

Choice Based Credit System (CBCS)
Diploma Vth Sem
MECHANICAL ENGINEERING

| | | | Periods | | | Evaluation Scheme | | | | | | |
|---|--------------|-------------------------------------|---------|---|---|-------------------|----|-------|-----|---------------|--------|-------|
| S. No | Subject Code | Name of Subject | L | T | P | Assignment | TA | Total | ESE | Subject Total | Credit | Hours |
| 1 | 7D.301 | Advance Manufacturing Process | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 | 3 |
| 2 | 7D.302 | Power Engineering. | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 | 3 |
| 3 | 7D.303 | Measurement and Control | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 | 3 |
| 4 | 7D.304 | Metrology & quality control | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 | 3 |
| 5 | 7D.305 | Automobile Engineering | 3 | 0 | 0 | 20 | 10 | 30 | 70 | 100 | 3 | 3 |
| 6 | 40D.401 | Seminar in Executive Communication* | | | | | | | | | | |
| PRACTICAL/DESIGN/DRAWING/SESSIONAL | | | | | | | | | | | | |
| 1 | 7DP.302 | Power Engineering. Lab | | | 2 | | 30 | 30 | 20 | 50 | 1 | 2 |
| 2 | 7DP.305 | Automobile Engineering Lab | | | 2 | | 30 | 30 | 20 | 50 | 1 | 2 |
| 3 | 7DP.304 | Metrology and quality control Lab | | | 2 | | 30 | 30 | 20 | 50 | 1 | 2 |
| | | | | | | | | | | 650 | 18 | 23 |

Note: - * Non Credit Course.

Program: Diploma

Semester: V

Course: Advance Manufacturing Process

Course Code: 7D.301

| L | T | P | C |
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| 3 | 0 | 0 | 3 |

Course Objective:

- To study and analyze technical features of various nontraditional machines and machine tools.
- Explain the machining of various materials by adopting CNC milling processes.
- To learn CNC programming for conventional and unconventional machining processes.
- To determine machining tooling, fixtures and jigs etc.
- To study maintenance, repair, and overhaul of machine tools.

Unit I:

Non-traditional machining processes: Need and importance of nontraditional machining processes ,its classifications.

Electrical discharge Machining. Principle of working, Setup of EDM, Die electric fluid, tools (electrodes), Process parameters, Output characteristic, Applications, e.g. micro-hole drilling, curve hole drilling.

Wire cut EDM-Principle of working, Setup of WEDM, controlling Parameters, Applications. **Laser Beam Machining:** Physical principle of Laser, Laser action in ruby rod, Types of Laser set-up for LBM. Characteristics, controlling Parameters, Applications ,Application Of Laser Beam for Welding (LBW).Other nontraditional machines such as ECM,AJM,USM,LBM,PAM etc. principle of working and applications.

Unit II:

CNC milling machines: Concept of CNC milling machine, Vertical and horizontal machining center: Constructional features, Axis identification, and Electronic control system. Automatic tool changer and tool magazine.

CNC programming: Preparatory functions (G code), miscellaneous functions (M code), Part programming including subroutines and canned cycles. Specific programming examples like simple curvilinear milling ,use of sub-routine, use of canned cycle. Principles of computer aided part programming.

Unit III:

Machine Tool Automation:

Introduction and Need .Single spindle automates, transfer lines. Elements of control system, Limit switches ,Proximity switches, Block diagram for feedback and servo control system ,Introduction to PLC, Block diagram of PLC.

Unit IV:

Special Purpose Machines (SPM): Concept, General elements of SPM, elementary SPM machines like Turret and Capstan lathe. Principles of SPM design Productivity improvement by using SPM. **Maintenance of**

Machine Tools: Need and importance of maintenance activity, Types of maintenance. Basic maintenance practices for simple machine element, viz Bearing, Coupling, Shaft and pulley etc.

Repair cycle analysis, Repair complexity, Maintenance manual, Maintenance records, Housekeeping. Introduction to Total Productive Maintenance (TPM).

Suggested Reading:

1. *Production Technology Volume I and II –P.N.Rao, Tata McGraw Hill Publication.*
2. *Production Technology- P.C. Sharma, Khanna Publication.*
3. *Production Technology- HMT, Tata McGraw Hill Publication.*

Program: Diploma

Semester: V

Course: Power Engineering

Course Code: 7D.302

| L | T | P | C |
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Course Objective:

- To study various power cycles, classification of I.C. Engines, combustion and ignition of fuels.
- Testing of I.C. engines on the basis of Morse test, motoring test, pollution test.
- Construction and working of air compressor and its accessories.
- Explaining the Gas Turbine and Jet Propulsion, their classification and applications.

Unit I:

I.C.Engine :Power Cycles-Carnot, Otto, Diesel, Dual, Brayton Cycle, representation on P-V,T-S diagram and Simple numerical on Otto cycle & diesel cycle. Classification of I.C.Engines. Two stroke and four stroke Engines. Construction and working, comparison, valve timing Diagram, Turning moment diagram.Brief description of I.C. Engine combustion (SI&CI), scavenging pre-ignition detonation, supercharging turbo charging, simple Carburetor, M.P.F.I., fuel injection pump. List of fuel, Lubricant additives and their advantages.

I.C.Engine testing and Pollution Control: Engine terminology: Stroke, bore, piston speed, mep, compression & cut-off ratio etc. Engine Testing- I.P,B.P. Mechanical, Thermal relative and volumetric efficiency, BSFC, Heat Balance sheet. Morse Test, Motoring test. List of fuel lubricant additives and their advantages. Pollution Control- Pollutants in exhaust gases of petrol and diesel engines, their effects on environment, exhaust gas analysis for petrol and diesel engine, Catalytic Converter, Bharat stage I, II, III norms.

Unit II:

AIRCOMPRESSER: Introduction- Classification of air compressors - Definition:- Pressure ratio- Compressor capacity- Free Air Delivered- Swept volume- Uses of compressed air- Single stage, multi stage, single acting, double acting. Reciprocating air compressor- Construction and working of single stage and two stage compressor- Efficiency-Volumetric, Isothermal & Mechanical-Advantages of multi staging. Rotary Compressor- Construction and working of screw, lobe, vane, centrifugal compressors & Axial flow compressor (No numerical)- Comparison and applications of reciprocating and rotary compressors- Purification of air to remove oil, moisture and dust. Methods of energy saving in air compressors.

Unit III:

Gas Turbine and Jet Propulsion: Classification and applications of gas turbine. Constant volume and constant pressure gas turbines. Closed cycle and open cycle gas turbines and their comparison. Methods to improve thermal efficiency of gas turbine- Regeneration, inter-cooling, reheating using T- ϕ diagram (no analytical treatment). Jet Propulsion- Principles of turbo jet, turbo propeller, Ramjet. Rocket propulsion- Solid propellants, solid propellant rocket and liquid propellants, components of liquid propellants, liquid propellant rocket.

Unit IV:

Refrigeration and Air-Conditioning: Introduction- reversed Carnot cycle, Bell Coleman cycle- COP of Heat Pump and refrigerator, Tonnes of Refrigeration. Vapour compression system- Vapour compression refrigeration cycle (Simple numerical) Basic components of Vapour Compression Cycle, their function and location. Simple Vapour absorption refrigeration system. Applications- Water cooler Domestic refrigerator, Iceplant & cold storage. Psychrometry- Psychrometric Properties of air, Dalton's law of partial pressure psychrometric chart & processes (No simple numerical). Air conditioning systems- Definition of Air conditioning and classification of Air conditioning Systems (Elementary treatment) Application- Window air conditioner.

Suggested Reading:

1. *Refrigeration and air conditioning book by C.P. Arora*
2. *Thermal Engineering by R.K. Rajput, Lakshmi Publications.*
3. *Engineering Thermodynamics by P.K. Nag*

Program: Diploma

Semester: V

Course: Power Engineering Lab

Course Code: 7DP.302

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List of Experiment

1. Study of 2-stroke Petrol engine.
2. Study of 4-stroke Petrol engine.
3. Study of 4-stroke Diesel engine.
4. Study of Vapour compression refrigeration system.
5. Study of Ice Plant.

Program: Diploma

Semester: V

Course: Measurement & Control

Course Code: 7D.303

| L | T | P | C |
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Course Objective:

- To learn the working principles and operations of several instruments.
- To know the terminologies used in measurement and selection of instruments.
- To understand the displacement measurement, temperature measurement, flow measurement and miscellaneous measurement.
- Selection of appropriate measuring tools for a particular application.

Unit I:

Significance of measurement, types of measurement, classification of instruments, Static terms and characteristics- Range and Span, Accuracy and Precision, Reliability, Calibration, Hysteresis and Deadzone, Drift, Sensitivity, Threshold and Resolution, Repeatability and Reproducibility, Linearity. Dynamic characteristics- Speed of response, Fidelity and Dynamic errors, Overshoot. Measurement of error: Classification of errors, environmental errors, signal transmission errors, observation errors, operational errors. Transducers: Classification of transducers, active and passive, resistive, inductive, capacitive, piezo-resistive, thermo- resistive.

Unit II:

Control systems: Block diagram of automatic control system, closed loop system, open loop system, feed back control system, feed forward control system, servo motor mechanism.

Unit III:

Displacement measurement: Capacitive transducer, Potentio meter, LVDT, RVDT, Specification, selection & application of displacement transducer.

Temperature measurements: Non-electrical methods-bi metal and liquid in glass thermometer, pressure thermometer. Electrical methods-RTD, platinum resistance thermometer, thermistor, Thermo electric methods elements of thermocouple, law of intermediate temperature, law of intermediate metals, thermo emf measurement. Quartz thermo-meter, Pyrometers- radiation and optical

Flow measurements: Variable head flow meters- Venturi, Flow nozzle, Orifice plate, Pitot tube, Variable area meter- Rotameter, Variable velocity meter-Anemo meter, Special flow meter-Hot wire anemometer, Electromagnetic flow meter, Ultrasonic flow meter.

Unit IV:

Miscellaneous Measurement: Acoustics measurement- Sound characteristics–

intensity, frequency, pressure, power–sound level meter, piezo electric crystal type. Humidity measurement– Hair hygrometer, Sling psychrometer, recording psychrometer, and Liquid level measurement– direct and indirect methods, Force & Shaft power measurement-Tool Dynamometer (Mechanical Type), Eddy Current Dynamometer, Strain Gauge Transmission Dynamometer. Speed measurement-Eddy current generation type tachometer, incremental and absolute type, Mechanical Tachometers, Strain Measurement-Stress-strain relation, types of strain gauges, strain gauge materials, resistance strain gauge-bonded and unbonded, types foil, semiconductor, wire wound gauges.

Suggested Reading:

1. *Metrology & Measurement* by A.K. Bewoor and V.A. Kulkarni, The McGraw-Hill Publications.
2. *Mechanical Engineering Measurements* by A.K. Sawhney, Dhanpat Rai & Son, New Delhi.
3. *Instrumentation & Mechanical Measurements* by A.K. Thayal, 2nd Ed, Galgotia Publications Pvt Ltd

Program: Diploma

Semester: V

Course: Metrology & Quality Control

Course Code: 7D.304

| L | T | P | C |
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Course Objective:

- To comprehend the terminologies used in measurement and selection of instruments.
- To identify and enlighten the variety of errors in measurement.
- To learn the working principles and operations of several measuring instruments.
- Selection of appropriate measuring tools for a particular application.
- To comprehend the concepts such as TQM, ISO, SQC, QC, and acceptance sampling.

Unit I:

Introduction to metrology: Metrology Basics: Definition of metrology, Categories of metrology, Scientific metrology, Industrial metrology, Legal metrology, Need of inspection, Revision of Precision, Accuracy, Sensitivity, Readability, Calibration, Traceability, Reproducibility, Sources of errors, Factors affecting accuracy, Selection of instrument, Precautions while using an instruments for getting higher precision and accuracy.

Standards and Comparators: Definition and introduction to line standard - end standard, Wave length standard, Slip gauge and its accessories, Length bars. Definition, requirement of good comparator, Classification, use of comparators, working principle of comparators, Relative advantages and disadvantages.

Limits, Fits, Tolerances and Gauges: Concept of Limits, Fits, And Tolerances, Selective Assembly, Interchangeability, Hole And Shaft Basis System.

Unit II:

Angular Measurement: Concept, Instruments For Angular, Measurements, Working And Use of Universal Bevel Protractor, Sine Bar, Spirit Level, Principle of Working of Clinometers, Angle Gauges (With Numerical on Setting of Angle Gauges). **Threads and Gear Metrology : Screw thread Measurements:** ISO grade and fits of thread, Errors in threads, Pitch errors, Measurement of different elements such as major diameter, minor diameter, effective diameter, pitch, Two wire method, **Gear Measurement and Testing:** Analytical and functional inspection, Rolling test, Measurement of tooth thickness (constant chord method), gear tooth vernier, Errors in gears such as backlash, run out, composite.

Unit III:

Testing Techniques : Measurement of surface finish: Primary and secondary texture, Sampling length, Lay, terminology as per IS 3073-1967, direction of lay, Sources of lay and its significance, CLA, Ra, RMS, Rz values and their interpretation, Symbol for designating surface finish on drawing, Various techniques of qualitative analysis, **Machine tool testing:** Parallelism, Straightness, Squareness, Coaxiality, roundness, run out, alignment testing of machine tools as per IS standard procedure. **Quality Control: Quality:** Definitions, meaning of quality of product & services, Quality characteristics, Quality of design, Quality of conformance, Quality of performance, Concept of reliability, Cost, Quantity assurance, Cost of rework & repair, Quality & Inspection, Inspection stages.

Unit IV:

Total Quality Management : Principles and concept of total quantity management. Quality Audit: Concept of audit practices, lead assess or certification. Six-sigma: Statistical meaning, methodology of system Improvement, **ISO 9000 Series & other standards:** Concept, ISO 9000 series quality standards, QS14000.

Statistical Quality Control– Meaning and importance of SQC, Variable and attribute Measurement.

Acceptance Sampling– Concept, Comparison with 100% inspection, Different types of sampling plans, with merits and demerits.

Suggested Reading:

1. *Metrology & Measurement by A.K. Bewoor and V.A. Kulkarni, The McGraw-Hill Publications.*
2. *Engineering Metrology by R.K Jain, Khanna Publishers.*
3. *A Textbook of Metrology by M. Mahajan, Dhanpat Rai & C*

Program: Diploma

Semester: V

Course: Metrology & Quality Control Lab

Course Code: 7DP.304

| L | T | P | C |
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List of Experiment

1. To calculate least count of vernier caliper and to measure the dimension of given specimen using vernier caliper.
2. To calculate least count of outside micrometer and to measure the dimension of given specimen using outside micrometer.
3. To measure dimensions of given specimen using Vernier Height Gauge, Digital height gauge and Vernier Depth Gauge.
4. To measure the angle of given specimen using Sine bar.
5. Gear tooth measurement.
6. To measure the angle of given specimen using vernier Bevel protractor.

Program: Diploma

Semester: V

Course: Automobile Engineering

Course Code: 7D.305

| L | T | P | C |
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Course Objective:

- To study the anatomy and construction of automobiles.
- To study the working principles of engine, gearbox, clutches, brakes, steering system.
- To study the functioning of suspension system, transmission system, wheels and tires, control and monitoring systems, and other electrical systems.
- To study about emissions, ignitions, and controlling the emissions.

Unit I:

Introduction of Automobile: Classification of automobiles, Vehicle layout & types, Body construction- Types & Nomenclature of car body. Introduction to aerodynamic body shapes. Automobile market in India, major manufacturers, their products & their collaborations.

Unit II:

Automobile Transmission: Clutch: necessity construction & working of coil spring & diaphragm spring, type of clutches. Gearbox: tractive effort and tractive resistance, type of gearbox: constant mesh gearbox, synchromesh gearbox, epicyclic gearbox. Torque converter, overdrive, transfer case. Final drive: necessity, construction & working of propeller shaft & differential. Axle: type of rear axle & their applications. Control systems: steering system- requirement of steering system. Types of front axles, construction and working of steering linkage. Steering gearbox. Introduction to power steering, steering geometry- camber, caster, toe-in, toe-out, kingpin inclination & their effects. Brake system construction & working of mechanical hydraulic & pneumatic brakes. Comparison of disc & drum brake.

Unit III:

Suspension systems, wheels & Tyres: Working & construction of Leaf spring rigid axle Construction & working of Mc Pherson & wish bone, Necessity & classification of suspension system. Introduction to air suspension. Trailing link suspensions. Construction & working of telescopic shock absorbers. Construction & working of spoked wheel, disc wheel & light alloy cast wheel. Types of rims, their construction & working. Construction, working & comparison of radial, cross- ply and tubed, tubeless tyre & tyre specifications. Factors affecting tyre life. Wheel Alignment and Balancing.

Unit IV:

Automobile Electrical Systems & Body: Battery-working, construction & rating of battery Ignition system- construction & working of battery, magneto, electronic and CDI ignition system. Starting system- construction & working of starting motor, Starter drives- bendix and over running clutch. Charging system- construction & working of alternator. Wiring system harnessing & colour codes. Lighting system- headlight, taillight, indicator light & their circuits. N Gauges construction & working of Fuel level gauge, oil gauge and water temperature gauge. Use of microprocessor in automobile control systems.

Suggested Reading:

1. *Automobile Engineering* by K.M. Moeed, (S. K.Kataria & Son's)
2. *Automobile Engineering* by Dr. A. K. Basu, (S.Chand Company Pvt. L td.)
3. *A Textbook of Automobile Engineering* by R.K. Rajput, (Laxmi Publication Pvt. Ltd.)

Program: Diploma

Semester: V

Course: AUTOMOBILE ENGINEERING LAB

Course Code: 7DP.305

| L | T | P | C |
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List of Experiment

1. Carrying out preventative maintenance of four wheeler as per manufacturer's specifications.
2. Carrying out preventative maintenance of two wheeler as per manufacturer's specifications.
3. Demonstration of single plate coil spring & diaphragm spring type clutch.
4. Demonstration of synchromesh gearbox.
5. Demonstration of differential.
6. Demonstration of rack & pinion steering gearbox.
7. Demonstration of rigid axle suspension.
8. Demonstration of hydraulic brake system
9. Testing of battery and charging system.
10. Study of LPG/CNG kit retrofitting.
11. Visit to four- wheeler service station & any automobile manufacturing unit.
12. Mini project:- Student will prepare a project report & present a seminar.

Program: Diploma

Semester: V

Course: Seminar In Executive Communication

Course Code: 40D.401

| L | T | P | C |
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Course Objective:

To impart more advanced basic skills through intensive practice, in this unit again the students get opportunities to apply their general awareness and classroom learning to practical situation to achieve the targeted career goal in this increasingly competitive world Some of the career oriented units are Discussion Skills, Interview Skills, Job Search Strategies, Job Correspondence etc., they need to undergo,

- An average student acquires basic skills required for a cherished job.
- Their appreciative personality development becomes a value added attribute in their professional sphere.
- The course enhances communication, leadership and teamwork skills; and personal development skills using practical approach and exposure of students to the realities of the world
- To put greater emphasis on development of non-technical skills, such as flexibility, leadership and good communication.

WORKSHOPS (Activity Based)

- Debate
- Extempore
- Group Discussion
- Panel Discussion
- Presentation-Paper & Oral
- Reports: Survey Report, Project Report, Case Study

Suggested Reading:

1. *Monippally, Matthukutty. M. 2001. Business Communication Strategies. 11th Reprint. Tata McGraw-Hill. New Delhi*
2. *Swets, Paul. W. 1983. The Art of Talking So That People Will Listen: Getting Through to Family, Friends and Business Associates. Prentice Hall Press. New York*
3. *Lewis, Norman. 1991. Word Power Made Easy. Pocket Books*
4. *Sen , Leena .Communication Skills ; Eastern Economy Edition*
5. *Ghanekar, Dr. Anjali . Essentials of Business Communication Skills ; Everest Publishing House*
6. *David Green. Contemporary English Grammar, Structure & Composition ; MacMillan*
7. *Dictionary; Oxford*
8. *Dictionary ; Longman*