

4.1 GENERIC SKILLS AND ENTREPRENEURSHIP DEVELOPMENT

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RATIONALE

Generic Skills and Entrepreneurship Development is one of the courses from “Human Science” subject area. Generic skills have emerged as an important component of employability skills, which enable an individual to become and remain employable over lifetime and to lead happy and prosperous life. Entrepreneurship development aim at developing conceptual understanding for setting-up one’s own business venture/enterprise. This aspect of Human Resource Development has become equally important in the era, when wage employment prospects have become meager.

Both the subject areas are supplementary to each other and soft skills are required to be developed in diploma passouts for enhancing their employability and self confidence.

DETAILED CONTENTS

1. Introduction to Generic Skills (4 hrs)
 - 1.1 Importance of Generic Skill Development (GSD)
 - 1.2 Global and Local Scenario of GSD
 - 1.3 Life Long Learning (LLL) and associated importance of GSD.
2. Managing Self (8 hrs)
 - 2.1 Knowing Self for Self Development
 - Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc.
 - 2.2 Managing Self - Physical
 - Personal grooming, Health, Hygiene, Time Management
 - 2.3 Managing Self – Intellectual development
 - Information Search: Sources of information
 - Listening: Effective Listening
 - Speaking: Effective Oral Communication
 - Reading: Purpose of reading, different styles of reading, techniques of systematic reading; Note Taking: Importance and techniques of note taking
 - Writing: Correspondence - personal and business

Note: Practical sessions should be coupled with teaching of effective listening, speaking, reading and writing.

2.4 Managing Self – Psychological

- Stress, Emotions, Anxiety-concepts and significance (Exercises related to stress management)
- Techniques to manage the above

3. Managing in Team (6 hrs)

- 3.1 Team - definition, hierarchy, team dynamics
- 3.2 Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background
- 3.3 Communication in group - conversation and listening skills

4 Task Management (3 hrs)

- 4.1 Task Initiation, Task Planning, Task execution, Task close out
- 4.2 Exercises/case studies on task planning towards development of skills for task management

5. Problem Solving (5 hrs)

- 5.1 Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving
- 5.2 Different approaches for problem solving.
- 5.3 Steps followed in problem solving.
- 5.4 Exercises/case studies on problem solving.

6. Entrepreneurship

6.1 Introduction (22 hrs)

- Concept/Meaning and its need
- Competencies/qualities of an entrepreneur
- Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level.

6.2 Market Survey and Opportunity Identification (Business Planning)

- How to start a small scale industry
- Procedures for registration of small-scale industry
- List of items reserved for exclusive manufacture in small-scale industry
- Assessment of demand and supply in potential areas of growth.
- Understanding business opportunity

- Considerations in product selection
- Data collection for setting up small ventures.

6.3 Project Report Preparation

- Preliminary Project Report
- Techno-Economic Feasibility Report
- Exercises on Preparation of Project Report in a group of 3-4 students

INSTRUCTIONAL STRATEGY

This subject will require a blend of different teaching and learning methods beginning with lecture method. Some of the topics may be taught using question answer, assignment, case studies or seminar. In addition, expert lectures may be arranged from within the institution or from management organizations. Conceptual understanding of Entrepreneurship, inputs by teachers and outside experts will expose the students so as to facilitate in starting ones own business venture/enterprise. The teacher will discuss success stories and case studies with students, which in turn, will develop managerial qualities in the students. There may be guest lectures by successful diploma holding entrepreneurs and field visits also. The students may also be provided relevant text material and handouts.

RECOMMENDED BOOKS

1. Soft Skills for Interpersonal Communication by S. Balasubramanian Published by Orient BlackSwan, New Delhi.
2. Generic skill Development Manual, MSBTE, Mumbai.
3. Lifelong learning, Policy Brief (www.oecd.org)
4. Lifelong learning in Global Knowledge Economy, Challenge for Developing Countries – World Bank Publication
5. Towards Knowledge Society, UNESCO Paris Publication
6. Your Personal Pinnacle of Success by DD Sharma, Sultan Chand and Sons, New Delhi
7. Human Learning, Ormrod
8. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
9. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
10. Handbook of Small Scale Industry by PM Bhandari

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	4	5
2.	8	15
3.	6	10
4.	3	10
5.	5	10
6.	22	50
Total	48	100

4.2 MECHANICS OF FLIGHT

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4 - 2

RATIONALE

An aircraft is capable of flying in spite of its large weight. It has particular shape and becomes air born with certain speeds. In order to appreciate the principles involved in flying, it is essential to gain knowledge and skill in the area of mechanics of fluids applied to flying.

DETAILED CONTENTS

1. Introduction (10 hrs)

Definition and importance of the subject, recapitulation of the names of the major components of the airplane, approach in flight mechanics, forces acting on an airplane in flight, body axes system for an airplane, special features of flight mechanics.

2. Atmosphere characteristics (14 hrs)

Earth's atmosphere: earth's atmosphere, the troposphere, the stratosphere, the mesosphere, the ionosphere or thermosphere, the exosphere, International standard atmosphere (ISA): need for ISA and agency prescribing it, features of ISA, Variations of properties with altitude in ISA: variations of pressure and density with altitude, variations with altitude of pressure ratio, density ratio speed of sound, geopotential altitude

3. Aircraft Properties (12 hrs)

Airplane as a rigid body, the airplane as a dynamic system, equilibrium conditions, static stability conditions, airplane dynamics, airplane control, aerodynamic properties of wing and its geometry

4. Airfoil characteristics (04 hrs)

Airfoil terminology, nomenclature of airfoil, Type of airfoil, aerodynamic centre of airfoil, pressure distribution

5. Drag estimation (12 hrs)

Aerodynamics drag, dimensional analysis, potential flow, induced drag, flow of viscous fluid, parasite drag, and flow of a compressible fluid, aerodynamic data, section characteristics, plan form characteristics, high lift and control devices, determination of three dimensional wing data, estimation of airplane drag, low & high speed drag estimation

6. Airplane performance (12 hrs)

Performance computation, generalized performance method, compressibility speed correction, range and endurance, take – off and landing distances, acceleration in climb, turning performance, design performance, propeller charts

LIST OF PRACTICALS

- 1) Determination of angle of attack for cambered airfoil and symmetric airfoil
- 2) Study and demonstration of location of aerodynamic centre of cambered airfoil and symmetric airfoil
- 3) Study and demonstration of the location of various high lifting devices
- 4) Study and demonstration of aircraft control system model

INSTRUCTIONAL STRATEGY

1. Teachers should lay special emphasis in making the students conversant with concepts, principles, procedures and practices related to various characteristics.
2. Focus should be laid in preparing jobs using various machines/equipment in the workshop.
3. Use of audio-visual aids/video films should be made to show specialized operations.

RECOMMENDED BOOKS

- 1) Mechanics of flight by A C Kermode; Pearson education Singapore pte ltd
- 2) Airplane Performance Stability and Control by Perkins C.D. and Hage, R.E.; John Wiley & son Inc., New York, 1988
- 3) Aircraft Dynamic Stability and Response by Babister, A.W.; Pergamon Press, Oxford, 1980.
- 4) Aeroplane Aero dynamics, Third Edition by Dommasch D.O., Shelby S.S. and Connolly, T.F.
- 5) Mechanics of Flight by A.C. Karmod
- 6) Flight Mechanics by John D. Anerson

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	16
2	14	22
3	12	18
4	04	08
5	12	18
6	12	18
Total	64	100

4.3 AIRCRAFT PROPULSION

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4 - 2

RATIONALE

The diploma holders in aeronautical engineering must have knowledge and skill about the propulsion system of an aircraft. This subject has been designed for the full basics about the knowledge of different types of engines which are used in aircraft system.

DETAILED CONTENTS

1. Steady 1-Dimensional flow (07 hrs)

One dimensional flow of a perfect gas, isentropic flow, non-isentropic flow, frictionless constant area flow, constant area flow with friction and without friction

2. Introduction to aircraft propulsion (07 hrs)

Introduction to propulsion, basic thermodynamics, fundamental equations, types of aircraft engines, performance parameters, thrust equation, factors affecting thrust and efficiencies.

3. Aircraft piston engine (08 hrs)

The internal combustion engine process, spark ignition and compression ignition, (SI and CI) engines, 4-stroke and 2-stroke engines, combustion processes, various types of arrangements for multi cylinder aircraft engines, Intake and Exhaust manifolds, Indicated Horse Power (IHP), Brake Horse Power (BHP) and Shaft Horse power (SHP) Engine performance, Effect of altitude and speed

4. Fundamentals of Gas Turbine Engines (07 hrs)

Working principle of gas turbine engine, gas turbine cycle, turboprop, turbofan and turbo jet engines, thrust and efficiency, methods of thrust augmentation, engine performance characteristics

5. Compressor (08 hrs)

Introduction of compressor, types of compressor, centrifugal compressor, axial flow compressor, defects occurred in compressor, advantage and disadvantages of centrifugal and axial flow compressor

6. Aircraft Gas Turbine Engine (07 hrs)

Compressor and turbine work, compressor and turbine efficiencies, general layout, gas flow diagram, engine intake and exhaust nozzles, after burner arrangements for thrust augmentation

7. Gas Turbine Systems and Components (10 hrs)

Fuel system components, various types of fuel systems, lubricating oils and lubricating systems, secondary air systems, arrangements of bleeding of compressor air for aircraft pressurization and oxygen systems, engine starting systems

8. Expansion process (10 hrs)

Turbine and its action, constructional details of turbine, materials of construction, general arrangement of turbo-prop and turbo-shaft engines, High and Low by pass ratio, turbo-fan engines, dual shaft gas turbine engines, its merits over single shaft engines

LIST OF PRACTICALS

- 1) Study and demonstration of an aircraft piston engine
- 2) Study and demonstration of forced convective heat transfer over a flat plate
- 3) Study and demonstration of performance of a propeller
- 4) Measurement of nozzle flow
- 5) Study and demonstration of combustion chamber
- 6) Study and demonstration of axial flow compressor
- 7) Study and demonstration of fuel-injection characteristics

INSTRUCTIONAL STRATEGY

1. Teaches should take the students to industry and explain the details of propulsion systems and their components.
2. While imparting instructions, focus should be on conceptual understanding.
3. Training slides of “Carrier Fundamentals of Aircraft propulsion” to be shown to students.

RECOMMENDED BOOKS

- 1) Gas Turbine Theory by Cohen, H. Rogers, G.F.C. and Saravanamuttoo; H.I.H Longman, 1989.
- 2) Gas Turbine, Jet and Rocket Propulsion by Mathur M.L. and Sharma, R.P; Standard Publishers & Distributors, Delhi, 1999
- 3) Mechanics and Thermodynamics of Propulsion by Hill P.G. and Peterson, C.R. Addison; WesleyLongman INC, 1999

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	07	11
2	07	11
3	08	12
4	07	11
5	08	12
6	07	11
7	10	16
8	10	16
Total	64	100

4.4 STRENGTH OF MATERIALS

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4 - 2

RATIONALE

Diploma holders in this course are required to analyze reasons for failure of different components and select the required material for different applications. For this purpose, it is essential to teach them concepts, principles, applications and practices covering stress, strain, bending moment, shearing force, shafts, columns and springs. It is expected that efforts will be made to provide appropriate learning experiences in the use of basic principles in the solution of applied problems to develop the required competencies.

DETAILED CONTENTS

1. Stresses and Strains (08 hrs)
 - 1.1. Concept of load, stresses and strain
 - 1.2. Tensile compressive and shear stresses and strains
 - 1.3. Concept of Elasticity, Elastic limit and limit of proportionality.
 - 1.3.1. Hook's Law
 - 1.3.2. Young Modulus of elasticity
 - 1.3.3. Nominal stress
 - 1.3.4. Yield point, plastic stage
 - 1.3.5. Ultimate strength and breaking stress
 - 1.3.6. Percentage elongation
 - 1.3.7. Proof stress and working stress
 - 1.3.8. Factor of safety
 - 1.3.9. Shear modulus
 - 1.4. Longitudinal and circumferential stresses in seamless thin walled cylindrical shells (derivation of these formulae not required)
2. Resilience (04 hrs)
 - 2.1. Resilience, proof resilience and modulus of resilience
 - 2.2. Strain energy due to direct stresses
 - 2.3. Stresses due to gradual, sudden and falling load.
3. Moment of Inertia (10 hrs)
 - 3.1. Concept of moment of inertia and second moment of area
 - 3.2. Radius of gyration
 - 3.3. Theorem of perpendicular axis and parallel axis (without derivation)
 - 3.4. Second moment of area of common geometrical sections :Rectangle, Triangle, Circle (without derivation); Second moment of area for L,T and I section
 - 3.5. Section modulus
4. Bending Moment and Shearing Force (10 hrs)

- 4.1 Concept of beam and form of loading
- 4.2 Concept of end supports-Roller, hinged and fixed
- 4.3 Concept of bending moment and shearing force
- 4.4 B.M. and S.F. Diagram for cantilever and simply supported beams with and without overhang subjected to concentrated and U.D.L.

5. Bending stresses (06 hrs)
 - 5.1 Concept of Bending stresses
 - 5.2 Theory of simple bending
 - 5.3 Use of the equation $f/y = M/I = E/R$
 - 5.4 Concept of moment of resistance
 - 5.5 Bending stress diagram
 - 5.6 Calculation of maximum bending stress in beams of rectangular, circular, and T section.
 - 5.7 Permissible bending stress Section modulus for rectangular, circular and symmetrical I section.

- 6 Columns (08 hrs)
 - 6.1 Concept of column, modes of failure
 - 6.2 Types of columns
 - 6.3 Buckling load, crushing load
 - 6.4 Slenderness ratio
 - 6.5 Factors effecting strength of a column
 - 6.6 End restraints
 - 6.7 Effective length
 - 6.8 Strength of column by Euler Formula without derivation
 - 6.9 Rankine Gourdan formula (without derivation)

7. Torsion (10 hrs)
 - 7.1 Concept of torsion- difference between torque and torsion.
 - 7.2 Use of torque equation for circular shaft
 - 7.3 Comparison between solid and hollow shaft with regard to their strength and weight.
 - 7.4 Power transmitted by shaft
 - 7.5 Concept of mean and maximum torque

8. Springs (8 hrs)
 - 8.1 Closed coil helical springs subjected to axial load and impact load
 - 8.2 Stress deformation
 - 8.3 Stiffness and angle of twist and strain energy
 - 8.4 Proof resilience
 - 8.5 Laminated spring (semi elliptical type only)
 - 8.6 Determination of number of plates

LIST OF PRACTICALS

1. Tensile test on bars of Mild steel and Aluminium.
2. Bending tests on a steel bar or a wooden beam.
3. Impact test on metals
 - a) Izod test
 - b) Charpy test
4. Torsion test on specimens of different metals for determining modulus of rigidity.
5. To determine the stiffness of a helical spring and to plot a graph between load and extension.
6. Hardness test on different metals.

INSTRUCTIONAL STRATEGY

1. Expose the students to real life problems.
2. Plan assignments so as to promote problem solving abilities and develop continued learning skills.

RECOMMENDED BOOKS

1. SOM by Birinder Singh; Katson Publishing House, New Delhi.
2. SOM by RS Khurmi; S. Chand & Co; New Delhi
3. Elements of SOM by D.R. Malhotra & H.C.Gupta; Satya Prakashan, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	12
2	04	06
3	10	16
4	10	16
5	06	10
6	08	12
7	10	16
8	08	12
Total	64	100

4.5 AIRCRAFT TESTING & MEASUREMENT

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RATIONALE

Diploma holder in aeronautical engineering must have a sound knowledge of basics involved in measurements besides knowledge of various aircraft testings. This subject is designed to give them an insight into typical systems so that they understand their principles of working.

DETAILED CONTENTS

1. Introduction (08 hrs)

Definition of metrology, standard of measurement, types of errors - controllable and random errors, precision, accuracy, sensitivity, hysteresis, response time, repeatability, calibration, uncertainty of measurement, interchangeability, standardization and standardizing organizations.

2. Linear Measurement (14 hrs)

Construction features and use of instruments for non-precision linear measurement: steel rule, callipers, surface plate, angle plate, V-block, construction features and use of instruments for precision measurements : verniercalipers, vernier height and depth gauges, micrometers, Slip gauges, Indian standards of slip gauges, sets of slip gauges, use of slip gauges, cylinder bore gauges, feeler and wire gauges, checking flatness, roundness and squareness.

3. Measurements of Screw Threads and Gauges (12 hrs)

Measurement of screw threads- Introduction, measurements of external and core diameters, checking of pitch and angle of threads with gauges, Measurements of gears (spur) – Measurement of tooth thickness, pitch, Profile projector, Coordinate Measuring Machine (CMM), Tool maker's microscope.

4. Angular Measurement (11 hrs)

Comparators – Characteristics, uses, working principles of different types of comparators: mechanical, electrical, electronics and pneumatic, construction and use of instruments for angular measurements: bevel protector, sine bar, angle gauges, and clinometer, angle dekker. Optical instruments for angular measurement, auto collimator.

5. Instrumentation (11 hrs)

Various types of instruments used for mechanical quantities such as displacement, velocity, acceleration, speed and torque. Use of transducers and electronic counters, stroboscope, vibrating reeds and tachometers, strain gauge – use of strain gauge and load cells

6. Aircraft Testing (8 hrs)

Importance of testing of various systems of aircraft and aero-engines. Testing of airspeed, pressure and temperature at various altitudes. structural loads in the wings and fuselage including vibration levels. static and fatigue testing of aircraft, measurement of angle of attack, noise levels (interior and exterior), internal temperature (in cabin and cargo components), aircraft control deflections (stick/yoke, rudder pedal and throttle position).

LIST OF PRACTICALS

1. To study revolution per minute (RPM) measurement of propeller using tachometer
2. Study and demonstration of various types of flight instruments
3. Use of strain gauges
4. Measurement of force, torque and power
5. Measurement of flow
6. Measurement of pressure
7. Measurement of acoustics
8. Measurement of temperature

INSTRUCTIONAL STRATEGY

1. Demonstrate use of various measuring instruments while imparting theoretical instructions.
2. Stress should be laid on correct use of various instruments.

RECOMMENDED BOOKS

1. Engineering Metrology by RK Jain; Khanna Publishers, New Delhi.
2. A Text Book of Production Engineering by RC Sharma; S Chand and Company, New Delhi.
3. Engineering Metrology by RK Rajput; SK Kataria and Sons, Ludhiana.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	12
2	14	20
3	12	18
4	11	16
5	11	16
6	08	18
Total	64	100

4.6 AIRCRAFT SYSTEMS

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4 - 2

RATIONAL

Diploma holder in aeronautical engineering must have a sound knowledge of various mechanical and electrical systems which go in the airframe. This subject is designed to give them an insight into typical systems so that they understand their principles of working

DETAILED CONTENTS

1. Hydraulic system: (10 hrs)

Advantages and disadvantages, types of circuit, flow through pipes, pumps and motors, static performance, actuators, seals and backup rings, reservoirs, accumulators, contamination control filters, tubings and hose pipes, indicating and warning systems, emergency and redundant systems valves, flow dividers and integrators, cooling systems

2. Servo-Control System: (7 hrs)

Stability and response, electro-hydraulic servo systems, position and force feedback, frequency response, principles of automatic control

3. Pneumatic Systems: (8 hrs)

Airconditioning and pressurisation systems, de-icing systems, heat loads, plumbing, cold air units, compact heat exchangers, valves, filters, air bottles, capsules and bellows, indication and warnings

4. Oxygen Systems: (8 hrs)

Gaseous and liquid oxygen systems, breathing masks, oxygen regulators, oxygen bottles, liquid to gas converters, emergency systems, pressure suits, indication and warnings

5. Landing Gear Systems: (8 hrs)

Types of landing gears and their design principles, shock absorbing devices, retracting mechanisms, wheels and brakes, antiskid system, steering systems, indications and warnings.

6. Fuel Systems: (7 hrs)

Types of fuels, their properties and testing, colour codes, fuel requirements, pumps, fuel transfer systems, fuel tanks, plumbing, valves, indications and warnings.

7. Lubrication Systems: (4 hrs)

Types of lubrication systems, lubricants, cleaning agents

8. Fire Protection Systems: (6 hrs)

Types of systems, Flame proofing, Fire walls, Fire detection systems, Fire extinguishing systems.

9. Seat Safety Systems: (6 hrs)

Ejection seats, Survival packs, Parachutes, Pilot's personal equipment, life rafts, Doors, Windows and Emergency exits, Seat belts.

LIST OF PRACTICALS

Study and demonstration of the following aircraft systems:

1. Study and demonstration of hydraulic system
2. Study and demonstration of Pneumatic system
3. Study and demonstration of Electrical system
4. Study and demonstration of basic control system
5. Study and demonstration of Fuel system

INSTRUCTIONAL STRATEGY

1. Teachers should take the students to industry and explain the details of hydraulic system and air-conditioning systems and their components.
2. While imparting instructions, focus should be on conceptual understanding.
3. Training slides of “Carrier Fundamentals of Refrigeration Air Conditioning” to be shown to students.

RECOMMENDED BOOKS

1. Jet Aircraft Power Systems by J V Casamassa and RD Bent; McGraw Hill.
2. Automatic Flight Control by E H J Pallet; BSP Profession Books.1993
3. Hydraulic System by Dr. Lalit Gupta
4. Pneumatic System by Dr. Lalit Gupta

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	18
2	07	10
3	08	13
4	08	13
5	08	12
6	07	10
7	04	06
8	06	09
9	06	09
Total	64	100

ENTREPRENEURIAL AWARENESS CAMP

This is to be organized at a stretch for two to three days during fourth semester. Lectures will be delivered on the following broad topics. There will be no examination for this subject

1. Who is an entrepreneur?
2. Need for entrepreneurship, entrepreneurial career and wage employment
3. Scenario of development of small scale industries in India
4. Entrepreneurial history in India, Indian values and entrepreneurship
5. Assistance from District Industries Centres, Commercial Banks, State Financial Corporations, Small industries Service Institutes, Research and Development Laboratories and other financial and development corporations
6. Considerations for product selection
7. Opportunities for business, service and industrial ventures
8. Learning from Indian experiences in entrepreneurship (Interaction with successful entrepreneurs)
9. Legal aspects of small business
10. Managerial aspects of small business

INDUSTRIAL TRAINING

Industrial Training aims at exposing the students to field practices, size and scale of operation and work culture at practical sites. For this purpose, students at the end of fourth semester are required to be sent for a period of 4 weeks to industry.

Each student is supposed to study the material and technology used at site and prepares a detailed report of the observation of process seen by him/her. These students should be supervised and guided by respective subject teachers. Each teacher may guide a group of four to five students.

The teacher along with field supervisors will conduct performance assessment of students. The components of evaluation will include the following.

a) Punctuality and regularity	15%
b) Initiative in learning new things	15%
c) Relationship with workers	15%
d) Industrial training report	55%

Note:

Students may be sent for industrial training at the following organizations:

- Aviation Clubs
- HAL
- NAL
- DRDO
- Airforce Station
- Airlines
- Aircraft Repair, Maintenance and Overhaul Workshops etc.