

**Curriculum for
Diploma Programme in
AIRCRAFT MAINTENANCE ENGINEERING
(AME)**



SIXTH SEMESTER

SIXTH SEMESTER (AIRCRAFT MAINTENANCE ENGINEERING)

Sr. No.	Subject	STUDY SCHEME			EVALUATION SCHEME						Total Marks
					Internal Assessment		External Assessment (Examination)				
		Th	Pr	Th	Pr	Th	Hrs.	Pr	Hrs.		
		Max. Marks	Max. Marks	Max. Marks	Hrs.	Max. Marks	Hrs.				
		Hrs/Week									
		L	T	P							
6.1	Turbo Propeller and Turbo Jet Engine – II	4	-	2	25	25	100	3	50	3	200
6.2	Aircraft Avionics	4	-	2	25	25	100	3	50	3	200
6.3	Aircraft Maintenance Practices	4	-	2	25	25	100	3	50	3	200
6.4	*Entrepreneurship Development and Management	3	-	-	25	-	100	3	-	-	125
6.5	Project-Oriented Professional Training	-	-	12	-	100	-	-	100	3	200
	* SOFT SKILL –IV	-	-	2	-	25	-	-	-	-	25
	Total	15	-	20	100	200	400	-	250	-	950

* Common with diploma programme in Mechanical Engineering

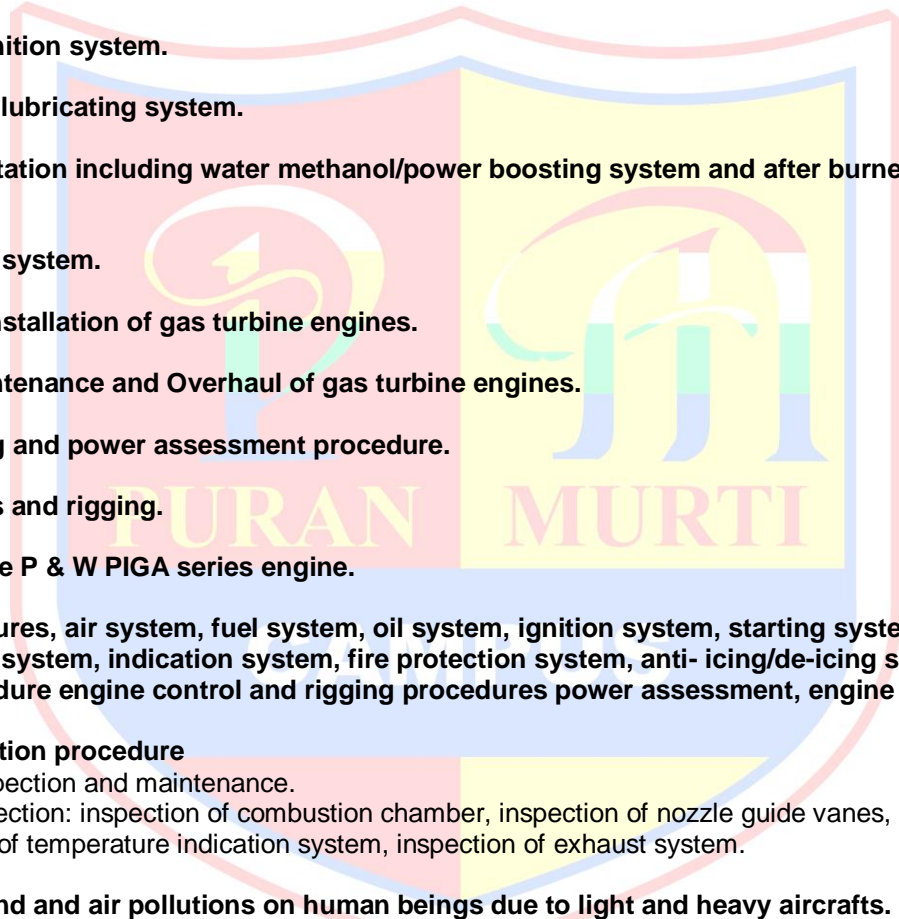
6.1 TURBO PROPELLER AND TURBO JET ENGINE - II

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RATIONALE

Turbo Propeller and Turbo Jet engine are also kinds of air craft engine. Knowledge of various kinds of engines used in air craft and inspection procedure is vary essential for maintenance personnel.

DETAILED CONTENTS

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1. Gas turbine fuels, fuel system & controls. (6 hrs)
 2. Starting and ignition system. (4 hrs)
 3. Lubricants and lubricating system. (2 hrs)
 4. Thrust augmentation including water methanol/power boosting system and after burner or reheat engines. (4 hrs)
 5. Thrust reversal system. (6 hrs)
 6. Dressing and installation of gas turbine engines. (6 hrs)
 7. Operation, Maintenance and Overhaul of gas turbine engines. (6 hrs)
 8. Ground running and power assessment procedure. (6 hrs)
 9. Engine controls and rigging. (4 hrs)
 10. Specific engine P & W PIGA series engine. (12 hrs)
- Construction features, air system, fuel system, oil system, ignition system, starting system, exhaust system, propeller system, indication system, fire protection system, anti- icing/de-icing system, engine installation procedure engine control and rigging procedures power assessment, engine trimming.
11. Engine inspection procedure (6 hrs)
 - a) Compressor inspection and maintenance.
 - b) Hot section inspection: inspection of combustion chamber, inspection of nozzle guide vanes, inspection of turbine, inspection of temperature indication system, inspection of exhaust system.
 12. Effects of sound and air pollutions on human beings due to light and heavy aircrafts. (2 hrs)

LIST OF PRACTICALS

1. Condition monitoring of a Jet Engine.
2. Inspection of accessories gear system.
3. Functional test of fuel system including fuel nozzle.
4. Functional check of temperatures indication system.
5. Rigging procedure of engine and propeller control.
6. Functional test of ignition igniter.

INSTRUCTIONAL STRATEGY

Teacher should introduce basic concepts and salient features of engine components of jet propelled engines which are operated in atmosphere to the students. They should familiarize students with advanced jet propulsion methods like hypersonic propulsion. Use simulation methods to demonstrate actual working of an engine. Teacher should discuss actual jet engine problems and their impact on engine performance.

RECOMMENDED BOOKS

1. . General Hand Books of Airframe and Power Plant Mechanics, U.S. Dept. of Transportation, Federal Aviation Administration, The English Book Store, New Delhi, 1995.
2. Aircraft Power Plants by Mekinley, J.L. and Bent, R.D; McGraw-Hill, 1993.
3. Gas Turbine Technology by Treager, S.; McGraw-Hill, 1997.
4. Airframe and Power Plant Mechanics (EA-AC 65-9A)-General Hand Book.
5. Mechanics & Thermodynamics of Propulsion by Hill, P.G. & Peterson, C.R.; Addison – Wesley Longman INC, 1999.
Aerospace Propulsion System by James Award
6. Gas Turbine Theory by Cohen, H. Rogers, G.F.C. and Saravana muttoo, H.I.H.; Longman, 1989.
7. Aero thermodynamics of Aircraft Engine Components by Oates, G.C.; AIAA Education Series, New York, 1985.
8. Jet Engine, 5th Edition by Rolls Royce; Rolls Royce Technical Publications, 2005.
9. Gas Turbine, Jet and Rocket Propulsion by Mathur, M.L. and Sharma, R.P.; Standard Publishers & Distributors, Delhi, 1999.
Aerospace Propulsion System by James Award.

SUGGESTED DISTRIBUTION OF MARKS Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
13	06	10
14	04	06
15	02	06
16	04	06
17	06	10
18	06	10
19	06	08
20	06	08
21	04	04
22	12	16
23	06	10
24	02	06

Total	64	100
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6.2 AIRCRAFT AVIONICS

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RATIONALE

An aircraft is capable of flying in spite of bad weather and several unfavourable conditions with the help of various instruments. In order to appreciate the principles involved in flying, it is essential to gain knowledge and skill in the area of all the instruments and equipments applied to flying.

DETAILED CONTENTS

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|---|-----------------|
| 1. Introduction to Avionics Sub Systems and Electronic Circuits
Typical avionics subsystems, amplifier, oscillator, aircraft communication system, transmitter, receiver, antenna. | (6 hrs) |
| 2. Avionics Technology
The nature of microelectronic devices: Processors , Memory devices , Digital data buses, Data bus examples – integration of aircraft systems , Regional aircraft/business jets, Fibre-optic buses , Avionics packaging – Line Replaceable Units ,Typical LRU architecture ,Environmental conditions , Integrated Modular Avionics | (12 hrs) |
| 3. Navigation System and Radar
Electrical diagram and identification scheme, circuit controlling devices, power utilisation-typical application to avionics, need for avionics in civil and military aircraft, gyroscopic versus inertial platform, structure of stable platform, inertial navigation units, inertial alignment, inertial interface system, importance of compass swing | (12 hrs) |
| 4. Electronic Flight Control System
Fly-by-wire system: - basic concept and features. Pitch and Roll rate: - command and response, control laws, frequency response of a typical Fly By Wire actuator, cooper harper scale, redundancy and failure survival, common mode of failures and effects analysis | (12 hrs) |
| 5. Flight Deck and Cockpits
Control and display technologies, Cathode Ray Tube, Light Emitting Diode and plasma panel - Touch screen - Direct voice input (DVI) – Civil cockpit and military cockpit: Multi function display, Head Up Display, Multi Function Keyboard | (12 hrs) |
| 6. Avionics Systems Integration
Avionics equipment fit, Electrical data bus system, communication systems, navigation systems, flight control systems, radar, electronic warfare, and fire control system, avionics system architecture–data buses MIL–STD 1553 B. | (10 hrs) |

LIST OF PRACTICALS

1. Study and demonstration of electronics flight systems.
2. Study and demonstration of communication and navigational systems.
3. Study and demonstration of Pitch and roll system.
4. Study and demonstration of amplifiers and oscillator of aircraft.
5. Study and demonstration of transmitters & antennas.

INSTRUCTIONAL STRATEGY

Teachers should:

1. Use computer based learning aids for effective teaching-learning
2. Expose students to real life problems
3. Plan assignments so as to promote problem solving abilities and develop continued learning skills

RECOMMENDED BOOKS

1. Introduction to Avionics Systems by R P G Collinson; Kulwar Academic Publishers, 2003
2. Aircraft Electrical System by E H J Pallett; Pitman Publishers, 1976
3. Avionics Systems by Middleton, D.H., Ed.; Longman Scientific and Technical Longman Group UK Ltd., England, 1989.
4. Digital Avionic Systems by Spitzer, C.R.; Prentice Hall, Englewood Cliffs, N.J., USA, 1987.
5. Navigation by R.B. Underdown & Tony Palmer; Black Well Publishing 2001.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	06	06
2.	12	20
3.	12	20
4.	12	20
5.	12	20
6.	10	14
Total	64	100

6.3 AIRCRAFT MAINTENANCE PRACTICES

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RATIONALE

The subject deals with the maintenance concepts and practices in general and as applicable to aeronautical field. The students will acquire knowledge and skill in the maintenance of aircraft and its system, controls and economics of maintenance. The teaching is to be practice- oriented.

DETAILED CONTENTS

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|---|----------|
| 1. Maintenance Schedules
Types of maintenance schedules, mandatory schedules, inspection of aircraft and components: types of inspections, various aircraft manuals, service letter and service bulleting, advisory circulars, repair, modifications, alteration, reconditioning, history record sheet. | (8 hrs) |
| 2. Maintenance of Radio and Communication Systems
Basics application and identification of electrical cables used in Aircraft radio installation, crimping and soldering techniques, bonding continuity and insulation tests. Composition, performance (stability and tolerance) and limitations of the fixed resistors and varistors (carbon composition, carbon film, wire wound and metallic film), AC and DC measuring instruments | (10 hrs) |
| 3. Engine Maintenance
Piston/Gas Turbines: Periodical servicing procedures, engine installation checks, control rigging, ground running checks, bleeding and performance checks. Engine on condition maintenance, Trouble shooting and rectification, Inspection after shock landing, Crack detection, Procedure for long and short terms storage of engine and accessories, engine preservation and depreservation. | (12 hrs) |
| 4. Maintenance of Airframe and Systems
Various types of structures in airframe construction, tubular, braced monocoque, semimonocoque, etc, longerons, stringers, formers, bulkhead, spars and ribs, honeycomb construction, airplane controls surfaces, Flying controls including power operated controls, hydraulic, pneumatic, landing gear various types, shock struts, nose wheel steering, ice and rain protection, fire detection warning and extinguishing, oxygen, air -conditioning and pressurization systems, wheels, tyres, brakes, antiskid system. | (10 hrs) |
| 5. Maintenance of Electrical and Instrument Systems
Airspeed indicator, altimeter, mach meter, gyroscope, turn and bank indicator, rate of climb and descent indicators, battery, basic elements of DC system, basic elements of AC systems. | (8 hrs) |
| 6. Quality and Airworthiness Assurance
Zero defect analogy, FMECA, fault tree analysis, bench marking, quality circles, quality audit. Quality standards: ISO 9000, AS9100, TQM, CMM, Six sigma, quality organizational set up in production/repair/operational set up. | (08 hrs) |
| 7. Civil aviation regulations | (08 hrs) |

DGCA(Directorate general of civil aviation) and FAA regulation: Licensing regulations, general regulations, operations regulations, airworthiness regulations, aviation safety regulations, air navigation regulations, aerodromes regulations

LIST OF PRACTICALS

Aircraft maintenance and overhaul lab experiments:

1. Marshaling signals/ground handling of aircraft.
2. Drawing of typical aircraft parts:
 - Drawing of various aircraft and engine parts like wings, fuselage, control surfaces, piston, crank shaft and valve mechanism etc.
 - Study of machine drawing and blue prints.
3. Maintenance of landing gear, removal and installation of tyres.
4. Maintenance of spark plugs.
5. Fueling, fuel sampling and testing.
6. Daily inspection of aircraft.
7. Identify Leakage in hydraulic system and its maintenance.
8. Calibration of pressure and temperature in hydraulic system.

INSTRUCTIONAL STRATEGY

Teacher should use experimental based learning for effective teaching-learning. They should be expose students to real life problems. Teacher should plan assignments so as to promote problem-solving abilities and develop continued learning skills among the students.

RECOMMENDED BOOKS

1. Aircraft Maintenance and Repair by Michael J. Kores and William A. Watkins; McGraw Hill.
2. Aircraft Instruments by E H J Pallet; Himalayan Book, New Delhi 1981.
3. Aircraft Instruments by C A Williams; Galgotia Publications, New Delhi 1973.
4. Instruments by R W Sloley and Coulthard.
5. Civil Aircraft Inspection Procedures (CAP 459) Pt II Aircraft; Himalayan Books
6. Airframe and Power Plant Mechanic (AC 65-15A) Airframe Hand Book; Himalayan Books.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	08	14
2.	10	16
3.	12	18
4.	10	16
5.	08	12
6.	08	12
7.	08	12
Total	64	100

6.4 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

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RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mindset with managerial skills helps the student in the job market. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

LEARNING OUTCOMES

After undergoing this course, the students will be able to :

- Know about various schemes of assistance by entrepreneurial support agencies
- Conduct market survey
- Prepare project report
- Explain the principles of management including its functions in an organisation.
- Have insight into different types of organizations and their structures.
- Inculcate leadership qualities to motivate self and others.
- Manage human resources at the shop-floor
- Maintain and be a part of healthy work culture in an organisation.
- Use marketing skills for the benefit of the organization .
- Maintain books of accounts and take financial decisions.
- Undertake store management.
- Use modern concepts like TQM, JIT and CRM.

DETAILED CONTENTS

SECTION – A ENTREPRENEURSHIP

1. Introduction

(10 Periods)

- Concept /Meaning and its need
- Qualities and functions of entrepreneur and barriers in entrepreneurship
- Sole proprietorship and partnership forms and other forms of business organisations
- Schemes of assistance by entrepreneurial support agencies at National, State, District – level, organisation: NSIC, NRDC, DC, MSME, SIDBI, NABARD, NIESBUD, HARDICON Ltd., Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks

2. Market Survey and Opportunity Identification/Ideation

(08 Periods)

- Scanning of the business environment
- Salient features of National and Haryana State industrial policies and resultant business opportunities
- Types and conduct of market survey
- Assessment of demand and supply in potential areas of growth
- Identifying business opportunity
- Considerations in product selection
- Converting an idea into a business opportunity

3. Project report Preparation (06 Periods)

- Preliminary project report
- Detailed project report including technical, economic and market feasibility
- Common errors in project report preparations
- Exercises on preparation of project report
- Sample project report

SECTION –B MANAGEMENT

4. Introduction to Management

(04 Periods)

- Definitions and importance of management
- Functions of management: Importance and process of planning, organising, staffing, directing and controlling
- Principles of management (Henri Fayol, F.W. Taylor)
- Concept and structure of an organisation
- Types of industrial organisations and their advantages
- Line organisation, staff organisation
- Line and staff organisation
- Functional Organisation

5. Leadership and Motivation

(03 Periods)

a) Leadership

- Definition and Need

- Qualities and functions of a leader
- Manager Vs leader
- Types of leadership
- Case studies of great leaders

b) Motivation

- Definition and characteristics
- Importance of self motivation
- Factors affecting motivation
- Theories of motivation (Maslow, Herzberg, Douglas, McGregor)

6. Management Scope in Different Areas

(06 Periods)

a) Human Resource Management

- Introduction and objective
- Introduction to Man power planning, recruitment and selection
- Introduction to performance appraisal methods

b) Material and Store Management

- Introduction functions, and objectives
- ABC Analysis and EOQ

c) Marketing and sales

- Introduction, importance, and its functions
- Physical distribution
- Introduction to promotion mix
- Sales promotion

d) Financial Management

- Introductions, importance and its functions
- knowledge of income tax, sales tax, excise duty, custom duty, VAT, GST

7. Work Culture (04 Periods)

7.1. Introduction and importance of Healthy Work Culture in organization

7.2. Components of Culture

7.3. Importance of attitude, values and behaviour

Behavioral Science – Individual and group behavior.

7.4. Professional ethics – Concept and need of Professional Ethics and human values.

8. Basic of Accounting and Finance (04 Periods)

a) Basic of Accounting:

- Meaning and definition of accounting
- Double entry system of book keeping
- Trading account, PLA account and balance sheet of a company

b) Objectives of Financial Management

- Profit Maximization v/s Wealth Maximization

9. Miscellaneous Topics (03 Periods)

a) Total Quality Management (TQM)

- Statistical process control
- Total employees Involvement
- Just in time (JIT)

b) Intellectual Property Right (IPR)

- Introduction, definition and its importance

- Infringement related to patents, copy right, trade mark

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment, seminar or case study method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organisations on visit. Approach extracted reading and handouts may be provided.

MEANS OF ASSESSMENT

Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development and Management by J.S.Narang; Dhanpat Rai & Sons, Delhi.
3. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
4. Handbook of Small Scale Industry by PM Bhandari
5. Entrepreneurship Development and Management by MK Garg
6. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	20
2	08	16
3	06	14
4	04	10
5	03	06
6	06	14
7	04	08
8	04	08
9	03	06
Total	48	100

6.5 PROJECT ORIENTED PROFESSIONAL TRAINING

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RATIONALE

Project work aims at developing skills in the students whereby they apply the totality of knowledge and skills gained through the course in the solution of particular problem or undertaking a project. The students have various aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments. The project assignment can be individual assignment or a group assignment. The students should identify the project at least two to three months in advance. The project work identified in collaboration with industry may be preferred.

Each teacher is expected to guide the project work of 5-6 students.

- Projects related to increasing productivity and better services
- Projects related to quality assurance
- Projects related to estimation and economics of production and services
- Projects connected with repair and maintenance of plant and equipment and aircraft
- Projects related to identification of raw material thereby reducing the wastage
- Any other related problems of interest of host industry

A suggestive criteria for assessing student performance by the external (personnel from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance criteria	Max. marks	Rating Scale				
			Excellent	Very good	Good	Satis- factory	Poor
1.	Selection of project assignment	10	10	8	6	4	2
2.	Planning and execution of considerations	10	10	8	6	4	2
3.	Quality of performance	20	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20	20	16	12	8	4
5.	Sense of responsibility	10	10	8	6	4	2
6.	Self expression/ communication skills	5	5	4	3	2	1
7.	Interpersonal skills/human relations	5	5	4	3	2	1
8.	Report writing skills	10	10	8	6	4	2
9.	Viva voce	10	10	8	6	4	2
Total marks		100	100	80	60	40	20

The overall grading of the practical training shall be made as per following table

	Range of maximum marks	Overall grade
i)	More than 80	<i>Excellent</i>
ii)	65-80	Very good
iii)	50-64	Good
iv)	41-49	Fair
v)	Less than 40	Poor

In order to qualify for the diploma, students must get "Overall Good grade" failing which the students may be given one more chance of undergoing 8 -10 weeks of project oriented professional training in the same industry and re-evaluated before being disqualified and declared "not eligible to receive diploma ". It is also important to note that the students must get more than six "goods" or above good" grade in different performance criteria items in order to get "Overall Good" grade.

Important Notes

1. This criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.
2. The criteria for evaluation of the students have been worked out for 100 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.
3. The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.
4. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.

The teachers are free to evolve another criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organizations in such an exhibition. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific industries are approached for instituting such awards.



CAMPUS

SOFT SKILLS – IV

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RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. The diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Communicate effectively.
- Apply techniques of effective time management
- Develop habits to overcome stress
- Face problems with confidence
- Exhibit attributes required to appear for an interview
- Learn about current and future career opportunities
- Exhibit entrepreneurial skills
- Use QC/QT tools

DETAILED CONTENTS

- Communication Skills - Presentation
 - Time management
 - Stress Management
 - Problem solving
 - Career opportunities-Current and future
 - Entrepreneurial Skills
 - Quality and Quality tools used in industry
- In addition, the students must participate in the following activities to be organized in the institute
- Sports
 - NCC/NSS
 - Cultural Event

Note: Extension Lectures by experts may be organized. There will be no examination for this subject.