

**STATE COUNCIL OF TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA
TEACHING AND EVALUATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES**

DISCIPLINE: AERONAUTICAL ENGINEERING										SEMESTER: 4TH		
SL NO	SUBJECT CODE	SUBJECT	PERIODS			EVALUATION SCHEME						
			L	T	P	INTERNAL EXAM			END SEM EXAM	TERM WORK	PRACTICAL EXAM	TOTAL MARKS
						TA	CT	Total				
THEORY												
1.	ANT 401	AIRCRAFT MATERIAL	3	1	-	10	20	30	70			100
2.	ANT 402	BASIC ENGINE(PISTON ENGINE)	3	1		10	20	30	70			100
3.	ANT 403	AIRCRAFT STRUCTURE	4	1	-	10	20	30	70			100
4.	ANT 404	BASIC AERODYNAMICS	4	0	-	10	20	30	70			100
5.	ANT 405	HUMAN FACTOR AND A/C RULES AND REGULATION	3	1	-	10	20	30	70			100
PRACTICAL/TERM WORK												
6.	ANP 401	MATERIAL TESTING AND NDT TEST	0	0	3					25	25	50
7.	ANP 402	PISTON ENGINE LAB	0	0	3					25	25	50
8.	ANP 403	AIRCRAFT STRUCTURE SERVICING LAB	0	0	3					25	25	50
9.	ANP 404	COMPUTER LAB	0	0	3					25	25	50
10.	ANP 405	TECHNICAL SEMINAR	0	0	3					25		25
11.	ANP 406	PROJECT-1	0	0	3					25		25
GRAND TOTAL			17	4	18	50	100	150	350	150	100	750

Total Contact hours per week: 39

Abbreviations: L-Lecture, T-Tutorial, P-Practical, TA- Teacher's Assessment, CT- Class test

Minimum Pass Mark in each Theory Subject is 35% and in Practical subject is 50%

AIRCRAFT MATERIAL

Name of the Course: Diploma in AERONAUTICS ENGINEERING			
Course code:	ANT 401	Semester	4 th
Total Period:	60	Examination	3 hrs
Theory periods:	3 P/W	Class Test:	20
Tutorial:	1 P/W	Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

Rationale :

Entire field of engineering deals with use of host of materials for making products for human consumption. These materials include wide spectrum of element, metals, alloys, polymers, ceramics and composite with diverse properties. It is imperative that an engineer from any field should have a good knowledge of such materials and their properties.

Topic wise distribution of periods

Sl. No.	Topics	Periods	Marks
1	Aircraft material-Ferrous	08	08
2.	Aircraft material-Non-Ferrous	08	07
3.	Composite and Non-Metallic	12	20
4.	Wodden structures	10	10
5.	Fabric covering	10	15
6.	Corrosion	12	20
	TOTAL	60	70

COURSE CONTENT

1.0 Aircraft Materials-Ferrous

- 1.1 Characteristics,properties and identification of common alloy steels used in aircraft.
- 1.2 Heat treatment and application of alloy steels.
- 1.3 Testing of ferrous materials for hardness,tensilestrength,fatigue strength

2.0 Aircraft Materials-Non -Ferrous

- 2.1 Characteristics,properties and identification of common non-ferrous materials used in aircraft
- 2.2 Heat treatment and application of non-ferrous materials
- 2.3 Testing of non- ferrous materials for hardness,tensilestrength,fatigue strength

3.0 Composite and Non -metallic

- 3.1 Characteristics,properties and identification of common composite and non-metallic materials,other than wood used in aircraft.
- 3.2 Sealent and bonding agent
- 3.3 The detection of defects/deterioration in composite and non-metallic
- 3.4 Repair of composite and non-metallic

4.0 Wooden structures

- 4.1 Construction methods of wooden airframe structures
- 4.2 Characteristics,properties and types of wood and glue used inaeroplanes
- 4.3 Preservation and maintenance ofwooden structure
- 4.4 Types of defects in wood material and in wooden structure

5.0 Fabric covering

- 5.1 Characteristics,properties and types offabricusedinaeroplanes
- 5.2 Inspections methods for fabric

5.3 Types of defectin fabric and repair of fabric covering

6.0 Corrosion

- 6.1 chemical fundamentals
- 6.2 formation by galvanic action process, microbiological, stress
- 6.3 Types of corrosion and their identification
- 6.4 Causes of corrosion
- 6.5 Material types susceptibility to corrosion

Learning Resources:

Text Books

Sl.No	Name of Authors	Title of the Book	Name of the publisher
1.	Tittertion	Aircraft Materials And Processes	
2.		Civil Aircraft inspection Procedure (CAP-459-PART-1,BASIC)	

BASIC ENGINE (PISTON ENGINE)

Name of the Course: Diploma in AERONAUTICS ENGINEERING			
Course code:	ANT 402	Semester	4 th
Total Period:	60	Examination	3 hrs
Theory periods:	3 P/W	Class Test:	20
Tutorial:	1 P/W	Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

Objective :

After completion of the study of Basic Engine(PISTON Engine) the student will be able:

- I. To know about the detailed structure of Engine and its types and working principle.
- II. To know about the various parts of Engine.
- III. To know about the engine fuel mechanism.
- IV. To know about the starting and ignition system and induction, exhaust and cooling system.

Topic wise distribution of periods

Sl. No.	Topics	Periods	Marks
1	Fundamentals	08	08
2.	Engine construction	15	20
3.	Engine fuel system	10	15
4.	Starting and ignition system	10	12
5.	Induction ,Exhaust And cooling system	10	15
6.	Lubrications and fuels	07	10
	TOTAL	60	70

1. FUNDAMENTALS

- 1.1 Mechanical, thermal and volumetric efficiencies
- 1.2 Operating principles of 2stroke,4stroke,Otto and Diesel Engine
- 1.3 Piston displacement and compression ratio
- 1.4 Engine configuration and firing order

2. ENGINE CONSTRUCTION

- 2.1 Crank case,crankshaft,cam shafts sumps
- 2.2 Accessory gearbox
- 2.3 cylinder and piston assemblies
- 2.4 Connecting rods,inlet and exhaust manifolds
- 2.5 valve mechanism

3. ENGINE FUEL SYSTEM

- 3.1 Carburettors
- 3.2 Types,construction and principles of operation of carburettors
- 3.3 Fuel injection systems
- 3.4 Types,constructionandprinciles of operation of Fuel injection systems

4. STARTING AND IGNITION SYSTEM

- 4.1 Starting system,pre heat system
- 4.2 Magneto types,construction and principles of opretion
- 4.3 Ignition harness,sparkplug
- 4.4 Low and high tension system

5.INDUCTION ,EXHAUST AND COOLING SYSTEM

- 5.1 Construction and operation of induction systems including alternate air system
- 5.2 Exhaust systems, engine cooling system-air and liquid

6.LUBRICANTS AND FUELS

- 6.1 properties and specifications
- 6.2 fuel additives

6.3 safety precautions

Learning Resources:

Text Books

Sl.No	Title of the Book
1.	Airframe and powerplant Mechanics (general handbook EA-AC 65-9A)
2.	Airframe and powerplant Mechanics (EA-AC 65 -12A) Power plant handbook)

AIRCRAFT STRUCTURE

Name of the Course: Diploma in AERONAUTICS ENGINEERING			
Course code:	ANT 403	Semester	4 th
Total Period:	75	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:	1 P/W	Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

Objectives :

After completion of the study of Aircraft Structure the student will be able:

1. Know about the Construction and assembly techniques of fuselage.
2. Know about Construction and assembly techniques of wings
3. Know about the stabilisers and flight control surfaces
4. Know about the Nacelles and weight and balancing of A/C.

Topic wise distribution of periods

Sl. No.	Topics	Periods	Marks
1	Introduction	10	10
2.	Fuselage	14	15
3.	Construction and assembly techniques of fuselage	12	10
4.	Wings	08	15
5.	Stabilisers and Flight control surface	08	15
6.	Nacelles/Pylons, Weight and balancing	08	15
	TOTAL	60	70

1.0 INTRODUCTION

- 1.1 Structural classification-primary, secondary and tertiary
- 1.2 Fail safe, safe life, damage tolerance
- 1.3 Zonal and station identification system
- 1.4 Stress, strain, bending, compression, shear, torsion, tension, hoop
- 1.5 Drains and ventilation provisions
- 1.6 System installation provision
- 1.7 Aircraft bonding and lightning strike protection provision

2.0 FUSELAGE

- 2.1 Construction and pressurization sealing
- 2.2 Wing, stabilizer, pylon and under carriage attachments
- 2.3 Seat installation and cargo loading system.
- 2.4 Doors and emergency exits. Construction, mechanisms, operation and safety device
- 2.5 Windows and windscreen, construction and mechanisms

3.0 CONSTRUCTION AND ASSEMBLY TECHNIQUES OF FUSELAGE

- 3.1 construction methods of stress skin fuselage, former, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structure, reinforcement, methods of skinning, anti-corrosive protection, wing, empennage and engine attachments
- 3.2 Structure assembly techniques-riveting, bolting, bonding
- 3.3 Methods of surface protection-chromating, anodizing, painting
- 3.4 Surface cleaning

3.5 Airframe symmetry-methods of alignment and symmetry checks

4.0 WINGS

- 4.1 Construction
- 4.2 fuel storage
- 4.3 landing gear ,pylon,control surface and high lift/drag attachments

5.0 Stabilisers and Flight control surface

- 5.1 construction,control surface attachment(stabilisers)
- 5.2 construction and attachment of flight control surface
- 5.3 balancing-mass and aerodynamic
- 5.4 Mechanism of N2 fixation.

6.0 Nacelles/Pylons, Weight and balancing

- 6.1 construction
- 6.2 firewall
- 6.3 Engine mounts
- 6.4 Weighing of aircraft and its C.G balancing

Learning Resources:

Text Books

- Civil Aircraft inspection procedure(CAP 459-PART 1,BASIC)
- Standard Aircraft Handbook(5th Edition)-larryreithmaier

BASIC AERODYNAMICS

Name of the Course: Diploma in AERONAUTICS ENGINEERING			
Course code:	ANT 404	Semester	4 th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

Objective :

On completion of studies of Basic Aerodynamics the student will be able to

1. understand and explain the physics of atmosphere
2. To know about various types of terminology.
3. Understand the principle of Theory of flight.
4. Understand the principle of rotary wing –aeroplane&flight control.
5. understand the principles of Hi-speed flight

Topic wise distribution of periods

Sl. No.	Topics	Periods	Marks
1	Physics of the Atmosphere	05	05
2.	Aerodynamics	14	20
3.	Theory of flight	13	15
4.	Flight stability and dynamics	10	15
5.	Aeroplane-rotary wing aerodynamics and flight control	10	15
6.	Hi-speed flight	08	10
	TOTAL	60	70

Sl. No.	Name of the Topics
1	PHYSICS OF THE ATMOSPHERE 1.1 International standard Atmosphere (ISA) 1.2 Application to Aerodynamics
2.	AERODYNAMICS 2.1 Airflow around a body 2.2 Boundary layer, laminar and turbulent flow, free stream flow, relative airflow, up wash and down wash, vortices, stagnation 2.3 The term-camber, chord, mean aerodynamics chord, centre of pressure, drag, lift etc. 2.4 Angle of attack, wash in and wash out, finessratio, wing shape and aspect ratio 2.5 Thrust, weight, aerodynamic Resultant 2.6 Generation of lift and drag-Angle of attack , lift coefficient, drag coefficient, polar curve ,stall. 2.7 aerofoil contamination including ice, snow
3.	THEROY OF FLIGHT 3.1 Relationship between lift,weight,trust and drag:glide ratio 3.2 steady state flight,performance 3.3 Theory of turn 3.4 Influnce of load factor :stall,flight envelope and structural limitation 3.5 Lift augmentation

4. **FLIGHT STABILITY AND DYNAMICS**
 - 4.1 Longitudinal stability
 - 4.2 Lateral stability
 - 4.2 Directional stability(active and passive)
5. **AEROPLANE-ROTARY WING AERODYNAMICS AND FLIGHT CONTROL**
 - 5.1 Operation and effect of:rollcontrol,aileron and spoilers;pitchcontrol,elevators,stipulators,variableincidence,stabilizers and canards.
 - 5.2 Yaw control:rudderlimlters,controls using elevons,ruddervators.
 - 5.3 High lift devices:slotslats,flaps
 - 5.4 Drag inducing Devices: spoilers,liftdumpers,speedbrakers.
 - 5.5 Operation and effect of various types of tabs and control surfaces
 - 5.6 Rotary Wing-Terminology, operation and effect of cyclic collective and anti
6. **HIGH-SPEED FLIGHT**
 - 6.1 Speed of sound subsonic flight,transonic flight, super sonic flight
 - 6.2 Mach number and critical mach number

Learning Resources:

Text Books

1. Civil Aircraft inspection procedure(CAP 459-PART 1,BASIC)
2. Standard Aircraft Handbook(5th Edition)-larryreithmaier

HUMAN FACTOR AND A/C RULES AND REGULATION

Name of the Course: Diploma in AERONAUTICS ENGINEERING			
Course code:	ANT 405	Semester	4 th
Total Period:	60	Examination	3 hrs
Theory periods:	3P/W	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

Objective :

On completion of studies of Human factor the student will be able to

1. know about the human performance and limitation.
2. know about the factor effecting performance & social psychology.
3. know about the Human error & Hazard in the work place.

Topic wise distribution of periods

Sl. No.	Topics	Periods	Marks
1	General	06	05
2.	Human performance and limitation	08	10
3.	Social psychology	10	15
4.	Factor affecting performance`	08	10
5.	Physical Environment	04	05
6.	Tasks and communication	06	05
7.	Human Error and Hazards in the work place	06	05
8.	Aircraft rule and regulation	12	25
	TOTAL	60	70

CONTENTS: Theory

Sl. No.	Name of the Topics
1	GENERAL 1.1 The need to take human factors into account: incidents attributable to human factors/human errors 1.2 Murphy law
2.	HUMAN PERFORMANCE AND LIMITATION 2.1 Vision, Hearing, information processing 2.2 Attention and perception 2.3 Memory, claustrophobia and physical access
3.	SOCIAL PSYCHOLOGY 3.1 Responsibility: individual and group 3.2 Motivation and De motivation 3.3 peer pressure, 'culture' issue 3.4 Teamworking, management, supervision, and leadership
4.	FACTORS AFFECTING PERFORMANCE 4.1 Fitness/Health; stress: Domestic and work related 4.2 Time pressure and deadlines 4.3 Work load: over load and under load 4.4 sleep and fatigue, shift work

4.5 Alcohol, medication, drug abuse

5. **PHYSICAL ENVIRONMENT**

5.1 Noise and fumes

5.2 illumination, climate and temperature

5.3 Motion and vibration, working environment

6. **TASKS AND COMMUNICATION**

6.1 physical work, repetitive work

6.2 Visual inspection and complex systems

6.3 within and between teams communication, work logging and recording

6.4 keeping up to date, currency. Dissemination of information

7. **HUMAN ERROR AND HAZARDS IN THE WORK PLACE**

7.1 Error models and theories

7.2 Types of error in maintenance tasks

7.3 Implication of errors (i.e. accidents), avoiding and managing errors

7.4 Recognising and avoiding hazards, Dealing with emergencies

8 **AIRCRAFT RULES AND REGULATION**

8.1 Basic knowledge of A/C Rules and regulation

Learning Resources:

Text Books:

1. A/C Rules and Regulation manual
2. Human factor handbook

MATERIAL TESTING AND NDT TEST

Name of the Course: Diploma in AERONAUTICS ENGINEERING			
Course code:	ANP 401	Semester	4 th
Total Period:	45	Examination	4 hrs
Lab. periods:	3 P/W	Term Work	25
Maximum marks:	50	End Semester Examination:	25

TECHNICAL SEMINAR

Name of the Course: Diploma in AERONAUTICS ENGINEERING			
Course code:	ANP 405	Semester	4 th
Total Period:	45	Examination	4 hrs
Lab. periods:	3 P/W	Term Work	25
Maximum marks:	50	End Semester Examination:	25

COURSE CONTENT:

1.0 Classes should be divided into smaller groups of not more than four in each group. One group should be assigned a topic for the Seminar. The topic should be usually related to their course of studies or should be of general interest. Every student of the group should prepare on a particular aspect of the main topic with active support and guidance from a teacher guide. The student should be encouraged to extensively use the library facilities and also to collect relevant material from different Technical magazines and journals. Each student should be usually asked to present his paper on the topic of the Seminar within 15 minutes after which a question answer session may follow for 5 minutes. Sr. faculty member should preside over the Seminar and ensure its smooth conduct. The student should be encouraged to use Audio-Visual Aids and other modern teaching methods during presentation of the topics in the Seminar. The Chairman should give the valedictory address and offer suggestions for quality improvement of the Seminar. Each student should at least speak for a minimum of three times during the year.

2.0 The students should be encouraged to collect newspaper clippings and magazine cuttings on emerging technology to be displayed on the date of the seminar.

3.0 The Sessional records should be maintained and evaluated by a team of faculty members and the final marks awarded by the team.