex ring state, power settling, over pitching; Auto-rotation; Ground effect.	40	15
	Flight Control Systems Cyclic control; Collective control; Swash plate; Yaw control: Anti-Torque Control, Tail rotor, bleed air; Main Rotor Head: Design and Operation features; Blade Dampers: Function and construction; Rotor Blades: Main and tail rotor blade construction and attachment; Trim control, fixed and adjustable stabilisers; System operation: Manual, Hydraulic, Electrical and Fly-by wire; Artificial feel; Balancing and Rigging.		15

Subject Code	Semester II	Total Hours	Session Hours
2.12	Blade Tracking and Vibration Analysis Rotor alignment; Main and tail rotor tracking; Static and dynamic balancing; Vibration types, vibration reduction methods; Ground resonance.	40	5
	Transmissions Gear boxes, main and tail rotors; Clutches, free wheel units and rotor brake.		5
2.13	Practicals		

Subject Code	Semester III	Total Hours	Session Hours
3.14	ELECTRICAL FUDAMENTALS – II DC Motor/Generator 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.	40	6
	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.		5
	Resistive (R), Capacitive (C) and Inductive (L) Circuits 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.		5
	Filters Operation, application and uses of the following filters: low pass, high pass, band pass, band stop.		3
	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.		5

Subject Code	Semester III	Total Hours	Session Hours
3.14	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.	40	8
	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.		8
DIGITAL TECHNIQUES & ELECTRONIC INSTRUMENT SYSTEM - I			
3.15	Electronic Instrument Systems Typical systems arrangements and cockpit layout of Electronic instrument systems.	50	18
	Numbering Systems Numbering systems: binary, octal and hexadecimal; Demonstration of conversions between the decimal And binary, octal and hexadecimal systems and vice versa.		12
	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.		07
	Data Buses Operation of data buses in aircraft systems, including knowledge of ARINC and other specifications.		07
	Logic Circuits Identification of common logic gate symbols, tables and equivalent circuits; Applications used for aircraft systems, schematic diagrams. Interpretation of logic diagrams.		06

Subject Code	Semester III	Total Hours	Session Hours
3.16	PISTON ENGINE - II Engine Indication Systems Engine speed; Cylinder head temperature; Coolant temperature; Oil pressure and temperature; Exhaust Gas Temperature; Fuel pressure and flow; Manifold pressure.	60	22
	Power plant Installation Configuration of firewalls, cowlings, acoustic panels, engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains.		18
	Engine Monitoring and Ground Operation Procedures for starting and ground run-up; Interpretation of engine power output and parameters; Inspection of engine and components: criteria, tolerances, and data specified by engine manufacturer.		15
	Engine Storage and Preservation Preservation and depreservation for the engine and accessories/ systems.		5
3.17	Helicopter Systems – I Air Conditioning <i>Air supply</i> Sources of air supply including engine bleed and ground cart Air conditioning systems; Distribution systems; Flow and temperature control systems; Protection and warning devices.	60	8
	Instruments/Avionic Systems <i>Instrument Systems (ATA 31)</i> 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; Vibration indicating systems — HUMS; Other aircraft system indication.		10
	<i>Avionic Systems</i> Fundamentals of system layouts and operation of: Auto Flight (ATA 22); Communications (ATA 23); Navigation Systems (ATA 34).		12

Subject Code	Semester III	Total Hours	Session Hours
3.17	<u>Electrical Power (ATA 24)</u> Batteries Installation and Operation; DC power generation, AC power generation; Emergency power generation; Voltage regulation, Circuit protection. Power distribution; Inverters, transformers, rectifiers; External/Ground power.	60	10
	<u>Equipment and Furnishings (ATA 25)</u> Emergency equipment requirements; Seats, harnesses and belts; Lifting systems. Emergency flotation systems; Cabin lay-out, cargo retention; Equipment lay-out; Cabin Furnishing Installation.		15
	<u>Fire Protection (ATA 26)</u> Fire and smoke detection and warning systems; Fire extinguishing systems; System tests.		5
3.18	<u>Maintenance Practices III</u> 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. Trouble shooting techniques	50	20
	Abnormal Events Inspections following lightning strikes and HIRF penetration. Inspections following abnormal events such as heavy landings and flight through turbulence.		10
	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		20
3.19	Practicals		

Subject Code	Semester IV	Total Hours	Session Hours
4.20	Engineering Drawing Engineering Drawings Diagrams and Standards Drawing types and diagrams, their Symbols Dimensions Tolerances Projections Identifying title block information	40	15
	Microfilm, microfiche and computerised presentations;		05
	Specification 100 of the Air Transport Association (ATA) of America;		05
	Aeronautical and other applicable standards including ISO, AN, MS, NAS and MIL;		05
	Wiring diagrams and schematic diagrams.		10
4.21	Digital Techniques & Electronic Instrument System II 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 micro computer 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.	40	5
	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.		5
	Integrated Circuits Operation and use of encoders and decoders; Function of encoder types; Uses of medium, large and very large scale integration.		3
	Integrated Circuits Operation and use of encoders and decoders; Function of encoder types; Uses of medium, large and very large scale integration.		3
	Multiplexing Operation, application and identification in logic diagrams of multiplexers and de multiplexers		3
	Fiber Optics Advantages and disadvantages of fiber optic data Transmission over electrical wire propagation; Fiber optic data bus; Fiber optic related terms; Terminations; Couplers, control terminals, remote terminals; Application of fiber optics in aircraft systems.		3

Subject Code	Semester IV	Total Hours	Session Hours
4.21	Electronic Displays Principles of operation of common types of displays Used in modern aircraft, including Cathode Ray Tubes, Light Emitting Diodes and Liquid Crystal Display.	40	5
	Electrostatic Sensitive Devices Special handling of components sensitive to electrostatic discharges; Awareness of risks and possible damage, component and personnel an ti-static protection devices. Software Management Control Awareness of restrictions, airworthiness requirements and possible catastrophic effects of unapproved changes to software programmes.		4
	Electromagnetic Environment Influence of the following phenomena on maintenance practices for electronic system: EMC-Electromagnetic Compatibility EMI Electromagnetic Interference HIRF-High Intensity Radiated Field Lightning/lightning protection		4
	Typical Electronic/Digital Aircraft Systems 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 ECAM-Electronic Centralised Aircraft Monitoring EFIS-Electronic Flight Instrument System EICAS-Engine Indication and Crew Alerting System FBW-Fly by Wire FMS-Flight Management System GPS-Global Positioning System IRS-Inertial Reference System TCAS-Traffic Alert Collision Avoidance System		5
4.22	<u>Gas Turbine Engine - I</u> Engine Performance Gross thrust, net thrust, choked nozzle thrust, thrust distribution, resultant thrust, thrust horsepower, equivalent shaft horsepower, specific fuel consumption; Engine efficiencies; By-pass ratio and engine pressure ratio; Pressure, temperature and velocity of the gas flow; Engine ratings, static thrust, influence of speed, altitude and hot climate, flat rating, limitations.	50	12
	Inlet Compressor inlet ducts Effects of various inlet configurations; Ice protection.		4

Subject Code	Semester IV	Total Hours	Session Hours
4.22	Compressors Axial and centrifugal types; Constructional features and operating principles and applications; Fan balancing; Operation: Causes and effects of compressor stall and surge; Methods of air flow control: bleed valves, variable inlet guide vanes, variable stator vanes, rotating stator blades; Compressor ratio	50	8
	Combustion Section Constructional features and principles of operation.		6
	Turbine Section Operation and characteristics of different turbine blade types; Blade to disk attachment; Nozzle guide vanes; Causes and effects of turbine blade stress and creep.		12
	Exhaust Constructional features and principles of operation; Convergent, divergent and variable area nozzles; Engine noise reduction; Thrust reversers.		8
4.23	<u>Propellers</u> Fundamentals Blade element theory; High/low blade angle, reverse angle, angle of attack, rotational speed; Propeller slip; Aerodynamic, centrifugal, and thrust forces; Torque; Relative airflow on blade angle of attack; Vibration and resonance	50	8
	Propeller Construction Construction methods and materials used in wooden, composite and metal propellers; Blade station, blade face, blade shank, blade back and hub assembly; Fixed pitch, controllable pitch, constant speed propeller; Propeller/spinner installation.		5
	Propeller Pitch Control Speed control and pitch change methods, mechanical and electrical/electronic; Feathering and reverse pitch; Over speed protection		6
	Propeller Synchronising Synchronising and synchrophasing equipment.		5

Subject Code	Semester IV	Total Hours	Session Hours
4.23	Propeller Ice Protection Fluid , Electrical de-icing equipment.	50	8
	Propeller Maintenance Static and dynamic balancing; Blade tracking; Assessment of : blade damage, blade erosion, blade corrosion, impact damage, blade delamination; Propeller treatment/repair schemes; Propeller engine running.		12
	Propeller Storage and Preservation Propeller preservation and depreservation		6
<u>ELECTRONIC FUDAMENTALS</u>			
4.24	Semiconductors/Diodes Transistors, Transistor symbols; Component description and orientation; Transistor characteristics and properties. (b) 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.	50	3
	Integrated Circuits Description and operation of logic circuits and linear circuits/operational amplifiers. 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.		10
	Printed Circuit Boards Description, Use of printed circuit boards.		10
	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: revolvers, differential, control and torque, transformers, inductance and capacitance transmitters. Understanding of the following terms: Open an closed loop, follow up, servomechanism, analogue, transducer, null, damping, feedback, deadband; 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.		15
4.25	Practicals		

Subject Code	Semester V	Total Hours	Session Hours
5.26	<u>GAS TURBINE ENGINE - II</u> Bearings and Seals Constructional features and principles of operation.	100	04
	Lubricants and Fuels Properties and specifications; Fuel additives; Safety precautions.		06
	Lubrication Systems System operation/lay-out and components.		04
	Fuel Systems Operation of engine control and fuel metering systems including electronic engine control (FADEC); Systems lay-out and components.		05
	Air Systems Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services.		06
	Starting and Ignition Systems Operation of engine start systems and components; Ignition systems and components; Maintenance safety requirements.		08
	<u>Engine Indication Systems</u> Exhaust Gas Temperature/Interstage Turbine Temperature; Engine Thrust Indication: Engine Pressure Ratio, Engine turbine discharge pressure or jet pipe pressure systems; Oil pressure and temperature; Fuel pressure and flow; Engine speed; Vibration measurement and indication; Torque; Power.		13
	<u>Power Augmentation Systems</u> Operation and applications; Water injection, water methanol; Afterburner systems.		4
	<u>Turbo-prop Engines</u> Gas coupled/free turbine and gear coupled turbines; Reduction gears; Integrated engine and propeller controls; Over speed safety devices.		13
	<u>Turbo-shaft engines</u> Arrangements drive systems, reduction gearing, couplings, control systems.		13
	<u>Auxiliary Power Units (APUs)</u> Purpose, operation, protective systems		8

Subject Code	Semester V	Total Hours	Session Hours
5.26	Power plant Installation Configuration of firewalls, cowlings, acoustic panels, engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains.	100	4
	Fire Protection Systems Detection and Operation of extinguishing systems.		3
	Engine Monitoring and Ground Operation Procedures for starting and ground run-up; Interpretation of engine power output and parameters; Trend monitoring (including oil analysis, vibration and boroscope) Inspection of engine and components to criteria, Tolerances and data specified by engine manufacturer; Compressor washing/cleaning; Foreign Object Damage.		7
	Engine Storage and Preservation Preservation and depreservation for the engine and Accessories/systems.		2
5.27	<u>Helicopter Systems II</u> Fuel Systems (ATA 28) System lay-out; Fuel tanks; Supply systems; Dumping, venting and draining; Cross-feed and transfer; Indications and warnings; Refueling and defueling.	60	10
	Hydraulic Power (ATA 29) 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.		10
	Ice and Rain Protection (ATA 30) Ice formation, classification and detection; Anti-icing and de-icing systems: electrical, hot air and chemical; Rain repellent and removal; Probe and drain heating.		10
	Landing Gear (ATA 32) Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, tyres, brakes; Steering; Skids, floats		10

Subject Code	Semester V	Total Hours	Session Hours
5.27	Lights (ATA 33) External: navigation, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency	100	3
	Pneumatic/Vacuum (ATA 36) System lay-out; Sources: engine, compressors, reservoirs, ground supply. Pressure control; Distribution; Indications and warnings; Interfaces with other systems.		3
	GAS TURBINE ENGINE Fundamentals Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle; The relationship between force, work, power, energy, velocity, acceleration; Constructional arrangement and operation of turbojet, turbofan, turboshaft, turboprop.		10
5.28	Aviation Management Production, planning and control system Fleet / MRO Management. Material management. Aircraft Inventory control. Aircraft preservation management. Handling of dangerous goods. Good maintenance practices. Standard practices & management. Time and Motion study. Ergonomic lay outs for maintenance. Cockpit resource management. Safety & Accident investigation. Insurance policy procedures in aviation. Study of EASA-145 & FAR -145 systems. ETOPS. Flight management. Project on Progressive vs Block maintenance. Control of ground equipments. Costing & accounting. Base management & MIS. Human resources. Leadership & personal management. Case study of industry standards. Health Safety & Environment techniques (HSE).	50	50
5.29	Practicals		

Subject Code	Semester VI	Total Hours	Session Hours
6.30	<u>Aircraft Structure Systems</u> Snag Analysis & Rectification (Mechanical) The snags in the aircrafts pertaining to syllabus covered in the semester I to Semester V for aircraft structure systems namely hydraulics, pneumatics, ice & rain protection, landing gear, oxygen, fire protection, air conditioning, and cabin pressurization. The snag analysis and rectification.	20	10
	Snag Analysis & Rectification (Avionics) The snags in the aircrafts pertaining to syllabus covered in the semester I to Semester V for aircraft structure systems namely electrical, instrument, radio & digital. The snag analysis and rectification.		10
6.31	<u>Aircraft Practices</u> Aircraft Engine & Engine fuel system – Repair, maintenance. The snags in the aircrafts pertaining to syllabus covered in the semester I to Semester V for aircraft structure systems namely Aircraft engines, Fuel system, Fuel metering system, lubrication system. The snag analysis and rectification..	20	10
	Ground handling & documentation Ground handling & ground support and safety equipments, Engine starting precaution, propeller & turbine engines, Hot & hung starts, use of equipment for hydraulic power, air conditioning, electrical power, fuelling of aircraft, precautions for servicing oil/ fuel, servicing of oxygen system, lashing & mooring of light and heavy aircraft, taxiing and marshalling, jacking of aircraft, cold weather handling		10
6.32	Practicals Aircraft Structure Systems		
6.33	Practicals Aircraft Practices		

**New ordinances 6749 & 6750 relating to the
B.Sc. (Aeronautics)**

- i) **Necessity of starting these courses:** - The University of Mumbai's Garware Institute of Career Education & Development plans to introduce three years Full time **B.Sc. (Aeronautics)**. The training course in the field of Aeronautics is designed to give the students a comprehensive knowledge of aircraft maintenance methodology/ systems/ procedures, its management and human factors to enable the participants to become skilled and competent professionals in aviation field which confirms their commitment to excellence in an ever-changing vibrant industry.
- ii) **Whether UGC has recommended to start the said courses:** - UGC encourages the incorporation of skill oriented and value added courses to develop skilled manpower.
- iii) **Whether all the courses have commenced from the academic year 2017-18:** - Yes, it would be commencing from the Academic year 2017-18.
- iv) **The Courses started by the University are self-financed, whether adequate number of eligible permanent Faculties are available?** - Yes, this course is self-financed. The expert visiting faculty from industries come to teach this course.
- v) **To give details regarding duration of the course and is it possible to compress the course? :-** The duration of the course in Three years (Six Semester). It cannot be further compressed.
- vi) **The intake capacity of each course and no. of admissions given in the current academic year (2017-18):** - The intake capacity of this course 60 students each batch and admitted 47 students.
- vii) **Opportunities of Employability / Employment available after undertaking these courses:** - The students completing this course have career opportunities are Aircraft servicing industry, Maintenance & Repair Organizations, Airline Management, Aircraft Technical support, Flight attending etc. This is primarily because careers in the aviation industry require a lot of special skills.



I/c. DIRECTOR