

# Summer Junior Fellowship Experience at LUMS

Maliha Manzoor

13 June - 15 July, 2011

LUMS Summer Internship



# Internship Schedule



- **June 13-17:** 2D and 3D drawings in AutoCAD
- **June 20-24:** 2D and 3D drawings in AutoCAD
- **June 27-July 1:** Learn about filing, and Lathe Machine
- **July 4-8:** Draw Helicopter simulator and learn about Milling and Drilling Presentations
- **July 11-15:** Electromagnetic Induction Lab and Final Presentation

# AutoCAD and Autodesk Inventor

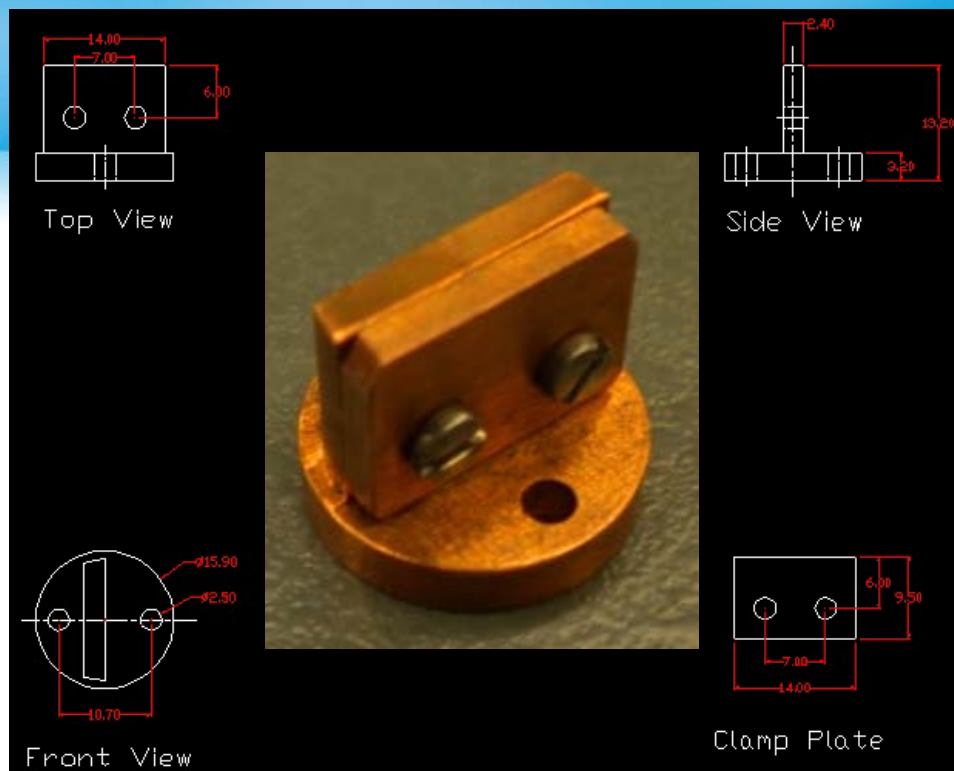
Maliha Manzoor  
13-28 June, 2011  
LUMS Summer Internship



# Purpose for AutoCAD and Autodesk Inventor



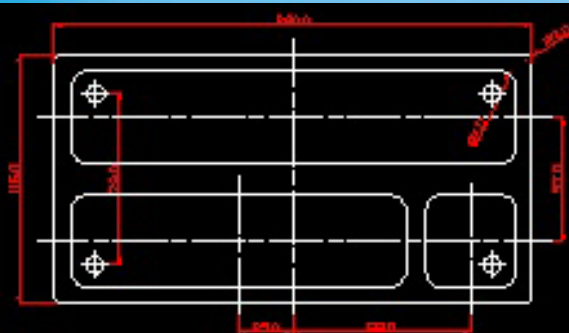
- Create technical drawings of objects
  - Drawing views
    - orthographic
  - 2D models
  - 3D models
  - animations
- Computer Drafting



MALIHA MANZOOR		H.M. RIZWAN		14-6-2011		1:1	
PHYSICS LAB (SSE) LUMS		TRAINING WORK				A4	

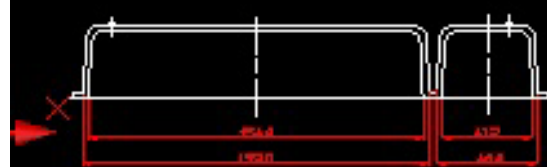
QUANTITY 1	MATERIAL		
DESIGNED BY MALIHA MANZOOR	REQUESTED BY H.M. RIZWAN	DATE 14-6-2011	SCALE 1:1
PHYSICS LAB (SSE) LUMS		PART NAME TRAINING WORK	DWG NO
		PRINCIPAL INVESTIGATOR DR. SABIEH ANWAR	SHEET A4



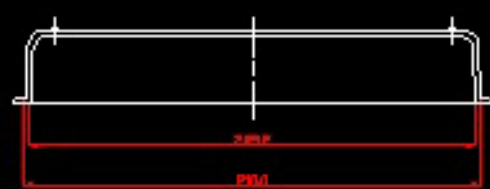


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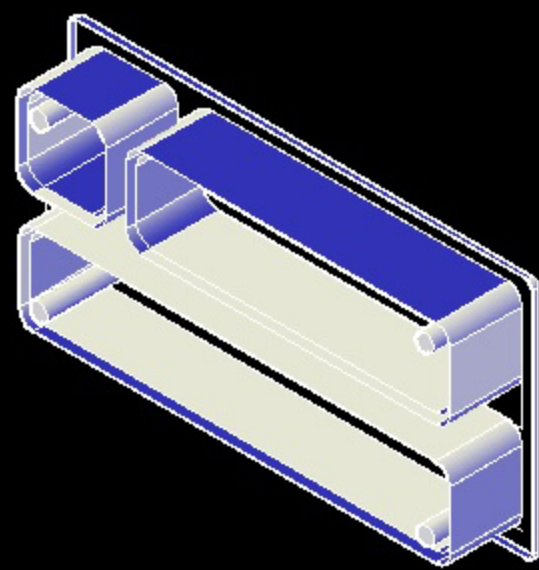
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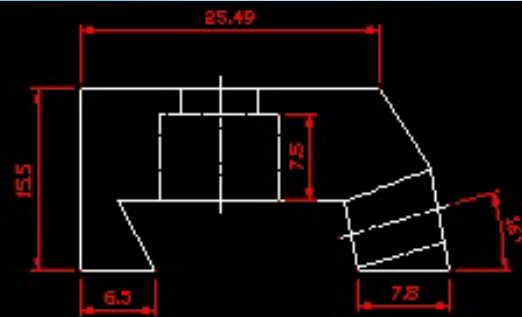


Section A-A

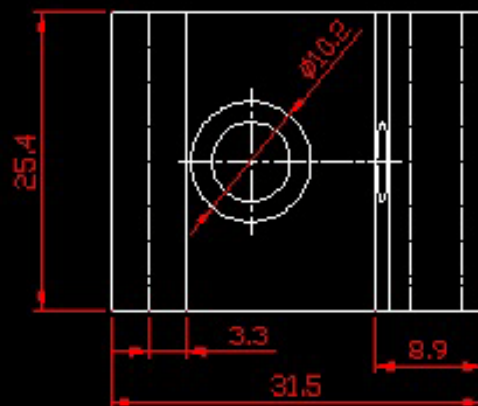
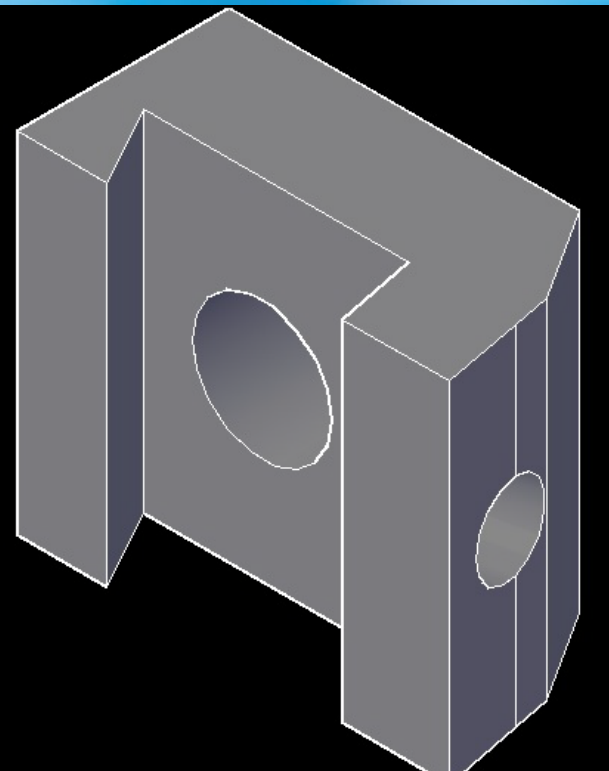


Section B-B

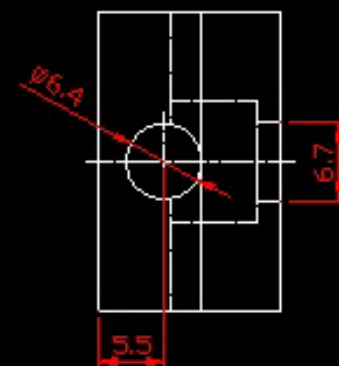




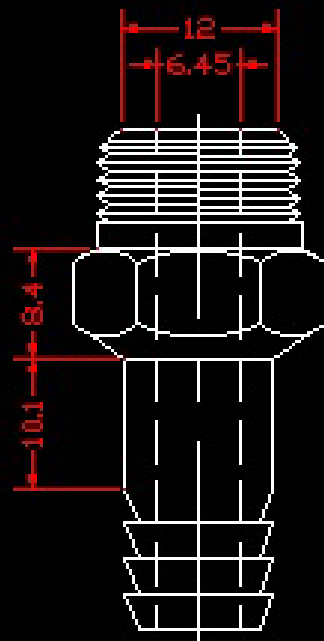
Top View



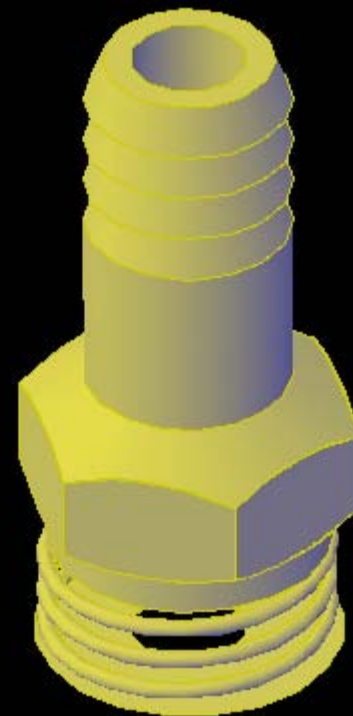
Front View



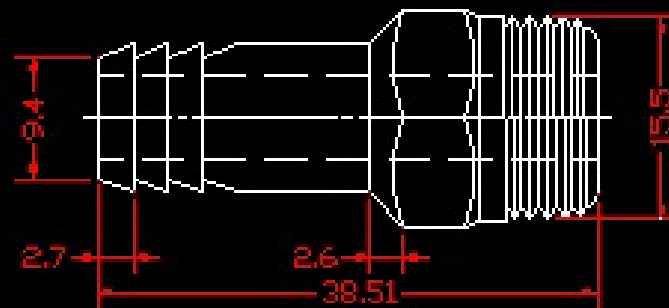
Side View



Top View



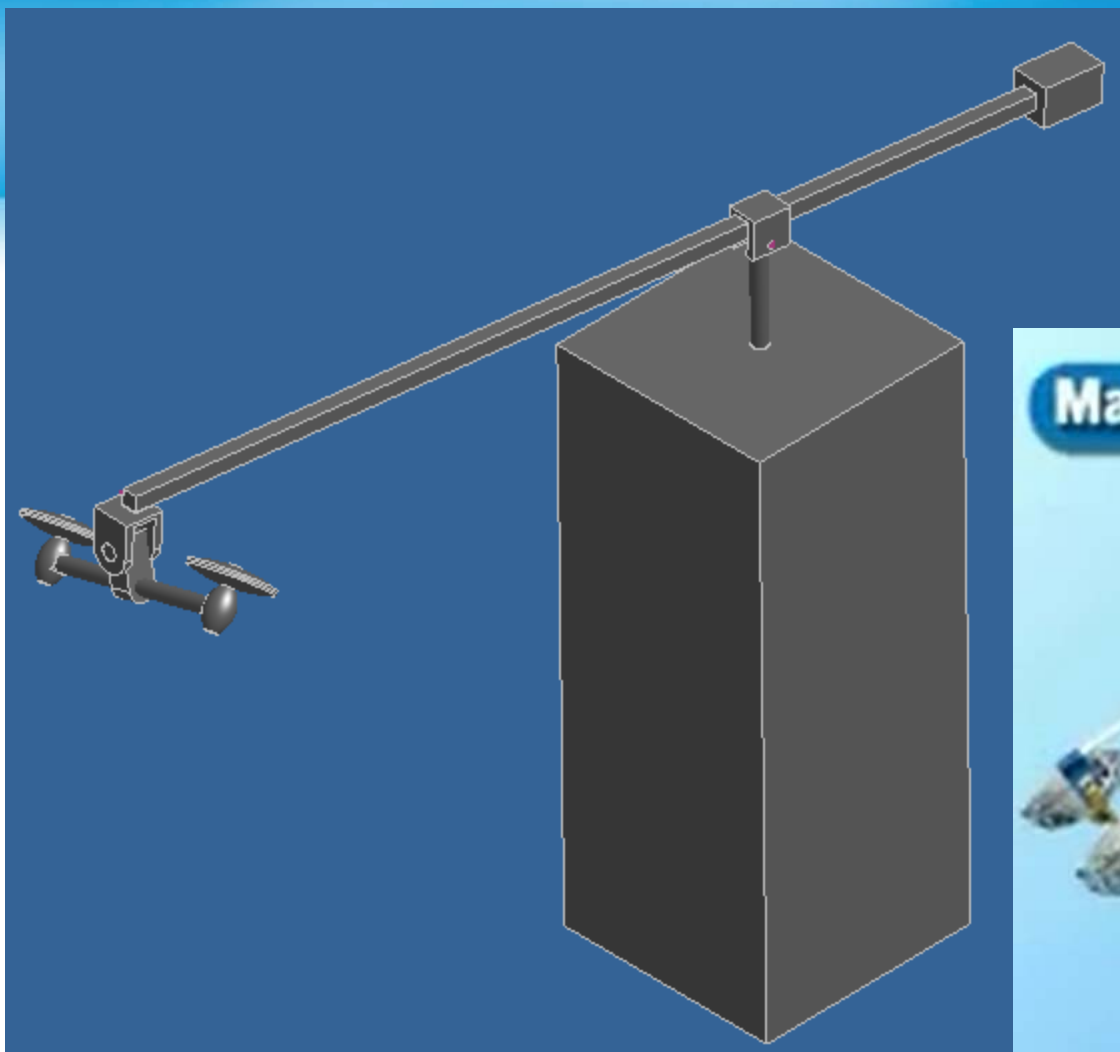
Front View



Side View







A photograph of a wooden desk. On the left, a black laptop is partially visible with the 'ThinkPad' logo. A silver pen lies on the desk surface. A dark book with some faint markings is positioned horizontally across the middle of the desk. In the bottom foreground, a portion of a chair with a black and white wavy pattern is visible. The background is a plain, light-colored wall.

# Filing

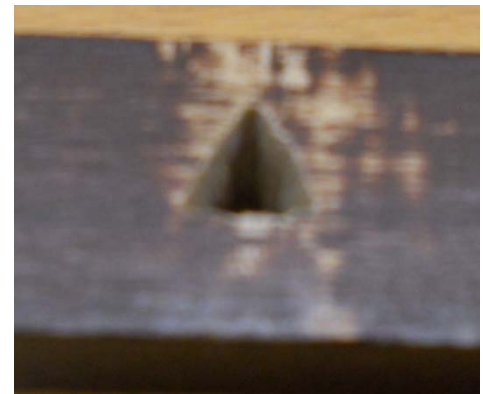
Maliha Manzoor

28 June, 2011

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# Types of files

- Flat
  - Different sizes
  - Used for flat surface
- Square
  - Four sided file
- Circle
  - Different diameters
  - Used to file down holes
- Semicircle
- Triangle
  - Three sided file for triangular works







# Lathe Machine

Maliha Manzoor

29 June, 2011

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# Headstock



- **Chuck** - holds the job
- **Spindle speed selector** - series of gears to control speed of spindle
- **Headstock spindle** - drive from motor to work holding devices
- **Feed-reverse lever** - forward and backward direction of feed rod



# Bed



- **Carriage** - moves along the bed for turning works
- **Tool post** - holds cutting tools
- **Compound rest** - supports turning tool
- **Cross slide** - gives a cross movement for cutting tool
- **Apron** - provides automatic feed to the carriage
- **Saddle** - supports cross slide
- **Chip pan** - catches excess pieces of work
- **Compound rest screw handle** - moves the compound rest to any angle
- **Clutch** - turns the machine on and off





# Tailstock



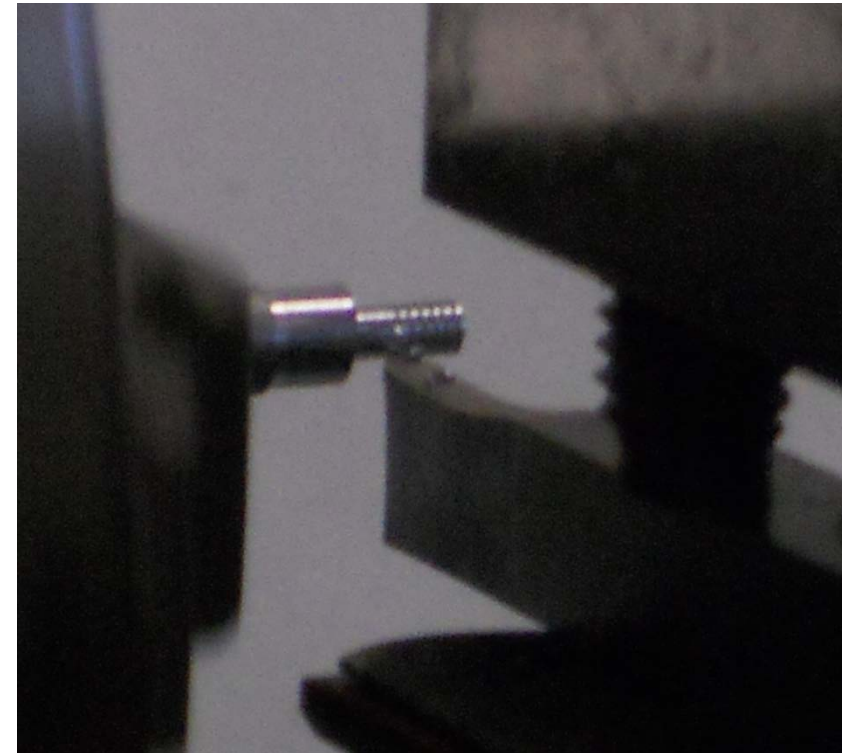
- **Dead center** - used to make center hole into work
- **Tailstock hand wheel** - moves tailstock spindle in or out of tailstock casting
- **Clamp nut** - locks the tailstock into any position



# Functions of Lathe Machine



- **Threading**
  - Inner and outer threads
  - Multi-threads
  - Different pitch
- **Facing**
  - Flat face
  - Even surface
- **Boring**
  - used with drill bit
  - Used to make larger holes



# Milling Machine

Maliha Manzoor

5 July, 2011

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# Milling Machine Uses



- **Facing edges**
  - Surfacing
  - Shaping
  - Fly cutting
- **Creating**
  - Pockets
  - Slots
  - Holes
  - Fillets
  - Chamfers
- **Boring**



# Vertical Milling Machine vs. Horizontal Milling Machine

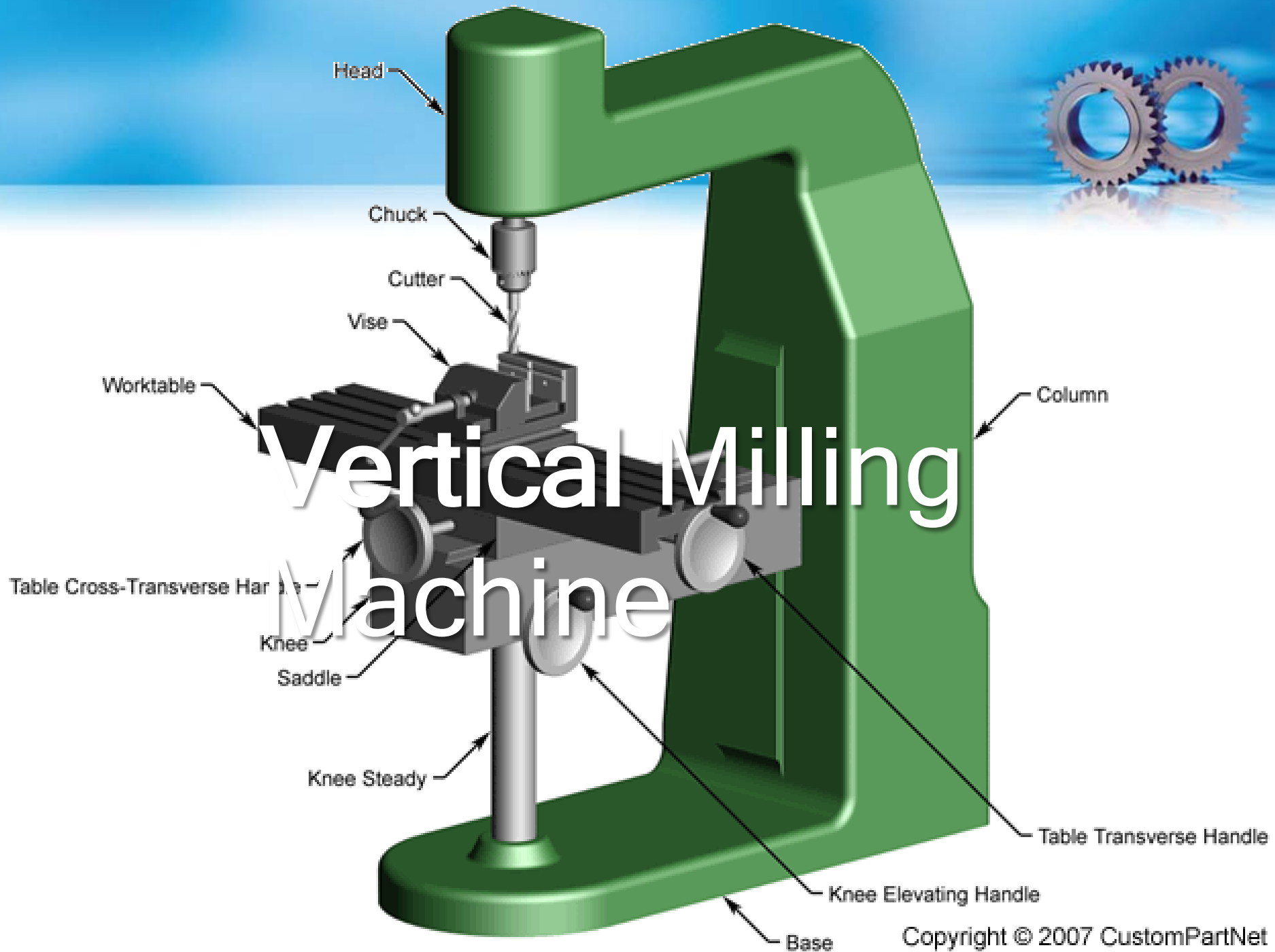


- Vertical:

- Spindle is on a vertical plane
- Head is able to turn to make angled cuts and surfaces
- Face and end milling
- Drilling operations

- Horizontal:

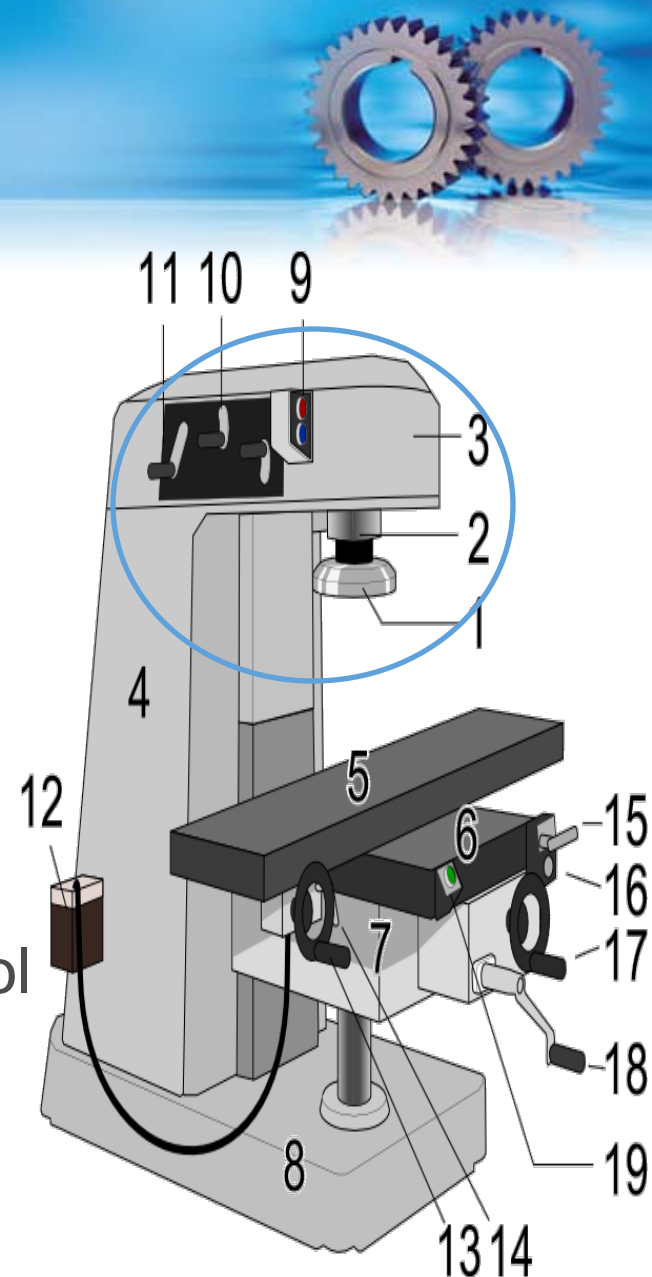
- Spindle is on horizontal plane
- Versatile and highly efficient
- Cut is determined by size and shape of cutter
- Can mill slots, pockets, and contours with vertical attachment





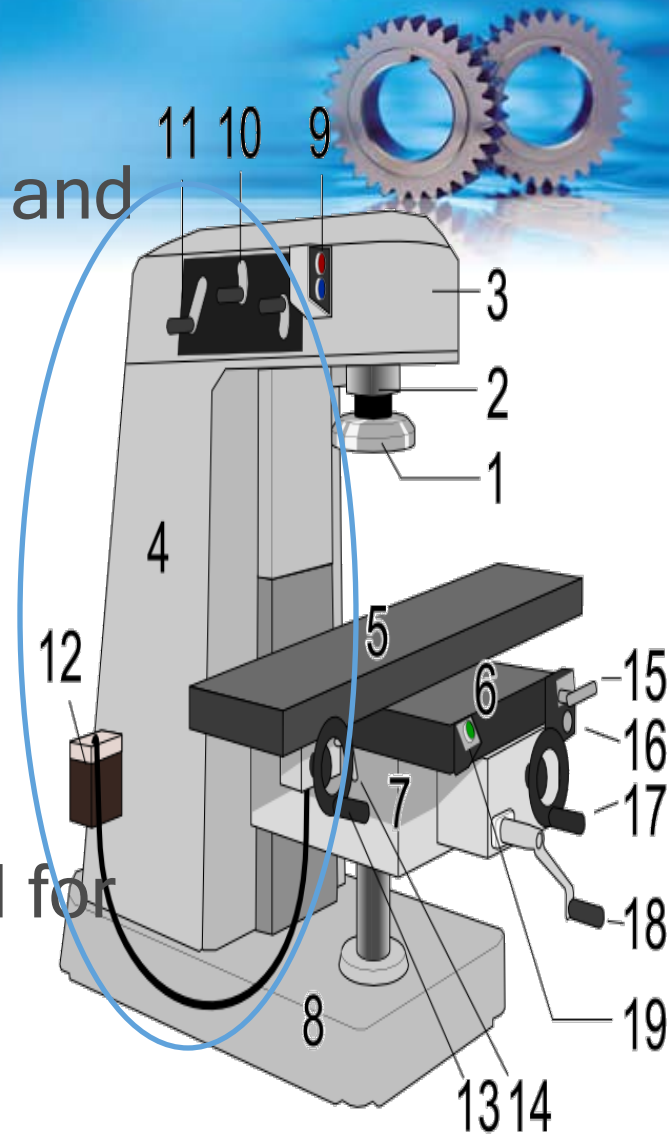
# Head

- **Motor stop/start button** - turns the machine on and off
- **Swivel head** - head is able to move 90° to cut angular surfaces
- **Spindle feed handwheel** - adjusts movement of spindle
- **Spindle nose** - holds chuck
- **Variable speed spindle motor** - changes speed of spindle
- **Motor speed control** - switch to control speed of motor
- **Motor direction control** - switch to control direction of motor



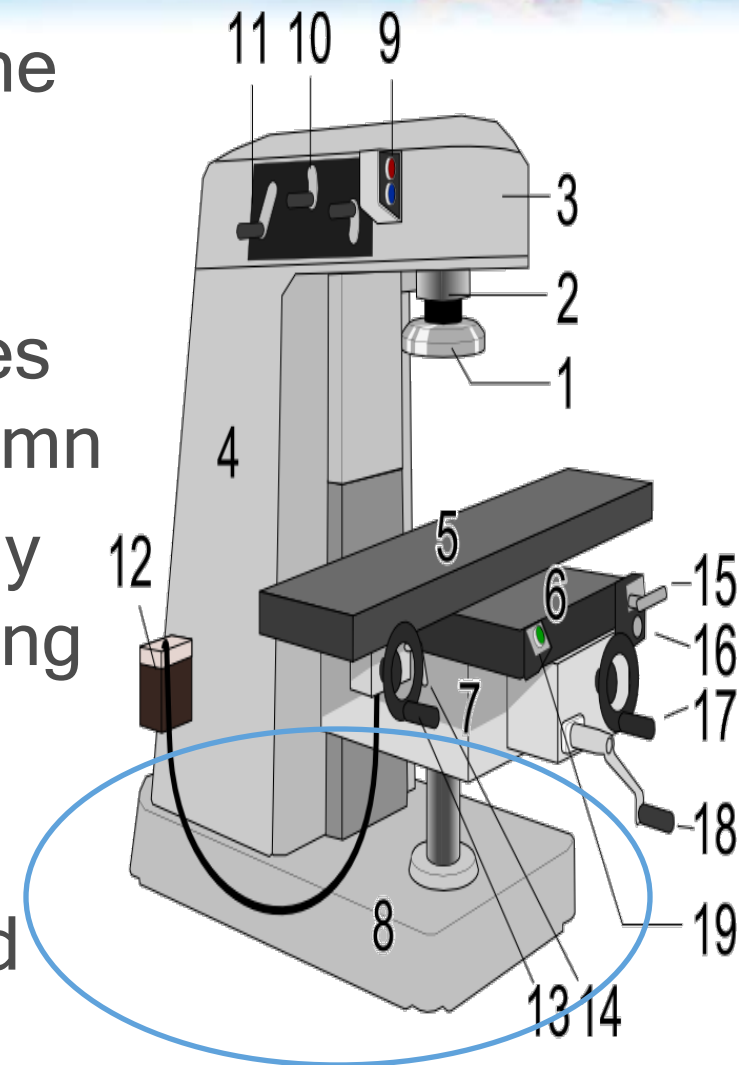
# Column

- **Coolant switch** - turns coolant on and off
- **Worktable** - holds job
- **Cross-traverse handle** - moves worktable along the y-axis
- **Table traverse handle** - moves worktable along the x-axis
- **Table traverse micrometer** - used for distance measurement when adjusting worktable along x-axis
- **Column** - guides knee when being adjusted up or down



# Knee

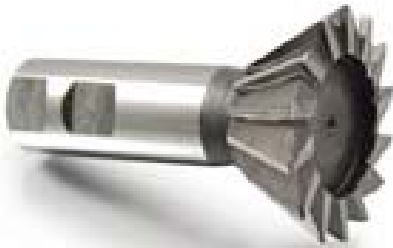
- **Knee** - moves up and down the column and supports the worktable
- **Knee elevating handle** - moves knee up and down along column
- **Knee lock** - keeps knee steady in place by locking the elevating handle
- **Knee steady** - supports knee
- **Base** - bottom of machine and holds coolant



# Vertical Milling Bits



- **Square-end**
  - used for creating pockets, slots, edge trims
  - facing
- **Ball-end**
  - Spherical pockets and fillets
- **Corner-Rounders**
  - Creates round corners
- **Conical-end**
  - Chamfers
- **Dovetail**
  - Angled cut



# Vertical Milling Cutters

- **Two-flute end mills**
  - Good chip clearance and fast metal removal
  - Slots, shallow holes, plunge cut
- **Four-flute end mills**
  - Finish cutting
- **Roughing end mills**
  - Fast metal remover to reduces heat friction, and horsepower
- **Combination end mill**
  - Roughing cutter on one end and finishing cutter on other end
  - Faster feed rates and deeper cuts





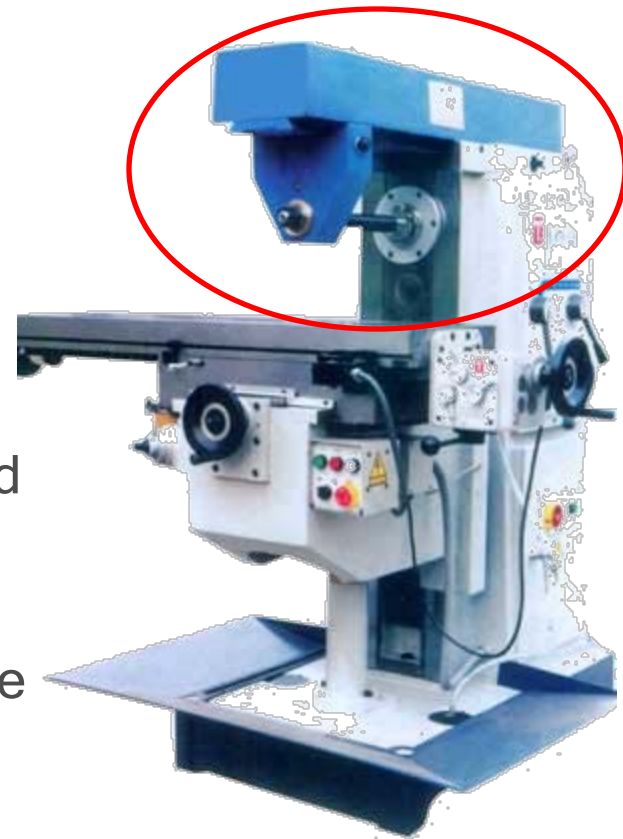


# Horizontal Milling Machine



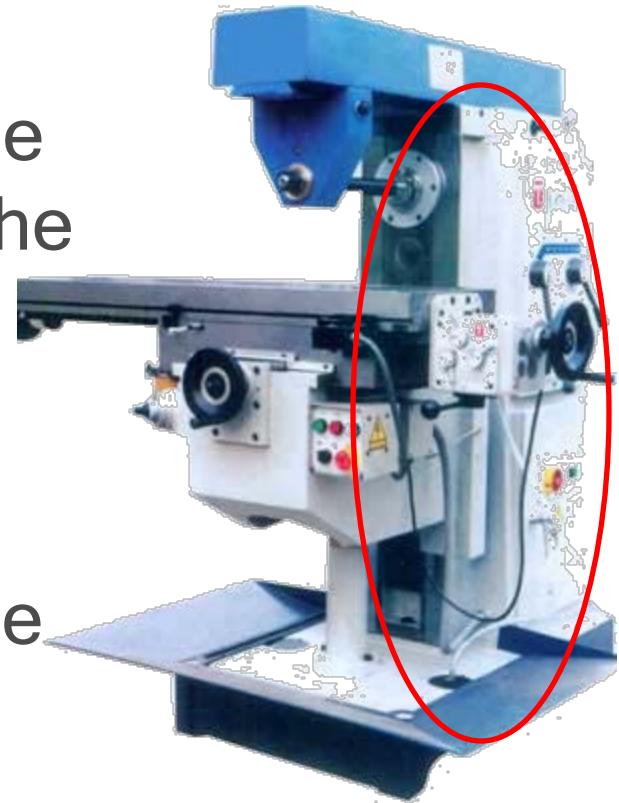
# Head

- **Saddle** - moved in or out with crossfeed handle to adjust work on the job
- **Feed dial** - set table feeds
- **Spindle** - holds arbors, cutters, and attachments
- **Overarm** - provides alignment and support for attachments and arbor
- **Arbor support** - aligns and supports arbors and attachments by clamping to any location on the overarm, holds cutter in place by keyways
- **Spindle-speed dial** - levers that turn to regulate spindle speed
- **Bearing bushings** - helps hold the cutter on arbor



# Column

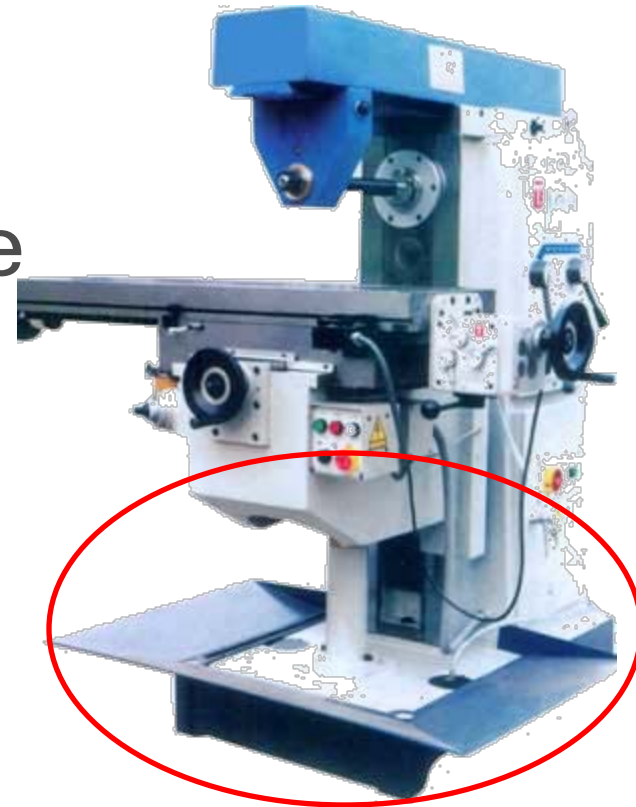
- **Column** - support and guides knee when it is being moved vertically
- **Swivel-table housing** - moves table up to 45° to allow angle work on the job
- **Table** - rests on saddle and holds job
- **Crossfeed handwheel** - move table toward or away from column
- **Table handwheel** - move table horizontally in front of the column



# Knee



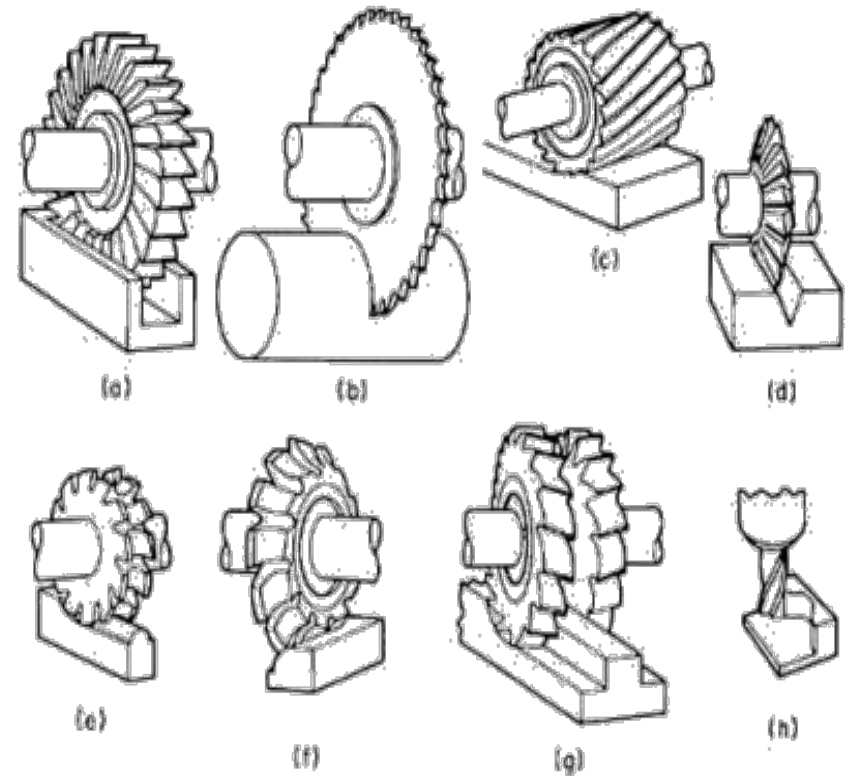
- **Base** - support for machine
- **Knee** - supports the table and knee feed mechanism; can be moved vertically to adjust work on the job
- **Elevating screw** - moves the knee and table up or down



# Horizontal Milling Bits and Cutters



- **Plain milling**
  - Create flat surfaces
- **Side milling**
  - Facing edges of work, cutting slots
- **Angular cutter**
  - Angular surfaces, grooves, serrations
- **Curved cutter**
  - Convex: cuts semicircle in the job, concave: leaves semicircle above the job
- **Gear cutter**
  - Different pitches and number of teeth
  - Special gear needs
- **Shell end mill**
  - Facing and periphery cutting







# Drilling Machine

Maliha Manzoor

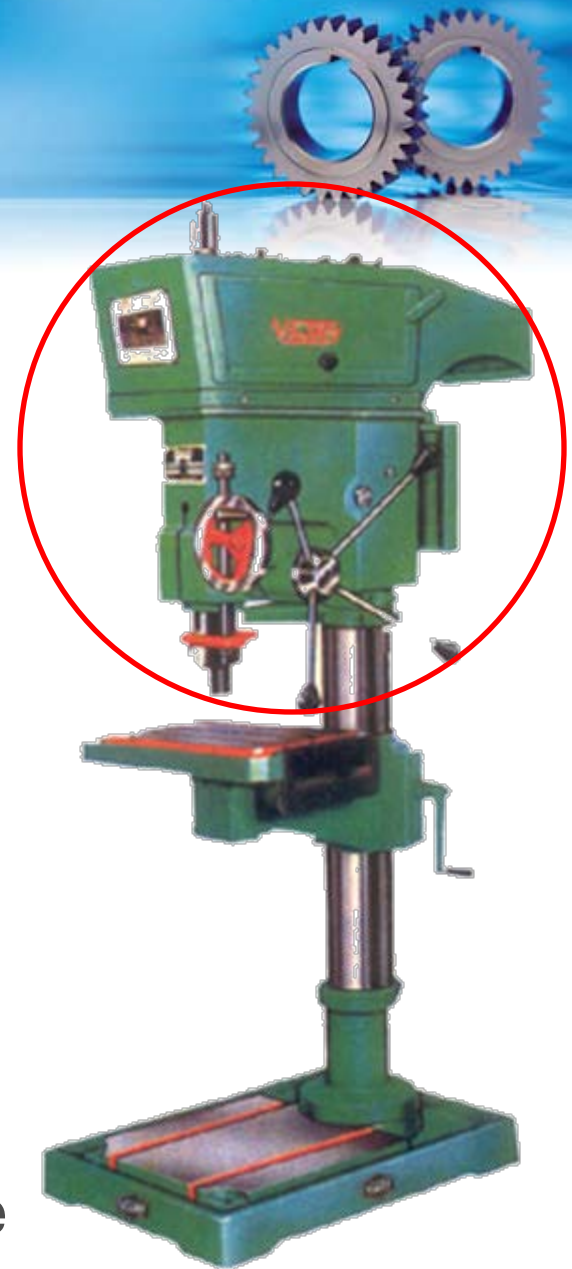
6 July 2011

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# Head

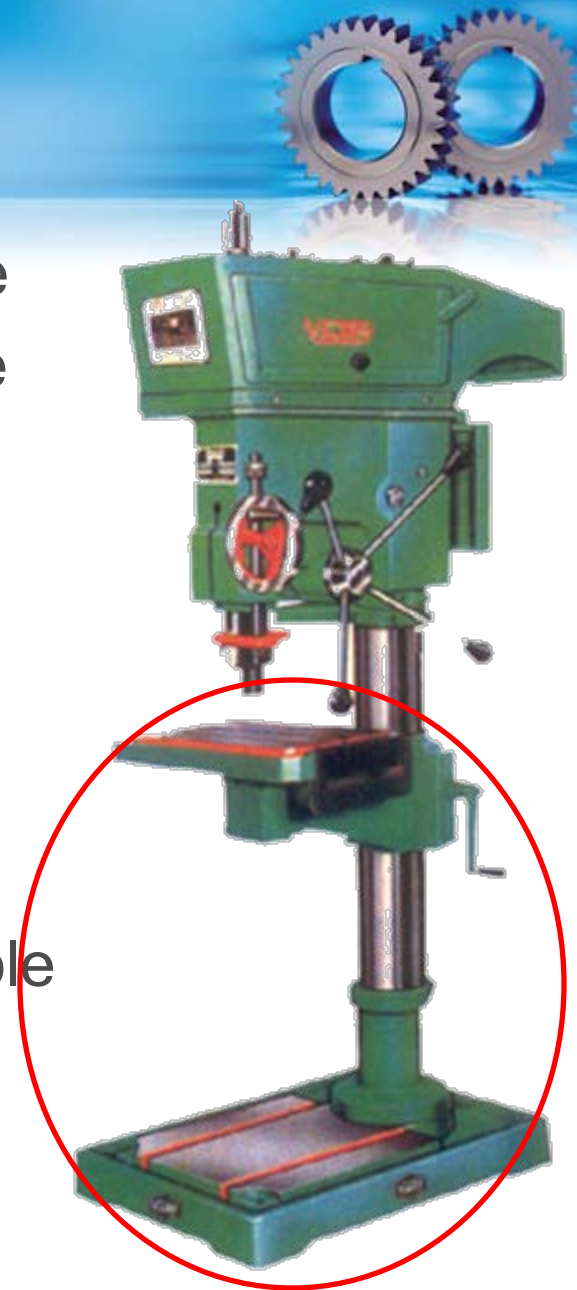
- **Drilling head** - holds the object that rotates and drives the cutting tool into the job
- **Depth Stop** - controls the depth that a cutting tool enters the job
- **Spindle** - holds and drives the cutting tool
- **Spindle Sleeve (quill)** - moves up and down the head to provide different downfeed to the job
- **Chuck** - attached at the end of the spindle





# Base and Column

- **Table** - supports the work piece; can be raised, lowered, or swiveled around the column
- **Base** - stability for machine
- **Handfeed Lever** - moves the spindle sleeve and cutting tool up or down in a vertical motion
- **Table Clamp** - clamps the job to the table for stability
- **Column** - guides the table along the column between the base and head

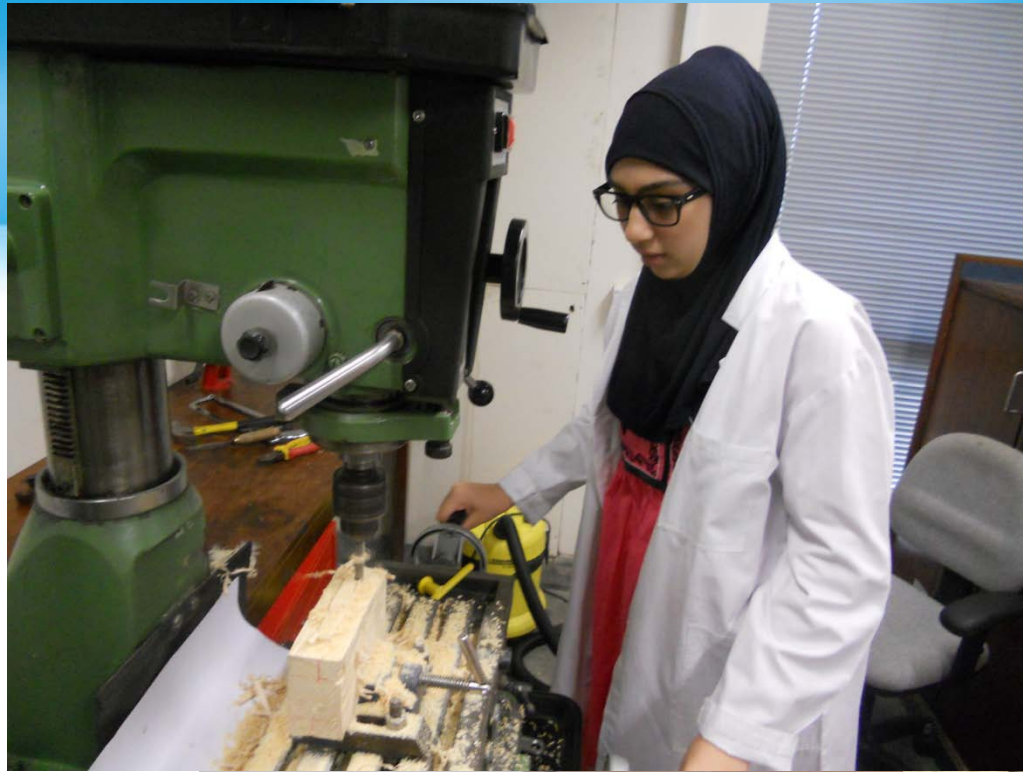




# Function of a Drilling Machine



- Drilling
- Reaming
- Countersinking
- Counterboring
- Tapping
- Spot facing





# Magnetic Fields, Hall effect and Electromagnetic Induction (Electricity and Magnetism)

Maliha Manzoor

8 July - 12 July, 2011

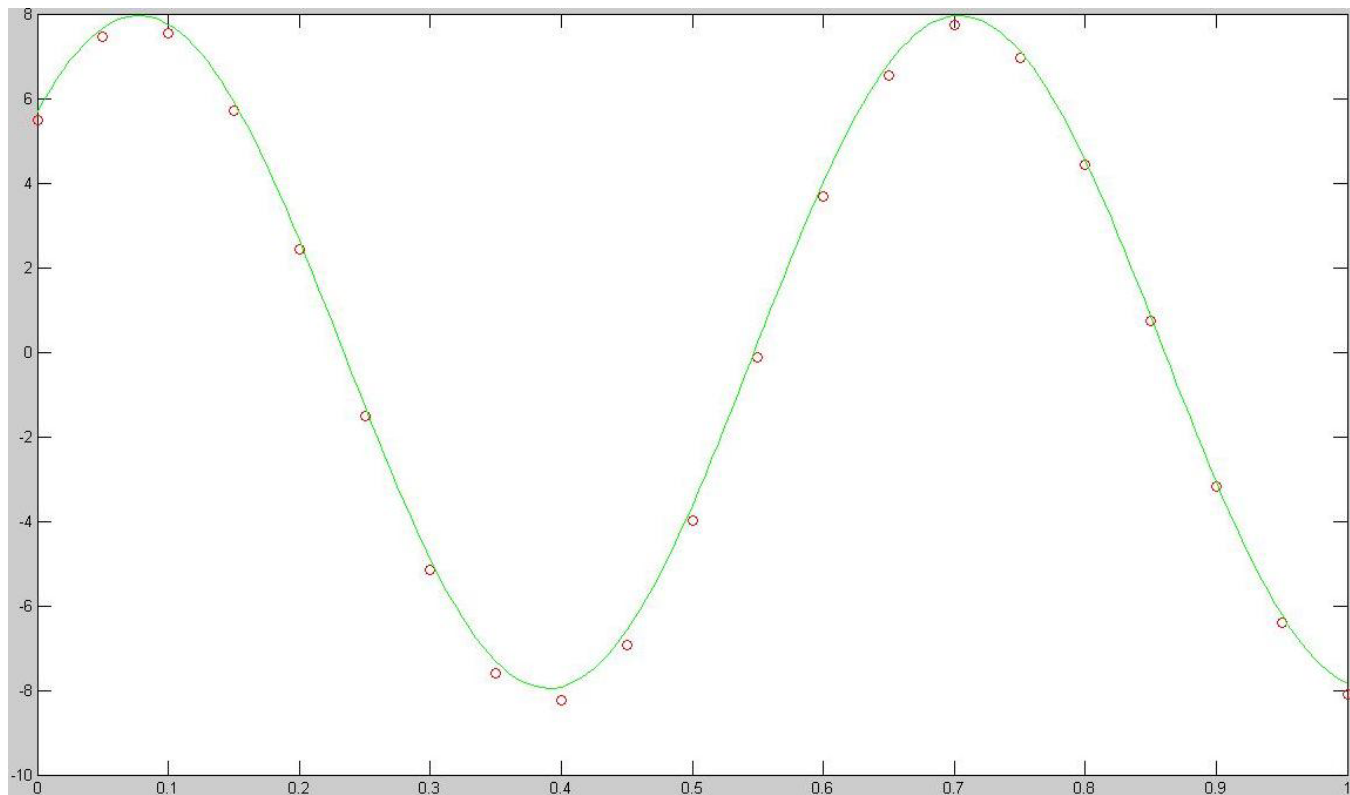
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# Matlab

```
>> lsqcurvefit(@sinusoid,[8 10 0],t,v);  
Optimization terminated: relative function value  
changing by less than OPTIONS.TolFun.  
>> t2=0:0.005:1;  
>> cfit=7.9551*sin(10.0256*t2+0.7971);  
>> figure;plot(t,v,'ro');hold on;  
>> plot(t2,cfit,'g-');  
>> [x,resnorm]=lsqcurvefit(@sinusoid,[8 10 0],t,v);  
Optimization terminated: relative function value  
changing by less than OPTIONS.TolFun.  
>> d=0:1:12
```



# Magnetic Field a Disk Magnet

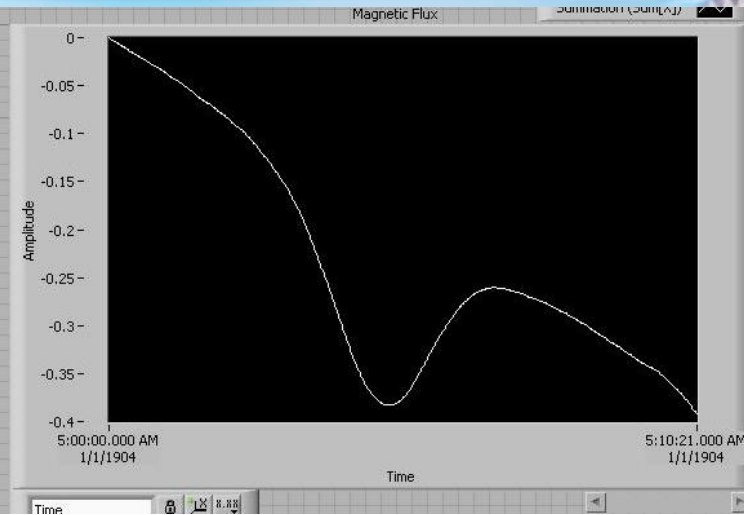
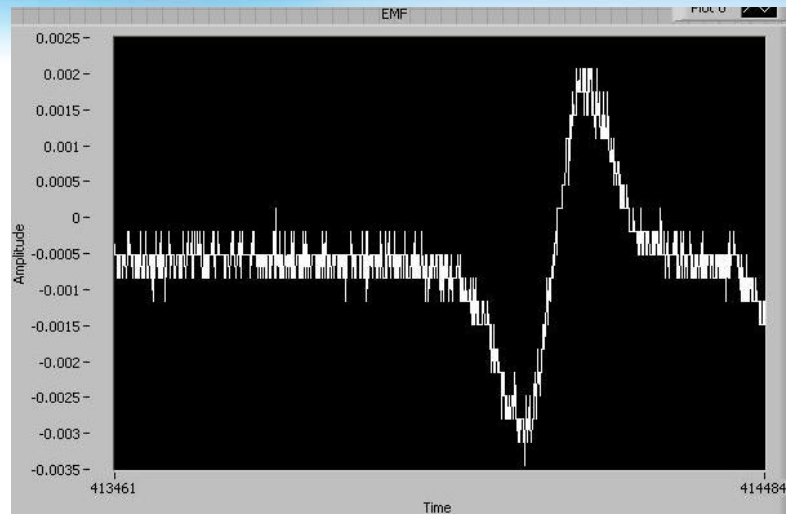


# Observations

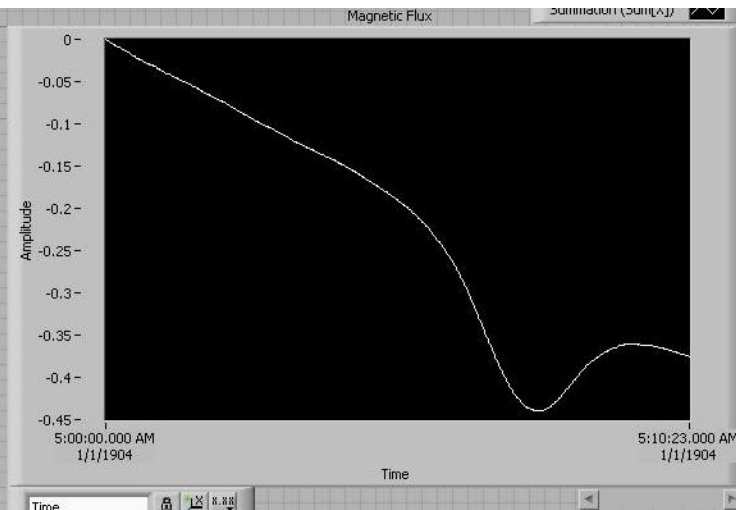
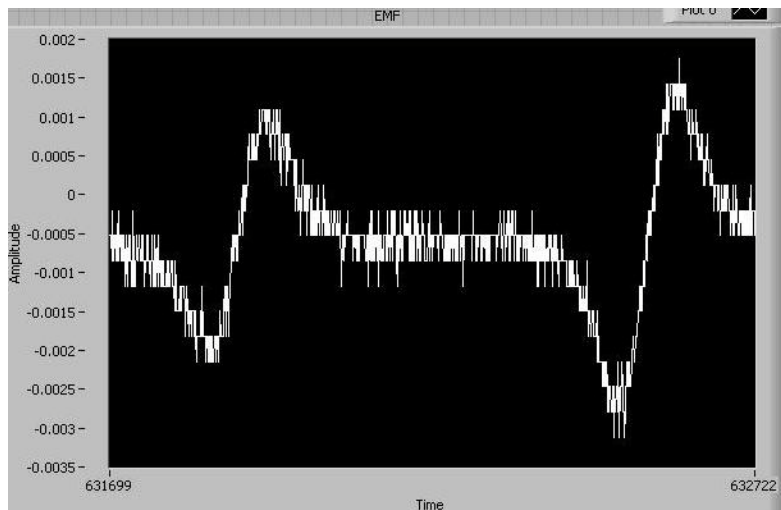


- **North** side of magnet - started with a voltage of about 5 V at 0 mm and as you got further away the output voltage decreased to ~2.5 V
- **South** side of magnet - opposite of north side, started at 0 V and as you moved further the output voltage increased to ~2.5 V

# Observing Induced EMF - Solenoid



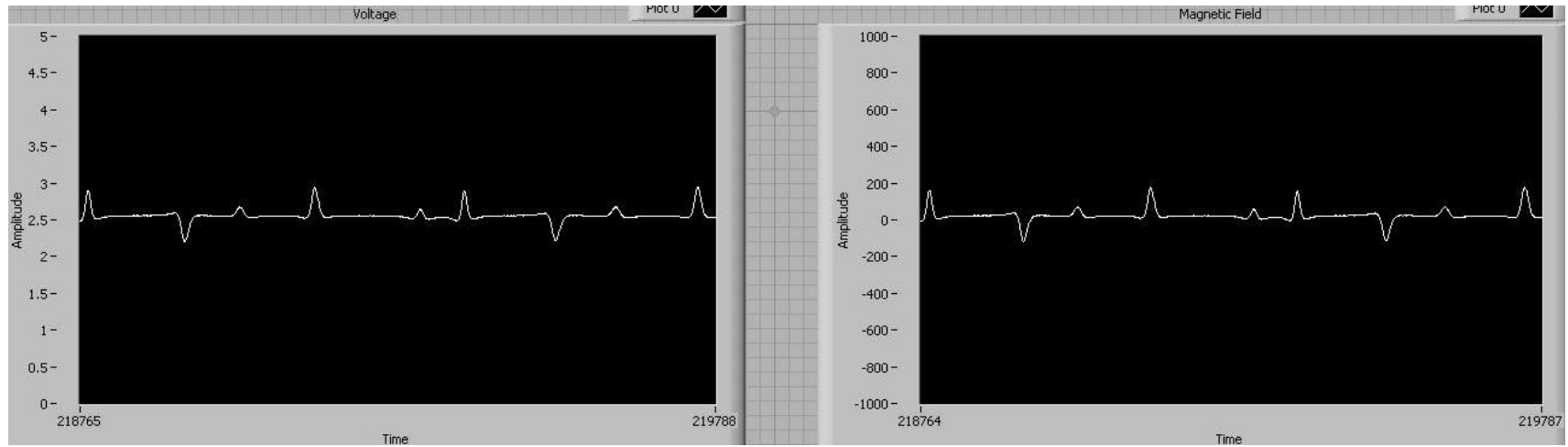
41 turns  
of coil on  
the  
solenoid



58 turns  
of coil on  
the  
solenoid



# Observing Induced EMF - Hall Probe



# Disk Operation



← W - 10110



K - 10101 →

