



Technical Examination Board, Gujarat State, Gandhinagar

3 D Scanning and CNC Routing

Title	ESDM109: 3 D Scanning and CNC Routing
Level	Certificate Course
Course Duration	Four Month (Part time) Three Week (Full Time) 120 Hrs (Th. 48 Hrs Pr. 72 Hrs)
Entry Qualification	B.E./B.Tech/Diploma/B.E. Sem.III onward/ Diploma Sem. IV onward (EC/IC/IT/CE or Similar Branch)/ BCA/MCA/B.Sc./M.Sc./Any other graduate(with Physics/IT)

Teaching Scheme:

Sub Code	Subject Name	Teaching Scheme		Examination Scheme				Term Work Marks	Total Marks
		Theory	Practical	Theory Marks	Hrs.	Practical Marks	Hrs.		
ESDM109	3 D Scanning and CNC Routing	4	6	50	2	100	4	25	175

Total Week	= 12	Theory	= 1 hour slot
Total Teaching slot/Week	= 04	Practical	= 2 hour slot
Theory Periods	= 48	Total teaching	10 hours/week (Part-time) 06 hours/day (Full time)
Practical Periods	= 72		

ESDM 109: 3 D Scanning and CNC Routing

3 D Scanning CNC Routing is a manufacturing technology that is much faster than all conventional manufacturing technologies. As a result, the immediate market with significant value are the manufacturing SMEs as they require 3D Printing and Digital Fabrication technologies to make what they need. Additionally, the Make in India mission has many advantages for manufacturing companies.

Course Objectives:

After completion of this course students will be able

- Operate 3 D Scanner and CNC
- scan objects & measurement of various parameters.
- Use 3D scanner for various application like in Aerospace, Automobiles, medical etc.
- Maintain 3 D Scanner and CNC
- Create design, routing & fabricating the final product.
- Communicate and preparation of job report & report writing.

ESDM109 : 3 D SCANNING AND CNC ROUTING

Unit-1	Introduction to 3D Scanning
1.1	Origin of 3D Scanning
1.2	3D Scanning Applications
1.3	Principles of 3D Scanning
Unit -2	Factors in 3D Scanning
2.1	Factors Affecting 3D Scanning
2.2	Atmospheric Conditions
2.3	Reflectance
Unit -3	Applications of 3D Scanning
3.1	Aerospace
3.2	Automotive
3.3	Cultural Preservation
3.4	Consumer Products
3.5	Manufacturing
3.6	Medical
Unit -4	Operation of 3D Scanners
4.1	Working of a 3D Scanner
4.2	Major Components in a 3D Scanner
4.3	Effective 3D Scanning
4.4	Post Processing of a 3D Scan File
4.5	Meshing, Stitching
4.6	Removal of Unnecessary Scan Data
4.7	Ensuring Water-tight model
4.8	STL Creation
Unit -5	CNC Routing
5.1	Origin of CNC Technology
5.2	Create a design for CNC
5.3	Tool path generation
5.4	Conversion to GCode
5.5	Preview design file
5.6	Fabricating the final product
Unit -6	Case Studies
6.1	Design visualization
6.2	3D Gear assembly

6.3	Life style goods
6.4	Assembly integration
6.5	End of arm tools/Exo-Skeleton/Robotic arm
6.6	Geneva Mechanism
6.7	UAV And others
Unit -7	Interpersonal and Communication Skills/Reporting
7.1	Communication Skills Technical Writing

Suggested List of Practical's

Sr. No	Practical Name
1	Prepare 3D surface models of given components (At least two) using AutoCAD.
2	Prepare 3D solid models of given components (at least five with basic features like extrude, revolve, cut, shell, chamfer, rib, fillet etc.) using any one parametric software available.
3	Prepare 3D models of given components (at least two with advance modeling features like blend, sweep, pattern) using anyone parametric software available.
4	Prepare 3D solid models of components of given assembly (5-7 parts having mechanism) also prepare assembly and orthographic drawings. Also simulate the assembly using any parametric modeling software with animation.
5	Identify major parts of CNC and draw sketch.
6	CNC Programming and Simulation.
7	Setting up of workpiece zero position and machining in Modular Vertical 3 Axis CNC Milling machine.
8	Machining in Semi production Vertical 3 Axis CNC machine
10	Setting up of workpiece zero position and machining in Modular CNC Turning machine.

Reference books:

- 3 D Scanning Technology by Nesi Linda \
- Validation of numerical simulation by 3D Scanning by Samir Leme
- An introduction to CNC by S Vishal
- CNC machines by P Radhakrishnan
- 3 D Scanning Technology by Tongbo Chen
- CNC Machine and automation by Khusdeep Goyal

Software/Tool list:

- 3D Scanner: Kinect Laser Scanner/White Light Scanner/Blue Light Scanner
- CNC Router: Drill CNC Routing System/3 Axis Metal CNC Machining/5 Axis Multi-Material CNC Machining
- High-spec PC
- Autodesk 123D, CATIA
- CNC Modelling: MultiCNC, GrabCAD

Course Reference:

1. Short Term Courses- NIELIT, Gol
2. Short Term Courses- NCVET, Gol