

B SC (Honours) AM SEMESTER –VI TEACHING & EXAMINATION SCHEME

SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME				TOTAL
			L	T	P			THEORY		PRACT		
								CIE	ESE	CIE	ESE	
1	AM0631	Transducer and sensor	5	1	0	6	6	60	40	00	00	100
2	AM0632	Aircraft structure and associated system	4	0	4	6	8	60	40	60	40	200
3	AM0633	Composite and fiber	5	1	0	6	6	60	40	00	00	100
4	AM0634	Ground handling and support system	4	0	4	6	8	60	40	60	40	200
5	AM0635	AEEC2	0	0	8	4	8	00	00	60	40	100
TOTAL			18	02	16	28	36	240	160	180	120	700

Program: B Sc (Honours) AM				Subject Code: AM0631			Semester: VI	
Teaching Scheme				Examination Evaluation Scheme				
Lecture	Tutorial	Practical	Credits	University Theory Examination	University Practical Examination	Continuous Internal Evaluation (CIE)- Theory	Continuous Internal Evaluation (CIE)- Practical	Total
5	1	0	6	40	00	60	00	100

Course Objectives :

1. Introduction about classification of transducers.
2. Study about Optical Energy Domain.
3. Study about mechanical energy domain.
4. Study about thermal energy domain.
5. Study about magnetic energy Domain.

Course Outcome :

CO 1: Explain different types of Transducers and Sensors. [BT-2]

CO 2: Use of Micro sensors and their application. [BT-3]

CO 3: Categorize different types of Optical sensors. [BT-4]

CO 4: Discuss Mechanical energy domain. [BT-2]

CO 5: Construction of Thermocouple and its application. [BT-6]

CO 6: List of various Magnetic Transducers and Sensors. [BT-1]

Course Contents:

Unit 1	Introduction : Classification of transducers, Transducer descriptions, parameters, definitions and terminology, Introduction to Microsensors, history and technology of Microsensors, reasons for miniaturization, scaling laws,	15 Hrs.
Unit 2	Optical Energy Domain Physics, Photoeffects in silicon and other materials, Photoconductive sensors, Photovoltaic sensors, Photoemissive sensors, Microsensors in the optical energy domain, semiconductor physics, Photodiodes and –transistors Fiberoptic sensors, Chemical sensors	15 Hrs.
Unit 3	Mechanical Energy Domain: Physics, Surface acoustic waves, variable resistance sensors, strain gauges, piezoelectric sensors, capacitive sensors, micromechanical sensors, sensor mechanisms, strain gauges, accelerometers and gyroscopes, pressure sensors, microphones and tactile sensors.	15 Hrs.
Unit 4	Thermal Energy Domain : Seebeck effect, Peltier effect, Thomson effect, Thermoresistance, Thermoresistive sensors, Thermo-mechanical, Thermoresistive micro sensors Bolometers and Thermopiles. Magnetic energy Domain Superconductivity, Hall Effect, Magnetoresistivity, variable inductance sensors, variable reluctance sensors, Hall Effect sensors, summary	15 Hrs.

Reference Books:

T.A. Kovacs, Micromachined Transducers Sourcebook, WCB/McGraw-Hill, 1998
J. R. Carstens, Electrical Sensors and Transducers, Regents/Prentice Hall, 1993.

List of Tutorials:

Measurement of pressure, strain and torque using strain gauge.

Measurement of speed using Electromagnetic transducer.

Measurement of speed using photoelectric transducers

Measurement of angular displacement using Potentiometer.

Measurement using load cells.

Measurement using capacitive transducer.

Measurement using inductive transducer.

Measurement of Temperature using Temperature Sensors/RTD.

Characteristics of Hall effect sensor.

Measuring change in resistance using LDR.

Subject: Aircraft Structure & Associated Systems								
Program: B Sc (honours) AM				Subject Code:AM0632			Semester: VI	
Teaching Scheme				Examination Evaluation Scheme				
Lecture	Tutorial	Practical	Credits	University Theory Examination	University Practical Examination	Continuous Internal Evaluation (CIE)- Theory	Continuous Internal Evaluation (CIE)- Practical	Total
4	0	4	6	40	40	60	60	200

Course Objectives :

1. Introduction to General term and vocabulary used in Aeronautical science
2. Study about Airframe Structures & general Concepts of aircraft system.
3. Study about different types of fasteners, Screw, bolt , rivets used in aircraft.
4. Study about Airframe Structures — Aeroplane, Wings (ATA 57).

Course Outcome :

CO 1: Explain general terms used in Aeronautical science. [BT-2]

CO 2: Classify Aircraft Structure as primary, secondary and tertiary.
[BT-4]

CO 3: Describe Aircraft bonding and continuity. [BT-2]

CO 4: Classify different types of Aircraft rivets and riveting methods.
[BT-4]

CO 5: Define general terminology related with Aircraft Structure.
[BT-1]

CO 6: Calculate current practice in aircraft design related to load transfer. [BT-3]

Course content :

<p>Unit 1</p>	<p>Introduction to General term and vocabulary used in Aeronautical science Introduction to aircraft technical literature. Introduction to ATA system Introduction to aircraft, major aircraft components, aircraft systems and their functions reference lines, station and zone identification systems</p>	<p>15 Hrs.</p>
<p>Unit 2</p>	<p>Airframe Structures — General Concepts Airworthiness requirements for structural strength; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Lightning strike protection provision. Drains and ventilation provisions, System installation provisions. Aircraft bonding and continuity. Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, methods of skinning, anti-corrosive protection, wing, empennage and engine attachments; Describe current practice in aircraft design related to load transfer, load path continuity and reduction of stress raisers in pressurized fuselages.</p>	<p>15 Hrs.</p>
<p>Unit 3</p>	<p>Fasteners used on aircraft 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. Aircraft rivets Types of solid and blind rivets: specifications and identification, heat treatment. Riveting Riveted joints, rivet spacing and pitch; Tools used for riveting and dimpling Inspection of riveted joints.</p>	<p>15 Hrs.</p>
<p>Unit 4</p>	<p>Structural Assembly Structural assembly techniques: riveting, bolting, bonding methods of surface protection, such as chromating, anodising, painting; Surface cleaning. Airframe symmetry: methods of alignment and symmetry checks. Complete airframe for symmetry fuselage for twist and bending, vertical stabiliser for alignment wings and horizontal stabilisers for dihedral and incidence Airframe Structures — Aeroplane Fuselage (ATA 52/53/56) :Construction and pressurisation sealing; Wing, stabiliser, pylon and undercarriage attachments; Seat</p>	<p>15 Hrs.</p>

	<p>installation and cargo loading system; Doors and emergency exits: construction, mechanisms, operation and safety devices; Windows and windscreen construction and mechanisms.</p> <p>Wings (ATA 57) Anhedral, dihedral incidence angle interplane struts longitudinal dihedral rigging position, stagger, wash in, washout Construction; Fuel storage; Landing gear, pylon, control surface and high lift/drag attachments.</p> <p>Stabilizers Construction; Control surface attachment.</p> <p>Flight Control Surfaces (ATA 55/57) Construction and attachment; Balancing — mass and aerodynamic.</p> <p>Nacelles/Pylons (ATA 54) Construction; Firewalls; Engine mounts.</p>	
<p>Reference Books: Dictionary of Aeronautical terms (Dale Crane) Aircraft handbook FAA (AC 65-15 A) Aircraft structure Ch. 01 (FAA) Aircraft Construction Repair and Inspection-By Joe Christy Aviation Maintenance Technician Hand book by FAA Aircraft Maintenance and Repair- Delp/Bent/McKinley, AC 43.1B</p>		

List of Practical

- 1 Identifying aircraft reference lines, station and zone numbers
- 2 Identification of major structural members of fixed wing aircraft. Loads on major structural members.
- 3 Identification of detail structural members of aircraft and loads acting on these structural members
- 4 Aircraft structure construction
- 5 Aircraft structural assembly, joints and lightning protection
- 6 Identification of components of flight control surfaces and methods of mass balancing.
- 7 Control surface, landing gear and engine attachment
- 8 Identification of type of Fuselage and method of pressure sealing. Identification of Pressure bulkheads and unpressurised bulkheads
- 9 Common structural defects, simple inspection technique and recording
- 10 Types of rivets, defects. Inspection of riveted joints and structure
- 11 Construction (Modelling) of various types structural joints
- 12 Check aircraft symmetry

Subject: Composites & Fibers								
Program: B Sc (Honours) AM				Subject Code: AM0633			Semester: VI	
Teaching Scheme				Examination Evaluation Scheme				
Lecture	Tutorial	Practical	Credits	University Theory Examination	University Practical Examination	Continuous Internal Evaluation (CIE)- Theory	Continuous Internal Evaluation (CIE)- Practical	Total
5	1	00	06	40	00	60	00	100

Course Objectives:

1. Introduction to Composite Materials
2. Manufacture techniques of composites materials.
3. Behaviour of unidirectional composites materials.
4. Analysis and strength of an orthotropic lamina.

Course Outcomes:

- CO 1: Explain different types of composite materials and its manufacturing process. [BT-2]
- CO 2: List out types of fiber and matrix materials. [BT-1]
- CO 3: Calculate the value of different parameters of unidirectional composites. [BT- 3]
- CO 4: Compare all inspection techniques and interpretation of results. [BT-5]
- CO 5: Analyze strength of an orthotropic lamina and laminated composite materials. [BT-4]
- CO 6: Create new ideas to improve properties of composite materials. [BT-6]

Course Content :

Unit 1	PART 1 Introduction to Composite Materials; Classification of composites, particulate composites, fibrous composites. Use of fiber reinforced composites; PART 2 Fiber, matrices and manufacture of composites; properties of various type of fibres like glass, Kevlar, Carbon and Graphite, methods of	15 Hrs.
---------------	---	----------------

	manufacture, surface treatment of fiber, various forms of fibers, matrix materials, polymers: Thermosetting and thermoplastic polymers, properties of polymers like epoxies, phenolic, polyester peek etc.	
Unit 2	<p>PART 3 Manufacture techniques of composites: hand lay-up technique, pressure bag and vacuum bag moulding techniques, puftrusion, resin-transfer moulding, injection moulding, Bulk moulding compound, sheet moulding compound.</p> <p>PART 4 Behaviour of unidirectional composites : volume traction, weight traction, density of composites, Micromechanics approach, longitudinal strength and stiffness, factors affecting longitudinal strength and stiffness, transverse strength and stiffness, sheer modulus and strength, Poisson's ratio, effect of fiber dimension and distribution on strength and stiffness, Halpin-Tsai equations.</p>	15 Hrs.
Unit 3	<p>PART 5 Analysis and strength of an orthotropic lamina : strain relations and engineering constants, relation between engineering constants and stiffness coefficients, strength of an orthotropic lamina, failure theories, Analysis of laminated composites, laminate orientation code, stress and strain variation in a laminate, properties of symmetric, cross ply angle-ply and quasi isotropic analysis of laminate after initial failure, hygrothermal behaviour of laminates.</p> <p>PART 6 Thermal and moisture expansion coefficients, transport properties, mass diffusion. Short fiber composites: approximate analysis of stress transfer, average fiber stress, modulus and strength of short fiber composites.</p>	15 Hrs.
Unit 4	<p>PART 7 Inspection techniques and interpretation of results : ultrasonic techniques, Acoustic emission techniques, X - ray radiography, CT Scan</p>	15 Hrs.

Reference Books

R.M. Jones, Mechanics of Composite Materials, Technomic Publication.

B.D. Agarwal and L.J. Broutman, Analysis and Performance of Fibre Composites, John Wiley & Sons.

Non-Destructive Test and Evaluation of Materials, Prasad J and C.G Krishnadas Nair

Non-Destructive Testing Handbook, Vol 1. Aerospace NDT – The American Society for

Non-destructive Testing.

List of Practicals:

- 1 Identify various composite material - glass, Kevlar, Carbon, Graphite, fibers and matrices and their application in aircraft
- 2 Identify various types of defects in composite structure
- 3 Inspection – simple and common technique, identification and analysis of common defects in composite structures

- 4 Ultrasonic techniques in detecting defects in composite structure
- 5 Radiography technique in detecting defects in composite structure
- 6 CT Scan technique in detecting defects in composite structure
- 7 Tools and consumables, including repair material for composite workshops.
- 8 General layout and environmental requirements of composite workshop. Safety precaution. Material storage, life control and handling
- 9 Workshop Techniques of basic composites repair

Subject: Ground handling, safety and support system								
Program: B Sc (Honours) AM				Subject Code: AM0634			Semester: VI	
Teaching Scheme				Examination Evaluation Scheme				
Lecture	Tutorial	Practical	Credits	University Theory Examination	University Practical Examination	Continuous Internal Evaluation (CIE)- Theory	Continuous Internal Evaluation (CIE)- Practical	Total
4	0	4	6	40	40	60	60	200

Course Objective:

1. Study about general knowledge about ground handling of Aircraft, Aircraft Safety.
2. Maintenance and handling of ground equipment's used in aircraft.
3. Knowledge of safety and fire precautions to be observed during maintenance including refuelling,
4. Maintenance of landing gear (L/G), Shock strut charging and bleeding
5. Maintenance of L/G brakes.

Course Outcome:

- CO 1: Explain Airfield lightning system, Aircraft rescue and fire fighting. [BT-2]
- CO 2: Demonstrate maintenance and handling procedures of ground equipment. [BT-3]
- CO 3: Perform experiment for different rigging procedures. [BT-3]
- CO 4: Assemble and maintenance of Landing gear. [BT6]
- CO 5: Identify the signals given by tower at Airport. [BT-1]
- CO 6: Classify different types of Air conditioning and heating unit. [BT-4]

Course Content:

Unit 1	General knowledge of ground handling of Aircraft, Aircraft Safety; Mooring, Jacking, Levelling, Hoisting of aircraft, Towing, Mooring of an a/c during adverse conditions. Aircraft cleaning and maintaining. Brief knowledge of airport and its procedures. Control tower, Dispersal	15 Hrs.
---------------	--	---------

	areas, Aprons, Tarmac, Taxi track, Runway and its ends. Approach and clear zone layout. Brief knowledge of the signals given by the control tower. Knowledge of Airfield lighting system, Aircraft Rescue & Fire Fighting.	
Unit 2	Maintenance and handling of ground equipment's used in maintenance of aircraft. Compressors, Portable hydraulic test stands, Electrical power supply equipment, charging trolley. Air-conditioning and Heating unit, Ground support air start unit. Pressure oil unit, Fire extinguishers, jacks, Hoisting cranes/gantry, Ladders, Platforms, Trestles, and Chocks.	15 Hrs.
Unit 3	Knowledge of safety and fire precautions to be observed during maintenance including refuelling, defueling & engine start. Maintenance of hydraulic accumulators, reservoirs and filters. Rigging of flight control surfaces and duplicate inspection; Rigging checks-Angular alignment checks and symmetry checks, Knowledge and use of Tensiometers, Protractors etc. Rigging of engine and propeller control.	15 Hrs.
Unit 4	Maintenance of landing gear (L/G), Shock strut charging and bleeding, Maintenance of L/G brakes i.e., Dragging, Grabbing, Fading, Brakes and excessive brake pedal travel. Maintenance on wheels, tyres and tubes i.e., dismantling, inspection, assembling, inflating, inspection and installation Storage of Rotables.	15 Hrs.

Text Books :

Dictionary of Aeronautical terms (Dale Crane)
Aircraft handbook FAA (AC 65-15 A)
Aircraft structure Ch. 01 (FAA)
Aircraft Construction Repair and Inspection-By Joe Christy Aviation
Maintenance Technician Hand book by FAA Aircraft Maintenance and
Repair- Delp/Bent/McKinley, AC 43.1B

Reference books:

General Handbook AC65-9A
Airframe Handbook AC 65-15A

List of Tutorial:

- Hydraulic system bleeding, replenish fluid reservoir and handling
 - 1 precautions
 - 2 Hydraulic accumulator charging
 - 3 Use of ground power unit and checks
Identification and control of various types of fires, practicing fire
 - 4 extinguishing
Practical on headset communication during arrival and departure of aircraft
 - 5 &
- Identification of aircraft hazard zones

- 6 Fuel sample check and refueling
- 7 Flight control system lubrication
- 8 Landing gear system lubrication
- 9 Landing gear oleo charging
- 10 Tyre pressure check
- 11 Aircraft parking and mooring

Subject: AEEC2								
Program: B Sc (Honours) AM				Subject Code:AM0635			Semester: VI	
Teaching Scheme				Examination Evaluation Scheme				
Lecture	Tutorial	Practical	Credits	University Theory Examination	University Practical Examination	Continuous Internal Evaluation (CIE)- Theory	Continuous Internal Evaluation (CIE)- Practical	Total
00	0	8	4	0	40	60	00	100

SR NO	LIST OF ELECTIVES (FOR 5 TH AND 6 TH SEMESTER)	BARNCH
1	Typical Gas Turbine Engine Maintenance	MECHANICAL
2	Aircraft (Hydraulic) Component Maintenance	MECHANICAL
3	Aircraft (landing gear) Component Maintenance	MECHANICAL
4	Aircraft wheels and Breaks - Component Maintenance	MECHANICAL
5	Aircraft Electrical Component Maintenance	AVIONICS
6	Aircraft Instruments Maintenance	AVIONICS
7	Aircraft communication and navigation system component maintenance	AVIONICS
8	Typical Aircraft Maintenance – Avionics Fixed wing Aircraft - Fly by wire)	AVIONICS

Note: Student have to opt any one subject from above mentioned list of subjects