Title: 3-D printing of Mechanical Fasteners

**Objective:** To prepare a 3D model of mechanical fasteners and perform drafting to obtain orthographic projections.

**Components/Equipments required with specifications:** 3D modelling software- INVENTOR, fractory software as a slicer, single nozzle 3D printer, and PLA filament, computer systems (i5 processor, 4GB RAM).

### **Procedure:**

## **3D Modelling of Nut:**

- 1. Setting up drawing sheet & Plane of work:
  - a. Inventor New Metric Standard mm Create
  - b. Sketch >2D Plane Selection
- 2. 2D sketch creation:
  - a. Draw Toolbar Rectangle Polygon enter no. of sides
  - b. Constraint toolbar Dimensions give dimensions to make sketch fully constrained (GREN COLOUR figure)
  - c. Draw Toolbar Circle
  - d. Constraint toolbar Dimensions give dimensions to make sketch fully constrained (GREN COLOUR figure)
  - e. EXIT 2D sketch
- 3. 3D modelling:
  - a. 3Model → Extrude → Select Profile → enter values for extent (10mm)
- 4. Thread Creation:
  - a. 3Model Threads Face selection (inner) Specifications

    Thread Type (ISO Metric) Size(10) Designation (M10X1)
- 5. Save file:
  - a. File Save file type .ipt
  - b. File Export file type stl

# **3D Modelling of Bolt:**

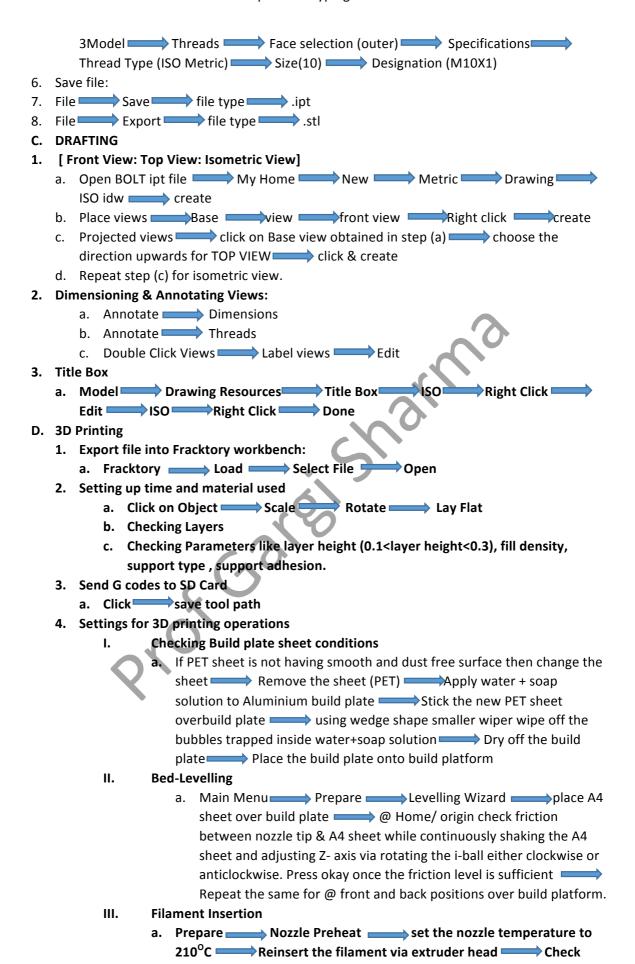
#### A. BOLT HEAD

- 1. Setting up drawing sheet & Plane of work:
  - a. Inventor New Metric Standard mm Create
  - b. Sketch 2D Plane Selection
- 2. 2D sketch creation:
  - a. Draw Toolbar Rectangle Polygon enter no. of sides
  - b. Constraint toolbar Dimensions give dimensions to make sketch fully constrained (GREN COLOUR figure)
  - c. Draw Toolbar Circle
  - d. Constraint toolbar Dimensions give dimensions to make sketch fully constrained (GREN COLOUR figure)
  - e. EXIT 2D sketch
- 3. 3D modelling:

3Model Extrude Select Profile enter values for extent (10mm)

# **B. BOLT BODY**

- 4. Select face from bolt head new sketch create circle exit sketch extrude enter values for extent (50mm)
- 5. Thread Creation:



that filament reached nozzle tip & stop pushing filament to nozzle once melted filament start coming out from nozzle.

- IV. Copying G codes to 3d printer
  - a. Prepare Print from SD Card Select file name Print
- V. Once print get over remove the print from build plate using spatula. Results:

Fig: 2D sketch of nut & bolt

Fig: Final 3D modelling of nut & bolt

Fig: Final Drafting of nut & bolt

Fig: Importing .stl file in fracktory workbench and assigning operational parameters to the file. (screenshots for load, toolpath, rotate, lay flat, layers, support type & adhesion)

Fig: Setting up 3D printer to print. (screenshots for filament insertion, nozzle preheating, bed levelling, how to put PTE sheet over build plate, print from SD card)

Fig: Final 3D printed model of nut & bolt

### VI. Discussion:

Write about the challenges you faced while learning 3 D modelling & 3D printing, how you overcome your design restrictions.

## VII. Learning Outcomes:

- 1) Learnt how to create 3D models from 2D sketch using inventor modelling software with the help of 3D commands like extrude, revolve, pattern etc.
- 2) Learnt mating concept between two objects via thread creation along with types of thread and their nomenclature.
- 3) Learnt to fabricate the prepared design via generating 3D printing G-codes.