Introduction to tool design

- Definition of tool design
- Responsibilities of a tool designer
- Objectives of tool design
- Tool design process
- Tooling drawings and layout
- Tool design safety

Geometric dimensioning and tolerancing

- Definition
- Relationship to conventional dimensioning techniques
- Geometric symbols and characteristics
- Datums
- Modifiers
- Application to conventional dimensions

Tool materials and selections

- Physical and mechanical properties
- Ferrous tool materials
- Nonferrous tool materials
- Nonmetallic tool materials
- Heat treating

Work holding principles

- Purpose and function of work holders
- Locating principles
- Types of workpiece location
- Basic types of locators
- Clamping principles
- Basic types of clamps
- Chucks and vises
- Design considerations of work holders

Cutting Tool Design

- Elements of machining
- Single point tool geometry
- Chip Formation

- Control of metal cutting characteristics
- Tool wear
- Tool life
- Cutting forces
- Power requirements
- Basic principles of multiple-point tools

Force and power requirements

- Linear travel tools
- Axial-feed rotary tools

II. Designing : Machine tool design

Jig design

- Definition
- Design considerations
- Types of jigs

Fixture design

- Definition
- Design considerations
- Types of fixtures

Gage design

- Definition and purpose
- Gaging principles and design considerations
- Gage types
- Gaging geometric dimensioned and toleranced parts
- Designing gaging and gaging systems

Tooling for Joining Processes

- Designing welding fixtures
- Tooling for cutting
- Tooling for mechanical joining processes
- Tooling for adhesive bonding

III. Drafting / Design Practice
Drafting/Design Practices

A. Machine tool drafting principles
   1.Symbology and nomenclature
   2.Alphabet of lines
   3.Representation of views

B. American National Standards Institute (ANSI) standards
   1.Interpretation of standards
   2.Application of standards

C. Creating tooling drawings and layouts
   1.Design sketches
   2.Detail drawings
   3.Manual layouts
   4.Computer-aided drafting layouts

IV. Machine tool design software's Cad/cam :

- Autocad,
- Pro/e
- Catia
- Ansys

V. Live projects for machine tool design engineering (2 nos)

- Project 1: Jig design for peripheral drilling.
- Project 2 : Jig design for radial drilling
- Project 3: Yoke turning fixture
- Project 4: Tribase boring fixture
- Project 5: Drill jig for crank arm
- Project 6: Jig for piston oil holes
- Project 7 : Turning fixture for fulcrum pin
- Project 8: Drill jig for adaptor

Project 9: Feed raise shaft assembly fixture