Annexure-3

PERIYAR UNIVERSITY
SALEM 638 011

PERIYAR INSTITUTE OF DISTANCE EDUCATIONS (PRIDE)

P.G. DIPLOMA IN COMPUTER AIDED MANUFACTURING

ONE YEAR PROGRAMME

NON SEMESTER

REGULATIONS AND SYLLABUS

(Effective from the Academic year 2007-2008 and thereafter)

PERIYAR UNIVERSITY, SALEM - 11
PERIYAR INSTITUTE OF DISTANCE EDUCATIONS
PRIDE

PG DIPLOMA IN COMPUTER AIDED MANUFACTURING (PGDCAM) ONE YEAR PROGRAMME

Regulations

Effective from the Academic year 2007 – 2008 and thereafter

1. CONDITION FOR ADMISSION

The candidate who has passed B.Sc. Computer Science, B.C.A., B.Sc. Information Science, and B.Sc. Information Technology of this University or Any degree with diploma in CAD/CAM/CA or any other University accepted by the syndicate as equivalent thereto subject to such conditions as may be prescribed therefore shall be permitted to appear and qualify for the P.G. Diploma in CAM degree Examination of this University after a course of one academic year.

2. DURATION OF THE COURSE

The course for the P.G. Diploma in COMPUTER AIDED MANUFACTURING shall consist of one Academic year.

3. COURSE OF STUDY

The Course of Study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time.

1. **MACHINE DRAWING**
2. **MACHINE SHOP TECHNOLOGY**
3. **ROBOTICS**
4. **ENTREPRENEURSHIP DEVELOPMENT**
5. **COMPUTER AIDED MANUFACTURING**
6. **MECHATRONICS**
7. **HYDRAULICS AND PNEUMATIC SYSTEMS**
8. **MANUFACTURING PROCESS**
9. **PRACTICAL I: AUTOCAD LABORATORY**
10. **PRACTICAL II:CAM and CNC LABORATORY**
11. **PRACTICAL III**

4. EXAMINATIONS :

The examination shall be three hours duration to each paper at the end of the year. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examination.

The external examiners should conduct the practical Examinations at the end of the year.

5. SCHEME OF EXAMINATIONS

The Scheme of Examinations for different years shall be as follows:

S. No	Paper Code	Title of the Paper	Exam Duration	Maximum Marks
1.		**MACHINE DRAWING**	**3**	**100**
2.		**MACHINE SHOP TECHNOLOGY**	**3**	**100**
3.		**ROBOTICS**	**3**	**100**
4.		**ENTREPRENEURSHIP DEVELOPMENT**	**3**	**100**
5.		**COMPUTER AIDED MANUFACTURING**	**3**	**100**
6.		**MECHATRONICS**	**3**	**100**
7.		**HYDRAULICS AND PNEUMATIC SYSTEMS**	**3**	**100**
8.		**MANUFACTURING PROCESS**	**3**	**100**
9.		**Practical I:AUTOCAD LABORATORY**	**3**	**100**
10.		**Practical II:CAM and CNC LABORATORY**	**3**	**100**
11.		**Practical III**	**3**	**100**
			Total :	1100

6. QUESTION PAPER PATTERN

a. For Theory

Time: 3 Hours Max. Marks: 100

Passing Min : 50

PART – A: 5X5 = 25

(Answer all Questions)

(Two Questions from each unit with Internal Choice)

PART – B: 5X15 = 75

(Answer all Questions)

(Two Questions from each unit with Internal Choice)

b. For Practical

Time: 3 Hours Max. Marks : 100

Passing Min : 50

One / Two Compulsory Problem(s) to be solved within 3 hours.

c. Distribution of the marks

Practical :

- For Writing procedures/programs in the main answer book 40%
- For listing and debugging 40%
- For correct and formatted output 20%

7. PASSING MINIMUM

The candidate shall be declared to have passed the examinations in a Theory/practical of study only if he/she secures not less than 50% of the total prescribed marks for the subject in the University Examinations.

8. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed the examination in **First Class**. All other successful candidates shall be declared to have passed in **Second Class**. Candidates who obtain 75% of the marks in the aggregate shall be deemed to have passed the examination in **First Class with Distinction** provided they pass all the examinations prescribed for the course at the first appearance.

9. COMMENCEMENT OF THIS REGULATION:

These regulations shall take effect from the academic year 2007-08, i.e., for students who are admitted to the first year of the course during the academic year 2007-08 and thereafter.

1. MACHINE DRAWING

UNIT - I SECTION VIEWS:
Introductions – need for sectioning – Hatching – Inclination of hatching lines – Spacing hatching lines – Hatching of larger areas – Hatching of adjacent parts – sketch and of full section, Half sections – types, Partial or local sections, Revolved or super imposed, Removed sections and offset sections.

UNIT - II LIMITS, FITS AND TOLERANCES
Introduction – Definition of various terms used in limits – Hole basis system – Shaft basis system –Types of fits – Selection of fits and applications – types of tolerances – form and position – Indication of tolerances and fits on the drawing.

UNIT – III KEYS AND SURFACE FINISH
Introduction – Types of keys – taper keys – Parallel or feather keys – wood druff keys – Empirical relation between diameter of the shaft and width & thickness of key for the above types of keys. Definition – Nominal surface – roughness – waviness – lay – productions methods and surface quality– symbol for lay – Indication of surface roughness for various machining operations.

UNIT - IV SCREW THREADS AND THREADED FASTENERS
Introduction – Nomenclature of screw threads – Basic profiles or forms of screw threads – Left hand and right hand threads – Internal and external threads – Drawing of vee and square threads –Application of threads – Bolts and Nuts – Drawing of Hexagonal bolt and Nut – Drawing of square head bolts – Riveted head – Types.

TEXT BOOKS
1. Machine Drawing – N. D. Bhatt
2. Machine Drawing – K. R. Goplakrishnan

REFERENCE BOOK
1. A First year Engineering Drawing, By A. C. Park is san, First Rep 1982, A. H. Wheeler & Company (P) Ltd, 15, L. B. Shastri marg, Allaghabed – 211 001.

2. MACHINE SHOP TECHNOLOGY

UNIT-I:

Planer: Types of planers-description of double housing planer-specifications-principles of operation-drives-quick return mechanism-feed mechanism-types, work holding devices and special fixtures-types of tools-various operation.

Shaper: Types of shapes-specifications-standard-plain-universal-principles of operations drives- quick return mechanism-crank and slotted link-feed mechanism-work holding devices-tools and fixtures.

Slotter: Types of slotters-specifications-method of operation-Whitworth quick return mechanism-feed mechanism-work holding devices-types of tools.

UNIT -II:

Drilling machines: Drills-flat drills-twist drills-nomenclature-types of drilling machines-bench type-floor type-radial type-gang drill-multi spindle type-principle of operation in drilling-speeds and
feeds for various materials-drilling holes-methods of holding drill bit-drill chucks socket and sleeve-drilling-reaming-counter sinking-counter boring-spot facing tapping- deep hole drill-drill jigs.

Milling machines: Types-column and knee type-plain-universal milling machine-vertical milling machine specification of milling machines-principles of operation-work and tool holding devices arbor- stub arbor-spring collets-adaptors-milling cutters-plain milling cutter-slab milling cutter-slitting saw-side milling cutter-angle milling cutter-T-slot milling cutter-woodruff milling cutter-fly cutter-nomenclature of milling cutter-milling process-conventional milling-climb milling-milling operations-straddle milling-gang milling-vertical milling attachment-types of milling fixtures.

UNIT-III:

Grinding machines: Types and classification-specifications-rough grinders-floor mounted hand grinders- portable grinders-belt grinders-precision grinders-cylindrical, surface, centre less grinders-internal grinders-planetary grinders-principles of operations-grinding wheels abrasives- natural and artificial-dressing and truing of wheels-

Broaching: Types of broaching machine-horizontal vertical and continuous broaching-principles of operation-types of broaches-classification-broach tool nomenclature-broaching operations-simple examples.

Boring and Jig boring: Boring machines-horizontal and vertical types-fine boring machines-boring tools-jig boring machine-measuring system-hole location procedure-deep hole boring.

UNIT-IV:

Gear manufacturing practice-Forming and Generating processes:

Gear forming process in milling-dividing head-principles of operation-indexing-linear indexing rapid, simple-differential and angular indexing-problems-gear milling-cutter selection nomenclature- module-pressure angle-milling procedure for spur, helical and bevel gears problems- other forming processes for manufacturing of gears. Generating process-gear shaper-gear hobbing-principe of operation only-gear finishing processes-burnishing-shaving-grinding and lapping-gear materials-cast iron,steel,alloy steels, brass, bronze, aluminium, nylon, fibre-no problems.

UNIT-V:

Jigs and Fixtures:Definitions and concept of Jig and fixture-Advantages of jigs and fixtures-elements of jigs and fixtures-locating devices-'V' locators-fixed stop locators-adjustable stop locators-clamping devices-strap clamp, screw clamp-cam action clamp-types of jigs-box drill jig-indexing drill jig types of fixtures-keyway milling fixture-string milling fixture.

Press working: Types of presses-mechanical and hydraulic presses-press tools and accessories-press working operations-bending operations-angle bending-curling-seaming-shearing operations blanking, punching, curling off-trimming-notching-slitting-lancing-shaving.

Non-Conventional Machining process: Ultrasonic machining-chemical machining-electro chemical grinding-electrical discharge machining-plasma arc machining-laser machining.

TEXT BOOK:

1. Elements of Workshop Technology-I& II-Hajra Choudry & Battacharya

REFERENCE BOOKS:

1. Production Technology-HMT
2. Production Tech- Jain & Gupta
3. Workshop Tech Vol I,II, III-Chapman
4. Production processes TTTI, Chennai

3. ROBOTICS

UNIT - I:

Introduction – definition – basic configuration of robotics and its working – robot components – manipulator, end effectors, drive system, controller, sensors – mechanical arm – degrees of freedom – links and joints – construction of links, types of joint – classification of robots – cartesian, cylindrical, spherical, horizontal articulated (SCARA), vertical articulated – structural characteristics of robots – mechanical rigidity – effects of structure on – control - work envelope and work volume - robot work volumes and comparison – wrist rotations – mechanical transmission, pulleys, belts, gears, harmonic drive – conversion between linear and rotary motion and its devices.

UNIT - II:

Robot controller – level of controller – open loop and closed loop controller – servo systems – microprocessor based control system – robot path control – point to point – continuous path control – sensor based path control – controller programming – actuators – dc servo motors – stepper motors – hydraulic and pneumatic drives - feedback devices – potentiometers – optical encoders – dc tachometers.

UNIT - III:

Robot motion analysis – robot kinematics – robot dynamics - end effectors – grippers and tools - gripper design – mechanical gripper – vacuum gripper – magnetic grippers – sensors – transducers – tactile sensors – proximity sensors and range sensors – force and moment sensors and its applications and problems - photoelectric sensors – vision system – image processing and analysis – robotic applications – robot operation aids – teach pendent – MDI and computer control.

UNIT - IV:

Robot programming – lead through methods and textual robot languages – motion specification - motion interpolation - basic robot languages – generating of robot programming languages – On-Line & Off-Line programming - robot language structure – basic commands – artificial intelligence and robotics.

UNIT - V:

Robot application in manufacturing – material handling – press loading and unloading – die casting – M/c tool loading and unloading – spot welding, arc welding – spray painting – assembly finishing – adopting robots to work station - requisite and non – requisite robot characteristics – stages in selecting robot for individual application – precaution for robot – economic analysis – social and labour issues – future of robotics.

REFERENCE BOOKS:

1. Industrial Robotics – Technology – Programming and Applications - Mikell P. Groover, Mite chell weiss, Roger Negal and Nicholes G. Odress.
2. Robotics – An Introduction – Doughales – R. Halconnjr.

4.ENTREPRENEURSHIP DEVELOPMENT

UNIT-I:

Entrepreneurial culture and structure – competing theories of entrepreneurship – entrepreneurial traits – types – behavioural patterns of entrepreneurs – entrepreneurial motivation – establishing entrepreneurial systems – idea processing, personnel-financial-information and intelligence, rewards and motivation – concept bank, role of industrial fairs.

UNIT-II:

Search for a business idea, sources and selection – project classification and identification – constraints – features of ancillary units, consumer products, feasibility prospects, project objectives, design and appraisal format for report- network analysis- activity performance – time schedules – factory design – design requirements – applicability of the factories act.

UNIT-III:

Financial analysis – capital cost, operating cost estimation and budgeting under uncertainty – risk and inflation – proforma profit and loss, balance sheet – cash flow statement – social cost benefit analysis, project sources of project finance, credit facilities – types – evaluation by the financial institutions – role of consultancy organizations – uses of leasing arrangements – institutions providing technical, financial and marketing assistance.

UNIT-IV:

Marketing channel – selecting channel members – setting quality standards – requirements strategies. Types of relevant institutions – entrepreneurship development programme in India - prospects.

UNIT-V:

Steps for starting a small industries – selection of types of organizations – incentives and subsidies – central government scheme and state government schemes, incentives to SSI – registration, registration licensing requirements for sales tax, CST, exercise duty, power, exploring the export possibilities – incentives for exports – import – import of capital goods and raw materials.

REFERENCE BOOKS

1. Khanka, S S. Entrepreneurial Development, S.Chand & Co, New Delhi 1999.
2. Gupta, C B. and Srinivasan, N P Entrepreneurial Development: Text and Cases - 3rd ed. Sultan Chand & Sons, New Delhi 1995.
3. Hisrich, Robert D. and Michael P Peters Entrepreneurship --5th ed.: Tata Mcgraw-Hill,. New Delhi, 2002.

5. COMPUTER AIDED MANUFACTURING

UNIT-I

Computer aided manufacturing: Introduction – CAM – Hierarchy – Elements of CAM systems – NC in CAM - Rationale for CAD/CAM. Product Development and Design: Introduction – Life cycle of a product – Product Cycle – Simultaneous Engineering – Design for manufacture and assembly–DFMA – Rules for the design of parts – Total quality approach.

UNIT-II

Machine Tool Control: NC of machine tools – Elements of the NC systems – Type of control Systems – Coortinate system – Input Devices – Punched Tapes – The NC procedure – NC part programming – Computer-Aided Part programming.

UNIT-III

Machining Centers – Turning Centres – CAD/CAM Integration –NC systems – Material Handling – Automated Guided Vehicles (AVGs).

UNIT-IV

Group Technology – Part Families – Parts Classification and Coding – Coding Systems – Facility Design using GT – Benefits of GT. Computer-Aided Process Planning: Introduction – Role of Process Planning – Implementation Techniques – Process planning Systems – Benefits of CAPP – Advantages. Master Production Scheduling – Material Requirements Planning (MRP) – Manufacturing Resource Planning (MRP II) – Capacity Planning.

UNIT-V

Shop Floor Control System: Introduction – Functions of SFC – SFC System. Just In Time Manufacturing: Definitions – JIT approach – Elements – JIT works Effects of JIT Production – Benefits of JIT. FMS: Introduction – Elements – Classification System for FMS – FMS Work-Stations – Material handling equipment – Computer control system - Applications and Benefits of FMS. Concept of CIM – Evaluation of CIM – CIM hardware and software – Introduction to Intelligent Manufacturing System.

TEXT BOOK:

1. Sadhu Singh, " Computer Aided Design and Manufacturing ", Khanna Publishers, New Delhi, 1998.

REFERENCES:

2. P.Radhakrishnan and S.Subramanyan, " CAD / CAM / CIM ", New Age International Ltd., 1994.
3. Groover and Zimmers, " CAD / CAM : Computer Aided Design and Manufacturing ", Prentice Hall of India, New Delhi, 1994.

6. MECHATRONICS

UNIT – I : Theory of Mechatronics

Automation – definition – need, advantages and disadvantages of automation. **Mechatronics** - What is mechatronics – Definition of mechatronics – benefits of mechatronics -Mechatronics in manufacturing – Mechatronics in products – Mechatronics &Engg. Design – A modular approach to mechatronics & Engg. Design – The engineer & mechatronics – mechatronics technology – Mechanical systems & design – Tradition Vs Mechatronics – The mechatronics approach – Replacement mechanism – simplification mechanism – Enhancement mechanism – Synthesis of mechanism – control – The design process.

UNIT – II : Sensors and Transducers:

Sensors and Transducers – Performance terminology- Displacement, position and proximity – Velocity and motion – Force – Fluid pressure, Liquid flow, liquid level – temperature light sensors – selection of sensors.

UNIT – III: Actuators

Pneumatic and Hydraulic System: Actuation systems, pneumatic and hydraulic systems, Directional control valves, Pressure control valve, Cylinders, Process control valves, Rotary actuators.

Electrical actuation systems: Electrical systems, mechanical switches, solid state switches, solenoids principle of working, types, specification and control of DC motor – AC motors , Stepper motors.

UNIT – IV: Programmable Logic Controller

Basic structure – Input / Output processing – Programming – mnemonics – Timers, internal relays and Counters – shift register – Master and jump controls – Data handling – Analogue input/output – selection of PLC.

UNIT – V: Industrial Design and Fault finding

Man-M/c interface: Industrial design & Ergonomics – Introduction – elements of product design – ergonomic factors for advanced manufacturing systems.

Information transfer – from M/c to Man- Human response to stimuli - Information from man to m/c. **Fault finding** - Fault detection techniques – common hardware faults.

Possible design solutions – Timed switch , bathroom scales.

TEXT BOOK:

1. Mechatronics – Second Edition - W.Bolton –Pearson Education Asia.

REFERENCES:

1. Mechatronics – HMT. Tata Mcgraw-Hill Publishing Company Limited, New Delhi 1998
2. Mechatronics: (Electronics In Products And Processes), A. Bradley and others - Chapman and Hall.
3. Fundamental of Mechatronics By C.R. Venkataraman - Sapna Book House, Bangalore – 560019.

7.HYDRAULICS AND PNEUMATIC SYSTEMS

UNIT - I:

Fluid Power –Definition –Pascal's Law- Basic Properties Of Hydraulic Fluids-Mass , Weight, Density, Specific Weight, Specific Gravity, Viscosity, Bulk Modulus. Hydraulic Pumps - Classification -Pump Types. Piston Pumps –Axial Piston Pump-Radial Piston Pumps- Graphical Symbols – Working Principles only. Gear Pumps-External Gear Pump- Internal Gear Pumps. Graphical Symbols – Working Principles only. Vane Pump-Unbalanced Vane Pump – Balanced Vane Pump- Graphical Symbols – Working Principles only.

UNIT - II:

Linear Actuators- Hydraulic Cylinders - Cylinder Types-Single Acting cylinder - Gravity Return cylinder–Spring Return cylinder -Telescopic Cylinder –Hydraulic Ram – Tandem Cylinder, Symbols and working principles only. Rotary actuators-motor types – gear motor-balanced vane motor-piston motor –two vane rotor actuator-rack AND pinion rotary actuator-motor torque –speed –power –efficiency –symbols –applications – specifications.

UNIT - III:

Directional Control Valves:-Check Valve-Shuttle Valves-Two Way Directional Control Valves -Three Way Directional Control Valves -Four Way Directional Control Valves – Directional Control Valves Actuation types-Symbols- Working Principles. Pressure Control Valve: Pilot Operated, Pressure Relief Valve –Pressure Reducing Valve –Sequence Valve – Symbols- Working Principles. Flow Control Valve –Type –Needle Valve –Pressure Compensated Flow Control Valve-Cushioned Cylinders –Flow Dividers –Balanced Spool Flow Divider-Rotary Flow Divider.

UNIT - IV:

Hydraulic Components –Accumulators – types –Diaphragm - Spring Loaded - Weight Loaded -Pressure Intensifiers – Hydraulic Reservoirs-Heat Exchanger types- Air cooled –Water cooled - Filters. Instrumentation and Measurement: Pressure Gauges-Flow meters-Temperature Gauges. Conduits and Fittings-Pipe - Tubing –Hose - Seals and Bearings - Hydraulic Fluids. Hydraulic Circuits:-Counter Balance Circuit –Sequence Circuit- Speed Control Circuit-Meter in Circuit –Meter out Circuit-Intermittent Feed Control-Speed Control for Continuous Processing. Booster and Intensifier Circuits-Force Multiplication –Pressure Intensification.

UNIT - V:

Pneumatics - Basic principles of pneumatics-difference between hydraulics and pneumatics-compressor types-two stage piston compressor –rotary vane compressor-rotary screw compressor –vacuum pumps- double acting pneumatic cylinder–gear motor-pressure regulator –filters-lubricators-FRL unit-water removal – air preparation and distribution –

Electronic control of fluid power -solenoid valves-servo valves- pump controls.

TEXT BOOKS:

1. Industrial Hydraulics –Third Edition John J.Pippenger Tyler, G.Hicks. McGraw-Hill Book Company's.
2. Introduction to Fluid Power--James L. Johnson.-Delmar Thomson Learning, Inc.

REFERENCES :

3. Fluid Power Technology-Robert P. Kokernale-Library Of Congress Cataloging-Publication Data.
4. Basic Fluid Power - Dudleyt, A Pease and John J Pippenger - Prentice Hall 1987.
5. Fluid Power With Applications - Antony Espossito, Prentice Hall 1980.
6. Hydraulics and Pneumatics - (HB) Adrewparr –Jaico Publishing House.
7. Pneumatic And Hydraulic Systems - Bolton W. Butterworth-Heinemann-1987

8. MANUFACTURING PROCESS

UNIT – I FOUNDRY

PATTERNS – definition – pattern materials – factors for selecting pattern materials – single piece solid, split patterns – pattern allowances – core prints – use of core boxes.
MOULDING – definition – moulding boxes, moulding sand – ingredients – silica – clay – moisture and miscellaneous materials – properties of moulding sand – sand additives – moulding sand preparation – mixing – tempering and conditioning – types of moulding – green sand – dry sand –machine moulding – top and bottom squeezer machines – jolting machines – sand slinger- core –CO2 process core making – types of core – casting using green sand and dry sand mould. CASTING – definition – sand casting – gravity die casting – pressure die casting – hot and cold-champer casting – centrifugal casting – continous casting – chilled casting – malleable casting –melting of cast iron – cupola furnace – melting of non ferrous metals – crucible and are furnaces –induction furnaces – instrument for measuring temperature – optical pyrometer – thermo electric pyrometers – cleaning of casting – tumbling, trimming sand and shot blasting – defects in casting– causes and remedies – safety practices in foundry.

UNIT – II FORGING AND WELDING

Hot working – advantages of hot working – hot working operations – rolling – forging, hammer or smith forging, drop forging, upset forging, press forging – roll forging. Welding – are welding definition – are welding equipment – are welding methods – carbon are, metal are, metal inert gas (mig), tungsten inert gas (tig), atomic hydrogen, plasma arc, submerged are and electro slag welding, gas welding – definition – oxy – acetylene welding – resistance welding – definition – classification of resistance welding – butt – spot – seam – projection welding– welding related processes – oxy – acetylene cutting – are cutting – hard facing bronze welding –soldering and brazing special welding processes – cast iron welding – thermit welding – solid slate welding, ultrasonic, diffusion and explosive welding – explosive cladding – modern welding, electron beam and laser beam welding – types of welded joints – merits and demerits of welded joints – inspection and testing of welded joints – destructive and non destructive types of tests – magnetic particle test – radiographic and ultrasonic test defects in welding – causes and remedies– safety practices in welding – three types of flames – gas welding equipment.

UNIT – III POWDER METALLURGY AND HEAT TREATMENT OF METALS

Methods of manufacturing metal powders – atomization of oxides and electrolytic deposition –pressing operation – sintering – hot pressing – sizing – infiltration – mechanical properties of parts made by powder metallurgy – design rules for the power metallurgy process. Heat treatment processes – purpose – procedures – applications of various heat treatment processes – iron – carbon equilibrium diagram – full annealing – process annealing stress relief annealing spherodising annealing – isothermal annealing – normalizing – hardening – tempering– quenching medium – different types and their relative merits – case hardening – pack carburizing – cyaniding – nitriding – induction hardening and flame hardening.

UNIT – IV LATHE WORK AND THEORY OF METAL CUTTING

Theory of lathes – specifications – simple sketches – principal parts – head stock – back geared type – all geared type – tumbler gear mechanism – quick change gear box – apron mechanism –carriage cross slide – automatic, longitudinal and cross feed mechanism – tail stock and its functions – work holding devise – face plate – three jaw chuck – four jaw chuck – catch plate and carrier – types of centres – machining operations done on lathe – lathe attachments – tool post grinders – milling attachments.

Methods of taper turning in lathe – cutting tool materials – high carbon steel – high speed steel –satellite – carbide – ceramic single point tool – nomenclature – chip breakers – tool life – cutting speeds and feeds.

UNIT – V

METROLOGY AND SEMI – AUTOMATIC AND AUTOMATIC LATHE

Metrology – vernier height gauge – digital type vernier micrometers – depth gauges – applications– plug and ring gauges – snap gauges – thread micrometers – gear tooth vernier – bevel protractor – slip gauges – sine bar – comparators – mechanical dial gauges – electrical, optical and pneumatic comparators – profile measurements – optical flat – surface finish measurements– profilometers.

Semi automatic lathes:

Types of semi automatic lathes – capstan and turret lathes – difference between turret and capstan – tools and work holding devices – self opening die head – collapsible taps – simple tool lay out – process sheet.

Automatic Lathes:

Automatic lathe – classification of single spindle automatic lathe – principle of automatic lathes –automatic screw cutting machines – multi spindle automatic lathes – use of cams in automats.

REFERENCES

1. Elements of workshop Technology Volume I & II by Hajra Chowdry & Bhattacharaya.
2. Manufacturing process by Begeman.
3. Workshop Technology Volume I, II, & III by Chapman.
4. Production Technology by Jain & Gupta.
6. Production Technology by P. C. SHARMA
7. HMT manual.
8. A Text book of workshop Technology by R. S. Khurmi & J. K. Gupta
9. Manufacturing Engineering & Technology by Kalpakjian.

9. AUTOCAD LABORATORY

Drawing Ex. Practice (Machine & Assembly Drawing)

1. Sleeve and Cotter joint
2. Socket and spigot joint
3. GIB and Cotter joint
4. Flange Coupling
5. Universal Coupling
6. Machine Vice
7. Swivel Bearing
8. Screw jack
9. Tail Stock

10. CAM and CNC LABORATORY

Introductions

1. Study of CNC lathe, milling
2. Study of international standards G-Codes, M-Codes
3. Program writing – Turning simulator – Milling simulator, IS practice – commands – menus

Exercise practice

CNC Lathe

1. Develop a part program for step turning and simulate
2. Develop a part program for taper turning and simulate
3. Develop a part program for circular interpolation and simulate
4. Develop a part program for multiple turning operation and simulate
5. Develop a part program for thread cutting, grooving and simulate
6. Develop a part program for internal drills, boring and simulate

CNC Milling

1. Develop a part program for grooving and simulate
2. Develop a part program for drilling (canned cycle) and simulate
3. Develop a part program for mirroring with subroutines and simulate
4. Develop a part program for rectangular and circular pocketing and simulate