2021

DIPLOMA IN CAD & CNC PROGRAMMING (1 Year)

SCIENCE & TECHNOLOGY ENTREPRENEURS' PARK

Guru Nanak Dev Engineering College

First Semester

Subject Code	Subject Name	Load Allocation (Per Week)			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
DCCP-001	Computer Graphics	3	1	0	40	60	100	4
DCCP-002	Metrology & Geometric Dimensioning Tolerance	3	1	0	40	60	100	4
DCCP-003	Engineering Drawing	3	1	0	40	60	100	4
DCCP-004	Production Technology	3	1	0	40	60	100	4
DCCP-005	Press Tool Design	3	1	0	40	60	100	4
DCCPP-001	CAD Lab-1	0	0	4	30	20	50	4
DCCPP-002	Engineering Measurement & Metrology Lab	0	0	4	30	20	50	4
DCCPP-003	Minor Project	0	0	3	30	20	50	3
	TOTAL	**15**	**5**	**11**	**290**	**360**	**650**	**31**

Second Semester

Subject Code	Subject Name	Load Allocation (Per Week)			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
DCCP-006	Production Management	3	1	0	40	60	100	3
DCCP-007	Engineering Material and Heat Treatment	3	1	0	40	60	100	3
DCCP-008	Entrepreneurship Development	3	1	0	40	60	100	3
DCCP-009	CNC Programming	3	1	0	40	60	100	3
DCCP-010	Product Development &Rapid Prototyping	3	1	0	40	60	100	3
DCCPP-004	CAD Lab-2	0	0	4	30	20	50	4
DCCPP-005	CNC Lab	0	0	4	30	20	50	4
DCCPP-006	Rapid Prototyping Lab	0	0	4	30	20	50	4
DCCPP-007	Major Project	0	0	3	40	60	100	3
	TOTAL	**15**	**5**	**15**	**330**	**420**	**750**	**30**

Program Objectives:

- To give principle information to understudies in the most recent mechanical subjects on Computer Aided Design, Computer Aided Manufacturing and Computer Aided Engineering Analysis and to plan for work in the core area.

- To establish amiable climate that advances learning, development and confers capacity to work with between disciplinary gatherings in proficient industry and R&D associations.

- To provide guidance to students for their choices in research and professional career outlook and to encourage students to take up competition

DCCP-001 COMPUTER GRAPHICS

GEOMETRY AND LINE GENERATION: Line segments, Pixels and frame buffers,

SHAPES: line, circle, ellipse generation.

GRAPHICS PRIMITIVES: Primitive operations, The display-file interpreter, Display-file structure, Display-file algorithms.

POLYGONS: Polygons representation, An inside test, Filling polygons, Filling with a pattern.

TRANSFORMATIONS: Scaling transformations, Reflection and zooming, Rotation, Homogeneous coordinates and translation, Rotation about an arbitrary point.

SEGMENTS: The segment table, Segment creation, closing a segment, deleting a segment.

WINDOWING AND CLIPPING: The viewing transformation, Clipping, The clipping of polygons, Generalized clipping.

THREE DIMENSIONS: 3D geometry, 3D primitives, 3D transformations, Parallel projection, Perspective projection, Isometric projections, Viewing parameters, Special projections.

LIGHT, COLOR AND SHADING: Point-source illumination, Shading algorithms, Shadows, Color models.

DCCP-002 Metrology & Geometric Dimensioning & Tolerance

INTRODUCTION TO METROLOGY: Definition, types, need of inspection, terminologies, methods of measurement, selection of instruments, measurement errors, units, Measurement standards, calibration, statistical concepts in metrology

LINEAR METROLOGY: Steel rule, calipers, verniercaliper, vernier height gauge, vernier depth gauge, micrometers, universal caliper

LIMITS FITS AND TOLERANCES:Interchangeability, selective assembly, limits, fit and tolerances, limit gauging, design of limit gauges, computer aided tolerancing

MEASUREMENT OF SURFACE FINISH: Introduction, terminology, specifying roughness on drawings, surface roughness parameters, factors affecting surface roughness, ideal surface roughness, roughness measurement methods, precautions in measurement, surface microscopy, surface finish softwares.

SCREW THREAD METROLOGY: Introduction, screw thread terminology, screw thread measurement.

MISCELLANEOUS MEASUREMENTS: Taper measurement, angle measurement,radius measurement

INTRODUCTION
What is GD&T?,Terminology & Basic Rules

FEATURES AND RULES OF GD&T
Intro to Features and Material Conditions, Rule #1 of GD&T (Envelope Principle), Maximum Material Condition, Least Material Condition, Regardless of Feature's Size & Rule #2, The Feature Control Frame

FORM TOLERANCES
Straightness (Surface), Straightness (Derived Median Line), Flatness (Surface), Flatness (Derived Median Line), Circularity, Cylindricity

ORIENTATION TOLERANCES

Parallelism (Surface), Parallelism (Axis), Perpendicularity (Surface), Perpendicularity (Axis), Angularity (Surface and Axis)

LOCATION TOLERANCES

True Position –Basics, Position – In-Depth, Intro to Functional Position Gauging, Why Use Position Over Coordinate Dimensions, Concentricity, Symmetry

RUNOUT TOLERANCES

Runout/Circular Runout&Total Runout

DCCP-003 ENGINEERING DRAWING

INTRODUCTION TO ENGINEERING DRAWING: Principles of engineering graphics and their significance – drawing instruments and their use – conventions in drawing – lettering – BIS conventions. Dimensioning rules, geometrical construction.

ORTHOGRAPHIC PROJECTION IN FIRST ANGLE PROJECTION ONLY: Principles of orthographic projections – conventions – first and third angle projections. Projections of points and lines inclined to both the planes.

PROJECTIONS OF PLANES AND SOLIDS: Projections of regular planes, inclined to both planes. Projections of regular solids inclined to both planes.

DEVELOPMENT OF SURFACES: Development of surfaces of right, regular solids – development of prisms, cylinders, pyramids, cones and their parts.

ISOMETRIC PROJECTIONS: Principles of Isometric Projections-Isometric Scale- Isometric ViewsConventions-Plane Figures, Simple and Compound Solids.

DCCP-004 PRODUCTION TECHNOLOGY

LATHE

Introduction, terminology used in lathe: feed, depth of cut, cutting speed, R.P.M. of pass etc. Types of lathe, centre lathe, capstan lathe, turret lathe, automatic lathe of computer guided lathe Constructional details of centre lathe.Specification of lathe.Difference between centre lathe & turret lathe.Operation on lathe – Turning (Cylindrical, toper), facing, drilling, boring, thread cutting, grinding C.N.C. lathe – computer operation for C.N.C. lathe, merits of C.N.C over manually operated lathe.

MILLING: Introduction, terminology used in Milling: feed, depth of cut, cutting speed, R.P.M. of pass etc. Types of Milling

SHAPER AND PLANNER

Introduction. Construction details of shaper. Quick return mechanism. Terminology used (feed. Depth of cut, no. of pass, R.P.M. stroke length cutting speed) Specification of shaper.Difference between shaper and planner, Planner operation. Types of jobs prepared on shaper and planner,

DRILLING & BORING MACHINES:

Introduction, classification, specification. Tools, accessories, operation, difference in drilling & boring tools.

PATTERN MAKING:

Definition of pattern. General terms used in pattern making. Pattern making tools, pattern materials wood, metals like brass, aluminium, white metal, plastics etc. Types of pattern – Single piece, split, loose piece, geted cope and drag and shell patterns. Pattern allowance: shrinkage, finish and rapping or shake allowance.

MOULDING-Introduction, terminology, Types of Moulding

CASTING-- Introduction, terminology, Types of Casting

GRINDING- Specification of grinding wheel, Type, Material and methods employed in different types of grinding processes.

DCCP-005 PRESS TOOL DESIGN

1.INTRODUCTION

Concept of mass production of sheet metal components, sheet material components and their applications, concept of press tools, press and their applications in mass production of components in industry.

2. PRESS TOOL OPERATIONS

(a) Concept and principle of shearing operations. Cutting operations and cutting dies such as blanking, piercing, trimming, notching and shaving.

b) Concept and principle of non- cutting operations such as forming, bending, curling, coining, embossing

3. ELEMENTS OF PRESS TOOLS Press tool parts as Die-set, stripper plate, guiding plate, punch & punch plate, die plate. Selection of material for each element of press tool.BIS standards for die-sets such as Bottom Plate, Top plate, pillars, bushes and types of bushes.

4. CLASSIFICATION OF PRESS TOOLS

Concept and description of

a Cutting dies/tools such as blanking tool, piercing tool, compound tool, progressive tool. Notching tool, trimming tool and shaving tool.

b Bending tool, forming tool, draw tools.

5. CLASSIFICATION OF PRESSES

a) Concept and working of presses for press tools such as Hand Presses, Hydraulic and Pneumatic presses.

b) Specification of presses.

c) Selection of press for press tool operations.

6. DESIGN PARAMETERS IN PRESS TOOL DESIGN

a) Concepts of sheering force, stripping force, cutting clearance, angular clearance. Land and shear angle, concept of die life.

b) Concept of strip layout classifications of strip layout such as piloting & stopping, strip guiding, material condition. Principle of grain direction.Material utilization, feeding mechanism.

DCCPP-001 CAD Lab-1

1. INTRODUCTION TO AUTOCAD COMMANDS

1.1 Concept of AutoCAD, Tool bars in Auto CAD, coordinate system, snap, grid, and ortho mode (Absolute, Relative and Polar)

1.2 Drawing commands – point, line, arc, circle, ellipse,

1.3 Editing commands – scale, erase, copy, stretch, lengthen and explode.

1.4 Dimensioning and placing text in drawing area

1.5 Sectioning and hatching

1.6 Inquiry for different parameters of drawing entity

2. DETAIL AND ASSEMBLY DRAWING OF THE FOLLOWING USING AUTOCAD

2.1 Plummer Block

2.2 Wall Bracket

2.3 Stepped pulley, V-belt pulley

2.4 Flanged coupling

2.5 Machine tool Holder (Three views)

2.6 Screw jack or knuckle joint

3. ISOMETRIC DRAWING BY CAD USING AUTO CAD

Drawings of following on computer: - Cone - Cylinder - Isometric view of objects

4. MODELLING (01 SHEET) 3D MODELLING, Transformations, scaling, rotation, translation

5. INTRODUCTION TO OTHER CAD SOFTWARES;(Pro Engineer/CATIA /

Inventor/Unigraphics/Solid Work: Salient features, simple drawing of components (2 D and 3D)(At least one software

DCCPP-002 EMM lab

- Measurement of Outside and Inside diameter of Given specimen by vernier Caliper

- Measurement of Outside diameter of Given specimen by Micrometer.

- Comparison and measurements using vernier calliper and micrometer.

- Taper Angle Measurement Using Sine Bar and Slip Gauge.

- Calibration of Vernier calliper using Slip Gauge.

- Measurement of Angle Using Universal Bevel Protractor.

DCCPP-003 Minor Project

Students will make individual minor projects based on the subjects they have studied.

DCCP-006 PRODUCTION MANAGEMENT

MANAGEMENT FUNCTIONS, Evolution of Management Theory, Management approach to Planning, Analysis and Control functions involved in a Production System; Production cycles, planning functions;

TYPES OF INDUSTRY : Job, Batch, Continuous, Mass and Flow Productions; Organisation and policies in respect of production planning and control;

PRODUCT DESIGN AND DEVELOPMENT; Forecasting techniques; Scheduling, Sequencing and plant loading for optimal utilization; Queueing models and line balancing;

MATERIALS PLANNING AND CONTROL, Inventory Management; Value Analysis; Productivity Analysis, Mechanics of production control.

DCCP-007 ENGINEERING MATERIAL AND HEAT TREATMENT

1. INTRODUCTION

Overview of different engineering materials and applications, Classification of materials, Thermal, Chemical, Electrical, Mechanical properties of various materials, Present and future needs of materials, Overview of Biomaterials and semi-conducting materials, Various issues of Material Usage-Economical, Environment and Social.

2. METALS AND ALLOYS

Introduction: Raw Materials in production of iron and steel, Basic Process of iron-making and steel-making, Classification of iron and steel,

Cast Iron: Different types of Cast Iron, manufacture and their usage.

Steels: Steels and alloy steel, Classification of plain carbon steels, Availability, Properties and usage of different types of plain carbon steels, Effect of various alloys on properties of steel, Uses of alloy steels (high speed steel, stainless steel, spring steel, silicon steel)

Non Ferrous Materials: Properties and uses of Light Metals and their alloys, properties and uses of White Metals and their alloys.

3. ENGINEERING PLASTICS

Important sources of plastics, Classification-thermoplastic and thermo set and their uses, Various Trade names of engg.Plastics, Plastic Coatings.

4. ADVANCED MATERIALS

Composites-Classification, properties, applications Ceramics-Classification, properties, applications.

5. TOOL AND DIE MATERIALS

Overview of Tool and Die materials, classification, properties and application.

6. INTRODUCTION TO HEAT TREATMENT

Heat treatment and its applications.Principles of heat treatment such as heating, socking and quenching.

7. IRON CARBON DIAGRAM

Heating and cooling, allotropic forms of iron; various phases and their constitutes, phase transformation, eutectic and eutectoid points of curves, classification of iron, steel and cast iron group.

8. HEAT TREATMENT PROCESSES

- Different heat treatment processes such as hardening, tempering, annealing and normalizing
- Flame hardening, nitriding, cyaniding, induction hardening,
- Different types of carburizing
- Temperature range of heat treatment process and rate of cooling

9. FURNACES AND EQUIPMENT

Common furnaces used in heat treatment shop. Working principles and selection of furnaces for heat treatment operations.

DCCP-008 ENTREPRENEURSHIP DEVELOPMENT

ENTREPRENEURSHIP

Definition and Concept of Entrepreneurship, Theories of Entrepreneurship, Myths about Entrepreneurship, Entrepreneurial Traits and Motivation, Role of Entrepreneurship in economic development. Types of Entrepreneurs. Barriers in the way of Entrepreneurship. Entrepreneurship Development (ED) Cycle.

BUSINESS PLAN

Creativity and Business Ideas, Blocks to creativity. Business Plans and reasons of failure of business plans. Micro-Small-Medium (MSME) Enterprise – Definition – Characteristics-Objectives- Advantages- Disadvantages-Role in developing countriesProblems- steps for starting- – Government Policies.

EDP

EDP in India – Phases of Entrepreneurial programs – Government Policies- Administrative Frame work – Policy instruments – Statutory Boards – Industrial Estates –Industrial clusters – Incentives and subsidies – Advantages - Needs & Problems – Promotional agencies. Business Incubators& Start-ups.

FINANCING OPTIONS

Bridge capital, Seed capital assistance, Margin money scheme, Industrial Sickness, Causes-Remedies- An overview on the roles of institutions/schemes in entrepreneurial development- SIDBI, Commercial Banks. Other financing options- venture capital, lease funding, Angel Investors. Revival, Exit and End to a venture.

DCCP-009 CNC PROGRAMMING

INTRODUCTION: NC, DNC, CNC, Programmed Automations, Machine control unit, Part program, NC tooling.

NC MACHINE TOOLS: Nomenclature of NC machine axes, Types of NC machine tools, Machining centres, Automatic tool changes (ATC), Turning centres.

MACHINE CONTROL UNIT & TOOLING: Functions of MCU, NC actuation systems, Part program to command signal, MCU organization, Computerized numerical control, Transducers for NC machine tools, Tooling for NC machining centres and NC turning machines, Tool presetting.

MANUAL PART PROGRAMMING: Part program instruction formats,

INFORMATION CODES: Preparatory function, Miscellaneous functions, Tool code and tool length offset, Interpolations, Canned cycles. Manual part programming for milling operations, Turning operations, Parametric subroutines.

COMPUTER AIDED PART PROGRAMMING:NC languages: APT, NELAPT, EXAPT, GNC, VNC, Pre-processor, Post processor.

DCCP-010 PRODUCT DEVELOPMENT&RAPID PROTOTYPING

INTRODUCTION: Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Classification of Rapid Manufacturing Processes: Additive, Subtractive, Formative, Generic RP process.

CAD MODELLING AND DATA PROCESSING FOR RP: CAD model preparation, Data interfacing: formats (STL, SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP), conversation, validity checks, repair procedures; Part orientation and support generation, Support structure design, Model Slicing algorithms and contour data organization, direct and adaptive slicing, Tool path generation

RP PROCESSES: Process Physics, Tooling, Process Analysis, Material and technological aspects, Applications, limitations and comparison of various rapid manufacturing processes.

ERRORS IN RP PROCESSES: Pre-processing, processing, post-processing errors, Part building errors in SLA, SLS.

DCCPP-004 CAD LAB-2

1. INTRODUCTION TO SOLIDWORKS COMMANDS

- Various concepts of Solidworks Tool/ Menu bars in Solidworks.

2. SKETCHING

- Drawing Commands – Point, Line, Arc, Circle, Ellipse, Hyperbola, Parabola.
- Editing Commands – Scale, Erase, Copy, Rotate, Stretch, Lengthen, Explode and Array.

3. PART

- 3D Designs of individual parts and other assembly components.

4. ASSEMBLY

- Arrangements of various parts and assembly as a single operational unit.

5. DRAFTING

- 2D Orthographic projections and Isometric Projection.

6. DRAFTING AND MODELLING OF THE FOLLOWING USING SOLIDWORKS

- Bench Vice as a single working/ Operational unit.
- Plummer Block assembly
- Screw Jack device and its working.
- Gears combinations and different mechanisms

DCCPP-005 CNC LAB

- Performing different Turning Operations on workpiece.

- Facing the sides/ ends of cylindrical bars.

- Performing different Drilling Operations including pilot drill to final hole size.

- Employing different Taper Turning techniques.

DCCPP-006 RAPID PROTOTYPING LAB

- Product Designing & Development of template.

- Material Selection for 3D printing of product/prototype.

- Filament Classification as per industrial/ production parameters and applications.

- Prototype Creation using 3D printer.

DCCP-007 MAJOR PROJECT

Students are required to make hardware/Software based projects on the subjects studied.