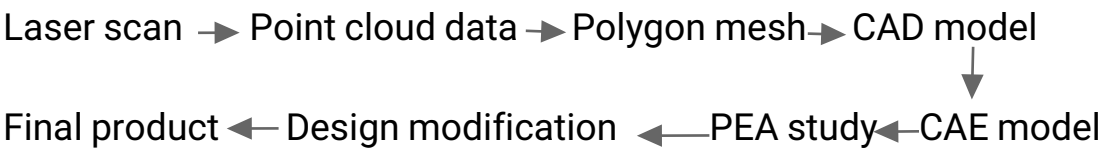
Reverse Engineering

It is a process of creating 3D virtual model from existing real world are used in3D computer aided design, CAM, CAE or other software

Steps in Reverse Engineering



Process of Reverse Engineering

1. Original
2. 3D scan
3. Data process
4. Engineer prototype
5. Reproduction

Calibration : adjusting a printer's settings to achieve accurate prints

importance of calibration : Improved print quality

Time and material savings

Consistancy

Scanning : It is the process of capturing the physical geometry of the object and its used to make 3D model

In this scanning process Blue light hexagon scanner is used .

Steps in scanning :

1. Clean the work table
2. Place the workpiece
3. Project light
4. Capture light

5. Process the data

Opto cad software is used to obtain 3D model in computer and CAD magic is used to make a modification in that 3D drawing

Rapid Prototyping

It is the process of creating a demo three dimensional object quickly with the help of 3D printing

3 Type of Rapid Prototyping

1. Crude prototype
2. Working prototype
3. Final prototype

Steps in rapid Prototyping :

1. CAD model
2. STL file convertion
3. Build prototype

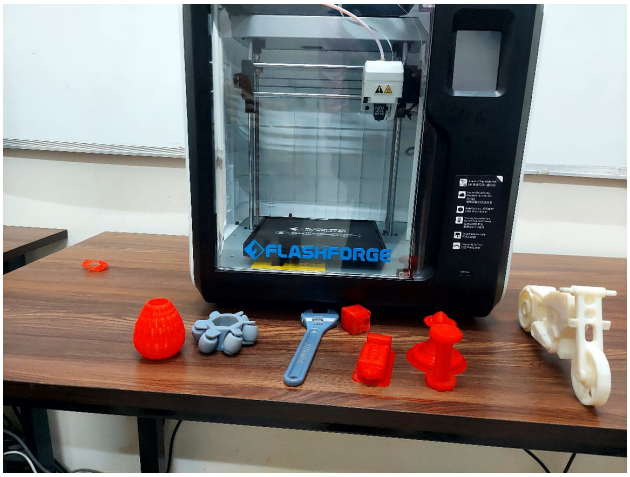
4. Post process

3D Printing

Process of creating a three dimensional object from digital design

Classification of 3D printing

1. Liquid based - Stereolithography
2. Solied based - Fused Deposition Modeling
3. Powder based - Selective Laser Sintering
4. Resin based - Polyjet

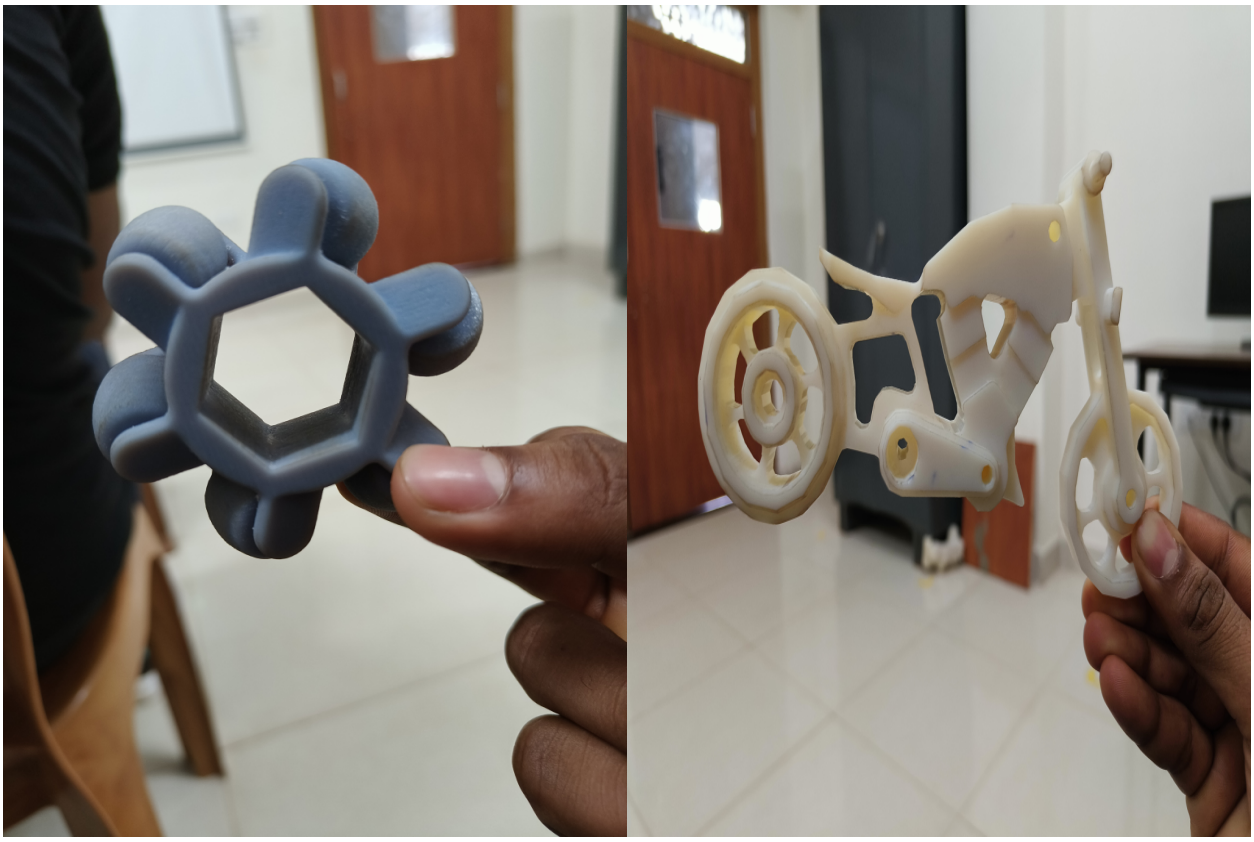


Fusion Deposition Modeling :

It is 3D printing technology whih used solied filament to create object .

Normally thermoplastic material are used in spool different colours. Spool

is supply to the nozzle and then nozzle starts heat and filament start melting and then 3D object will be created . Before the printing we paste the stl file data to machine and then we give slicing height and speed process and all necessary information . After creating the object we remove the object from work table and then send to post processing methods.



ROBOTICS

what is robod?

Robot as machine design to perform tasks automatically offen mimicking human action or Improving upon them in speed precision or efficiency robot can be control by software program instruction or through artificial intelligence.

Types of Robots -

- Industrial Robot

- Service Robot
- Mobile Robot
- Humanied Robot
- Collaborative Robot

What is Robotics?

Robotic is the interdependency field of science and engineering that focuses on the design development and operationof the robots it combines aspects of electrical engineering computer science and artificial intelligence to create machine capable of perform tasks autonomously or semi autonomously.

Three laws of robotics was design by a science writer Jssac assimov in 1942

1. Robot should not injure a human.
2. Robot should obey the order given by the human.
3. A robot should work in its own existence or area.

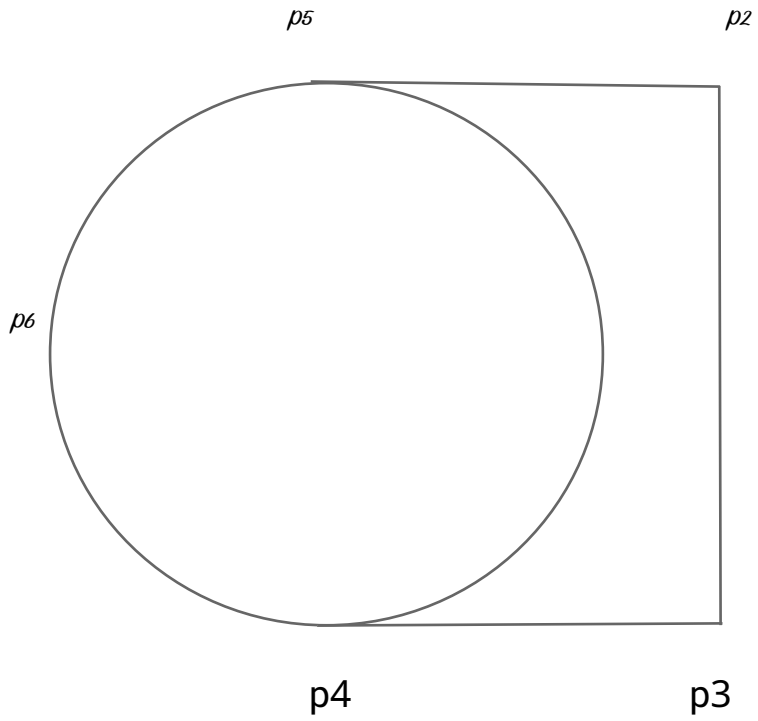
Industrial parts of 6 axis Robot-

1. Base
2. Arm
3. Joints
4. Gripper , welding toches , spray gun , actuator
5. Brain
6. Sensor
7. Cabelling and Wireing
8. Teach pendent
9. Power supply

Instruction used in 6 axis Robot

1. Mov
2. Ovrd
3. Movr
4. Movc
5. Dly

6. HIT



OVRD 100	MOV P4
MOV P0	MVC P4 P6 P5
MOV P1	OVRD 100
OVRD 20	MOV P1
MOV P5	MOV P0
MOV P2	HLT
MOV P3	

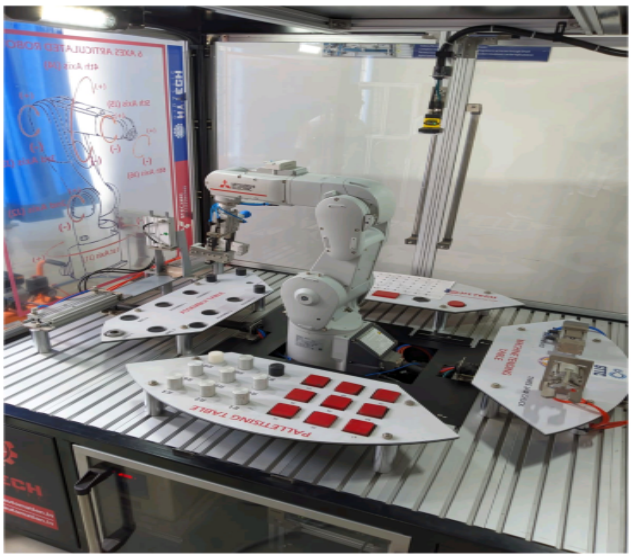
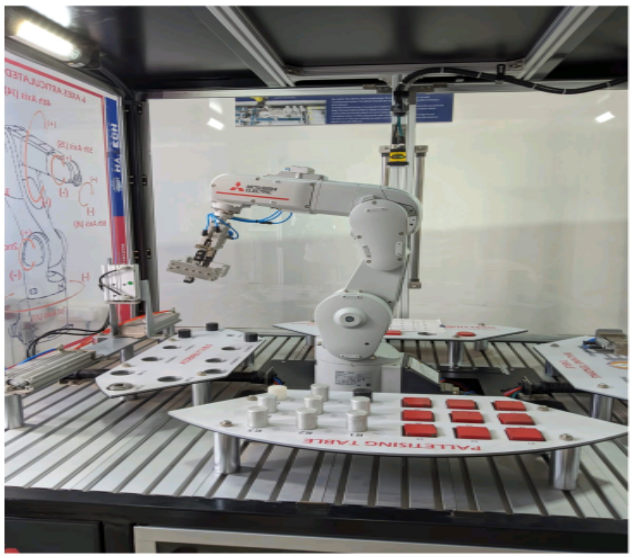
Robot model - RV_4FRL_D

Controller - CR800 series

Operating system - RT tool box 3

Communication - TCP/IP

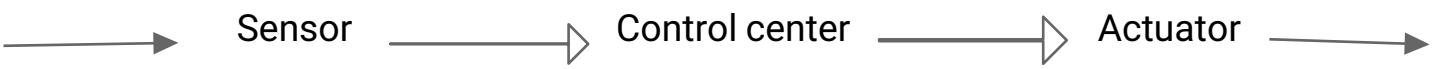
AC current - 230V

Industrial Internet of Things (IIOT)

Internet of things is an ecosystem of connected physical objects that are accessible through the internet.

Block diagram of IOT



Four main components used in IOT

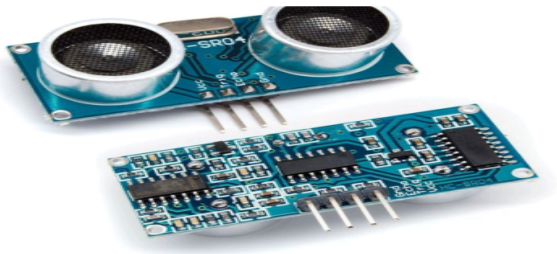
1. Low power embedded system
2. Cloud computing
3. Availablity of big data
4. Network connection

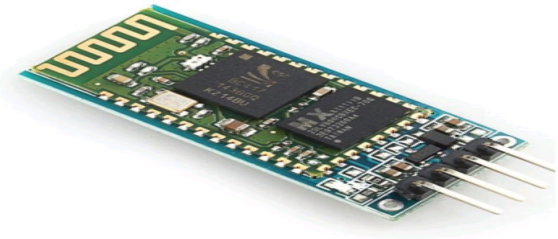
Four layer of IOT

1. Sensing layer
2. Network layer
3. Data processing layer
4. Application layer

Software used in IOT

- ★ Arduino IDE
- ★ ESP 8266
- ★ Arduino UNO
- ★ Arduino C

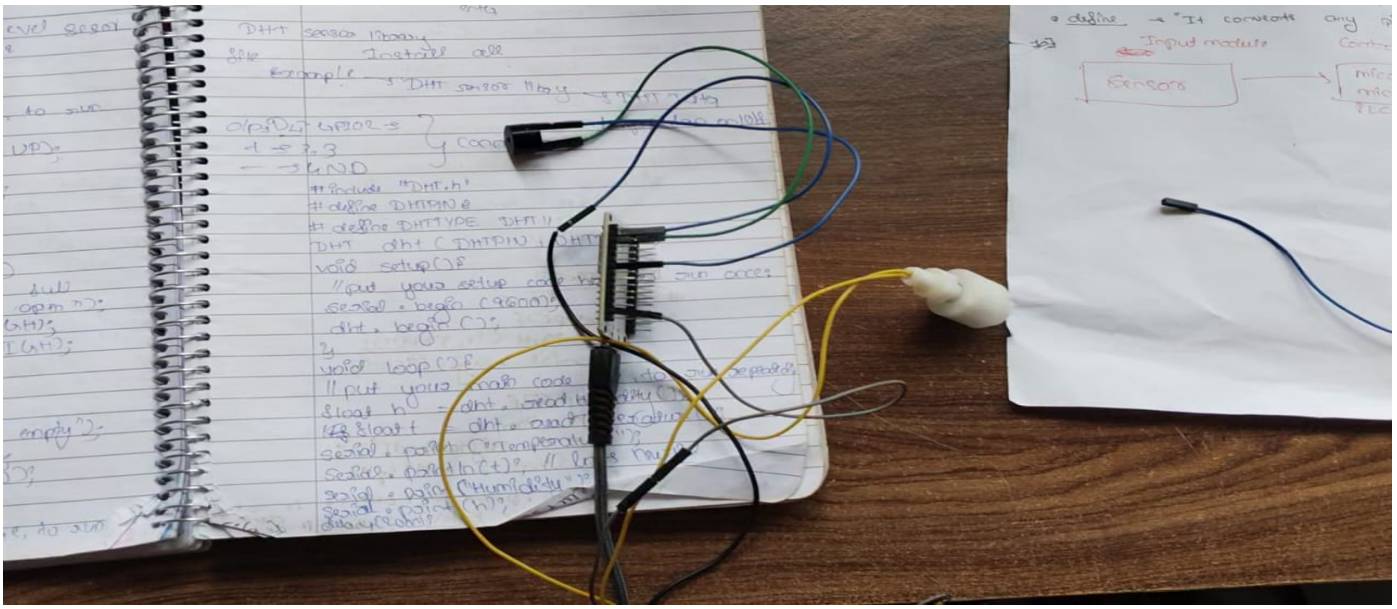




Program for Bliking of LED

```
#define led 2 //D4

void setup()
```

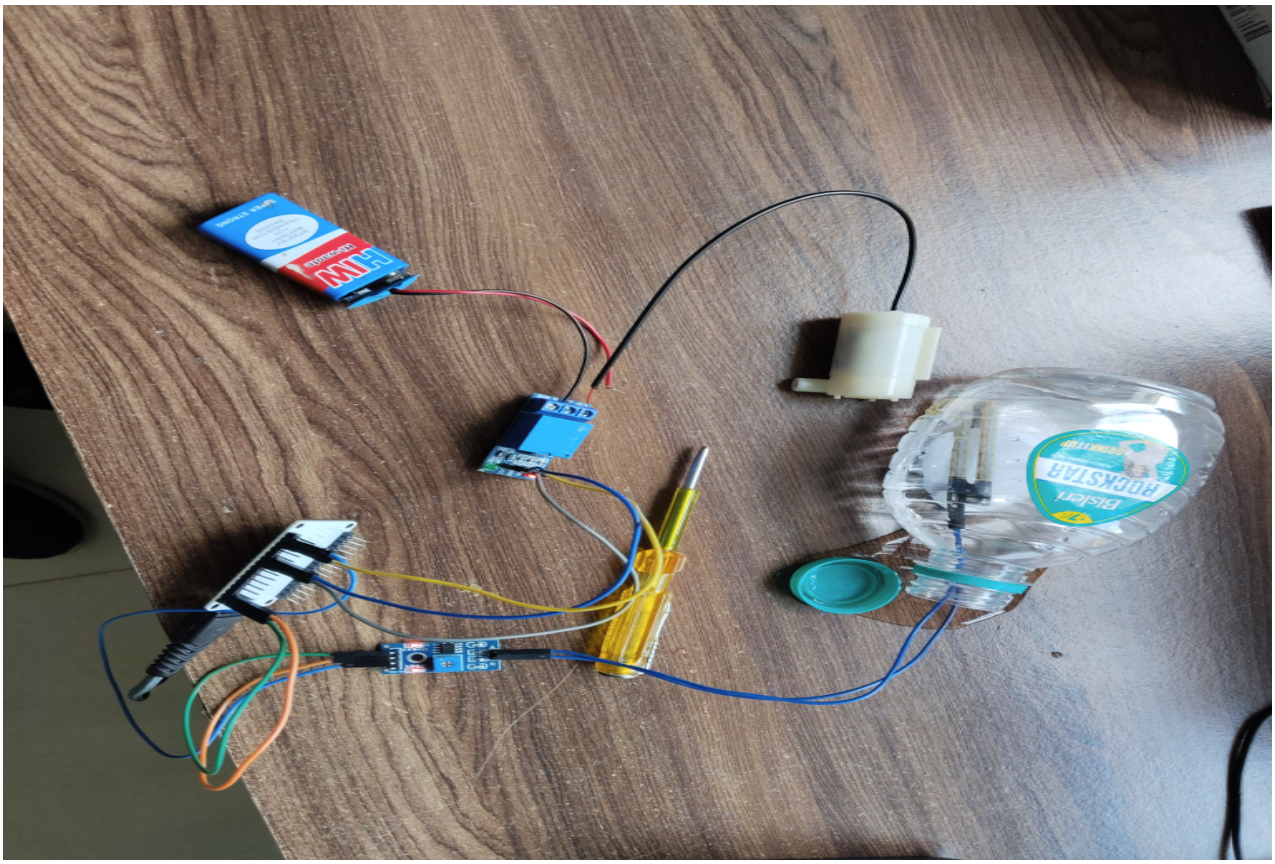
```
{

pinmode (led, OUTPUT);

}

void loop()

{

digital write (led,LOW)

delay(2000);

digital write (led,HIGH);

delay(2000);

}
```



Program for Smart Irrigation System

```
#define soil 5// D1

#define relay 4//D2

void setup()

{

pinMode (soil, INPUT);

ounMode(relay, OUTPUT);

serial.begin(1200);

}

void loop

{

if(digital Read(soil)==0)

{

serial.printIn("motor is off");

digital write (relay,HIGH);

}
```

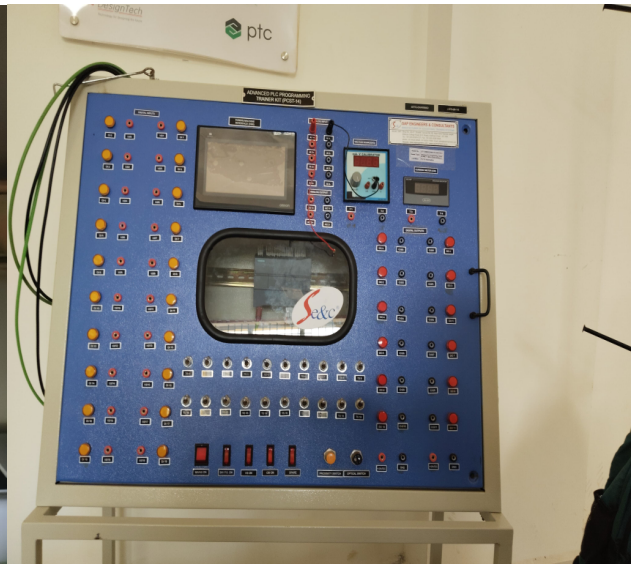
```
else

{

serial.print In ("Motor is on ");

digital write(relay,LOW);

}

delay(2000);

}
```



PLC = Programmable logic controller

plc is an electronic device that takes input from machine via sensors and transmit and execute the logic programmed in memory and generate the useful output on actuators to control a machine

we used TIA (totally integrated automation) software to do plc programming



COMPUTER NUMERICAL CONTROL (CNC)

CNC stands for Computer Numerical Control. It refers to a manufacturing process that uses computer-controlled machines to cut, shape, and assemble various materials, such as metals, plastics, woods, and composites.

CNC machines use programmed instructions to perform precise operations, including:

1. Milling
2. Turning
3. Drilling
4. Grinding
5. Routing
6. Cutting

Key benefits of CNC:

1. Precision and accuracy

2. Increased productivity

3. Reduced labor costs

4. Improved consistency

5. Complex shape capabilities

6. Minimal material waste

Common CNC applications:

1. Aerospace

2. Automotive

3. Medical devices

4. Mold making

5. Tooling

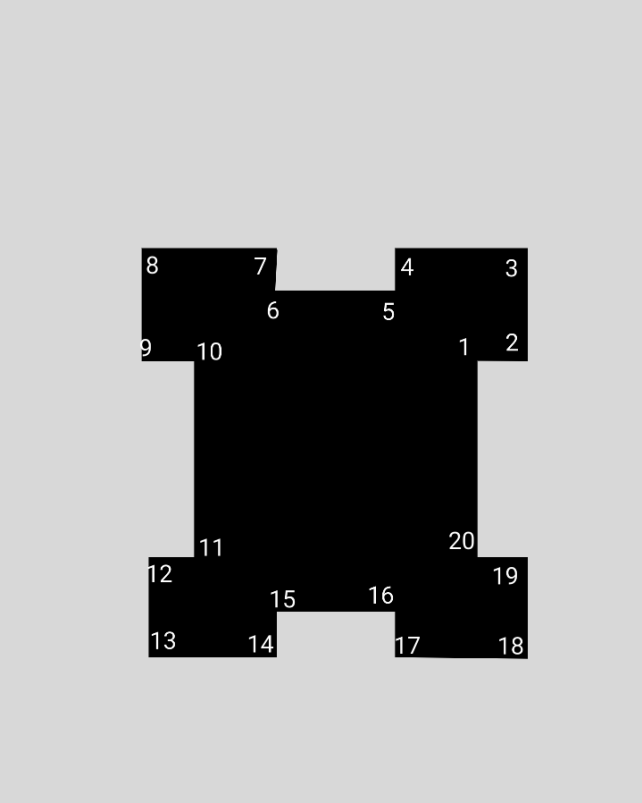
6. Furniture making

CNC machines typically consist of:

1. Computer or controller

2. Software (CAD/CAM)

3. Machine tools



o0001

G90 G54 G21 G17

G00 x0 y0 z100

G00z10

G00 x20 y20

M03 S1000

G01 z-0 5 F80

G01 x30 y20 F800

G01 x30 y40

G01 x10y40

G01 x10 y20

G01 x-10 y20

G01 x-10 y40

G01 x -30 y40

G01x-30 y20

G01 x-20 y-20

G01 x-30 y-20

G01 x-30 y-40

G01 x-10 y- 40

G01 x-10 y-30

G01 x10 y-30

G01 x10 y-40

G01 x30 y-40

G01 x30 y-20

G01 x20 y-20

G01 x20 y20

G00 z100

M05

M30

CNC Machines

G –Code & M-Code

G-CODE	DESCRIPTION	M-CODE	DESCRIPTION
G00	Rapid movement	M00	Program stop
G01	Linear movement	M01	Optional stop
G02	Circular interpolation C/W	M02	End of program
G03	Circular interpolation CC/W	M03	Spindle start C/W
G15	Polar command cycle	M04	Spindle start CC/W
G16	Polar command cancel	M05	Spindle stop
G17	X Y Plane selection	M08	Coolant ON
G21	Programming in metric mode [mm]	M09	Coolant OFF
G28	Return to Reference point	M30	Program end and rewind
G40	Cutter compensation cancel	M06	Tool change
G41	Tool radius compensation left	M40	Spindle gear at middle
G42	Tool radius compensation right	M41	Low gear select
G43	Tool height offset compensation negative	M42	High gear select
G44	Tool length compensation negative direction	M65	Mirror in 'X' Axis ON
G50	Scaling OFF	M66	Mirror in 'Y' Axis ON
G51	Scaling ON/Mirroring	M68	Mirror in 'X' And 'Y' Axis OFF
G54/G59	Work co-ordinates system	M78	Tailstock advancing
G70	Finish turning cycle	M79	Tailstock reversing
G71	ID AND OD Turning cycle	M98	Subprogram call
G72	Face turning cycle	M99	Subprogram EXIT
G73	Chip break cycle for milling		
G73	Pattern repeating turning cycle		
G74	L/H Tapping cycle for milling		
G74	Peck drilling cycle for lathe		
G76	Threading cycle for lathe		
G76	Fine boring cycle for milling		
G80	Canned cycle cancel		
G81	Simple drilling cycle		
G83	Peck drilling cycle		
G84	R/H Tapping cycle for milling		
G86	Boring cycle		
G90	Absolute dimensioning method		
G91	Incremental dimensioning method		
G92	Set an offset in all co-ordinate system		
G94	Feed per minute		
G95	Feed per revolution		
G96	Constant surface cutting feed ON		
G97	Constant surface cutting feed OFF		
G98	Return to initial point in canned cycle		
G99	Return to R point in canned cycle		

Machine Specification
CNC Milling Machine

CNC Vertical Machining Center (VMC) Specification

Sl No.	Specification	units
1	Axis motor and drive	servo motors with servo drives
2	X Axis	300mm
3	Y Axis	255mm
4	Z Axis	250mm
5	Distance between table top and spindle nose	70 – 370mm
6	Distance between spindle and column	270mm
7	Feed rate	0 to 1200mm/min
8	Rapid travel	0 to 1200mm/min
9	Table size	600 x 160mm
10	T – Slot	3 x 10 x 50
11	Load on table	120kgs
12	Spindle motor capacity	2HP
13	Motor type	AC Motor with VFD
14	Spindle nose taper	ISO 30 / BT 30
15	spindle RPM	100 to 3000 RPM
16	Control system	SiemensPLC based emulated standards
17	Maximum tool length	40mm
18	maximum tool diameter	60mm
19	Actuation	hydraulic / pneumatic
20	Dimension in mm	1540 x 1200 x 1700 mm
21	Power supply	230V, Single phase

Industry Visit

Company name - RVS engineering

In this company they manufacture moulds presstool jigs and fixtures steel metal components in this visit we learn about moulds and its types and hoe they assemble moulds by manually. and also we se EDM machini in which the programmer add a 3d model to software and generate the code through the machine and then connected to a EDM . which has wire which cut the metal.And then we visit the VMC machine in which the milling operation is done through ta vertical milling machine with the help of software .

We also visited the laser cutting machine in which the programmer is program the cutting operation through the software and then it will import to pendrive and operater insert the pendrive and import the program and run the cutting operation.

From the laser cutting we can obtain better precision in dimensions and good surface finish also . In that company they have laser cutting machine which is only capable to cut 16mm sheet .

From the industry visit of 7 days in GTTC we learn as well as we see the output or machine that are too rare to see or which we dont operate in our college . This visit helps to get the much more knowledge about the machines and subject in advance manufacturing.

INDUSTRY VISIT