DEPARTMENT OF PRODUCTION TECHNOLOGY
MIT CAMPUS
ANNA UNIVERSITY:: CHENNAI – 600 044.

COURSE PLAN

COURSE DETAILS:

Degree	BE		
ProgrammeName	Production Engineering		
Course Code &Title	PR 5602 CNC Machines		
Credits	3	Session	JAN 2024 – MAY 2024
Course Type	Program Core	Section	1
Name of the Faculty	Dr. J. Jancirani Professor Department of Production Technology, MIT Campus, Anna University, Chennai -44		

COURSE OBJECTIVES:
1. To provide knowledge on the fundamentals of CNC machines.

2. To educate the different components and functions of CNC machines.

3. To teach the control systems, advantages and disadvantages of CNC machining centers.

4. To discuss and develop the CNC program.

5. To explain the different cutting tool materials and work holding devices.

UNIT I   INTRODUCTION   9
Evolution Of CNC Technology, Principles, Features, Advantages, Applications, CNC And DNC Concept, Classification Of CNC Machines – Turning Centre, Machining Centre, Grinding Machine, EDM, Types Of Control Systems, CNC Controllers, Characteristics, Interpolators– Computer Aided Inspection- Economics Of CNC.

UNIT II   STRUCTURE OF CNC MACHINE   9
CNC Machine Building, Structural Details, Configuration And Design, Guide Ways – Friction, Anti Friction And Other Types Of Guide Ways, Elements Used To Convert The Rotary Motion To A Linear Motion – Screw And Nut, Recirculating Ball Screw, Planetary Roller Screw, Recirculating Roller Screw, Rack And Pinion, Spindle Assembly, Torque Transmission Elements – Gears, Timing Belts, Flexible Couplings, Bearings- Maintenance Of CNC Machines.

UNIT III   CNC MACHING   9
Coordinates, Axes, and Motion - CNC Systems - CNC Controls - Operating a CNC Machine – CNC Milling – Types, Machines axes, Machining centers, CNC Turning – Types, Number of axes, Axes designation -Advantages and Disadvantages of CNC Technology – Applications

UNIT IV   CNC PROGRAMMING   9

Coordinate Systems and Reference Points -The Ten Steps of CNC Programming - Structure Of A Part Program, G Codes and M Codes, Tool Length Compensation, Cutter Radius And Tool Nose Radius Compensation, Do Loops, Subroutines, Canned Cycles, Mirror Image, Parametric Programming, Machining Cycles, Programming For Machining Centre And Turning Centre For Well Known Controllers, Generation of CNC Codes From CAM Packages.

UNIT V   TOOL AND WORK HOLDING DEVICES   9

Introduction To Cutting Tool Materials – Carbides, Ceramics, CBN, PCD–Inserts ClassificationPMK, NSH, Qualified, Semi Qualified And Preset Tooling, Tooling System For Machining Centre And Turning Centre, Work Holding Devices For Rotating And Fixed Work Parts.

45 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able to

CO1. To describe the fundamentals of CNC machines.

CO2. To discuss the different components and functions of CNC machines.

CO3. To illustrate the control systems, advantages and disadvantages of CNC machining centers.

CO4. To recall and develop the CNC program.

CO5. To identify the appropriate cutting tool and work holding devices.

TEXT BOOKS :

1. HMT, "Mechatronics", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2005.

2. Warren S.Seamers, "Computer Numeric Control", Fourth Edition, Thomson Delmar, 2002.

REFERENCES

1. Rao P.N., "CAD/CAM" ,Third Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi,2010.

2. Michael Fitzpatrick " Machining and CNC Technology" McGraw-Hill Higher Education (2013)

3. Graham T. Smith " CNC Machining Technology, Volume II Cutting, Fluids and Work holding Technologies" Springer-Verlag London (1993)

4. Daniel Kandray ," Programmable automation technologies - an introduction to CNC, Robotics and PLCs" Industrial Press (2010).

5. Radhakrishnan P, " Computer Numerical Control (CNC) Machines" , New Age International Publishers, 2018.

COURSE ARTICULATION MATRIX

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	1	1	1	1	2	2	-	-	-	-	-	1	1	-
2	1	1	1	1	2	2	-	-	-	-	-	1	1	-
3	1	1	1	1	2	2	-	-	-	-	-	1	1	-
4	1	1	1	1	2	2	-	-	-	-	-	1	1	-
5	1	1	1	1	2	2	-	-	-	-	-	1	1	-

Avg.	1	1	1	1	2	2	-	-	-	-	-	1	1	-

The correlation levels:1: Low;2: Medium;3: High.

COURSE ALIGNED PROGRAMME OUTCOMES (PO)

At the end of the course, students will be able to
1. To describe the fundamentals of CNC machines.
2. To discuss the different components and functions of CNC machines.
3. To illustrate the control systems, advantages and disadvantages of CNC machining centers.
4. To recall and develop the CNC program.
5. To identify the appropriate cutting tool and work holding devices.

COURSE TENTATIVE SCHEDULE / PLAN

Week	Day	Date	Hrs	Unit	Topics	Text Ref
1	TUE	23.01.2024	3,4		Evolution Of CNC Technology, Principles, Features, Advantages, Applications	T1,R
	WED	24.01.2024	4	U I	CNC And DNC Concept, Classification Of CNC Machines – Turning Centre, Machining Centre, Grinding Machine	T1
2	WED	31.01.2024	4		EDM, Types Of Control Systems, CNC Controllers	T1
3	TUE	06.02.2024	7,8		PIN Diagram of 8051- Architecture of 8051 Family	T1
	WED	07.02.2024	4		Interpolators– Computer Aided Inspection	T1
4	TUE	13.02.2024	7,8		Economics Of CNC.	T1
	WED	14.02.2024	4		CNC Machine Building, Structural Details, Configuration And Design	T1
5	TUE	20.02.2024	7,8		Guide Ways – Friction, Anti Friction And Other Types Of Guide Ways	T1
	WED	21.02.2024	4		Elements Used To Convert The Rotary Motion To A Linear Motion – Screw And Nut	T1
6	TUE	27.02.2024	7,8	U II	Recirculating Ball Screw, Planetary Roller Screw, Recirculating Roller Screw, Rack And Pinion, Spindle Assembly	T1
	WED	28.02.2024	4		Torque Transmission Elements – Gears, Timing Belts	T1
7	TUE	05.03.2024	7,8		Flexible Couplings, Bearings- Maintenance Of CNC Machines	T1
	WED	06.03.2024	4		Coordinates, Axes, and Motion - CNC Systems	T1

8	TUE	12.03.2024	7,8	U III	CNC Controls - Operating a CNC Machine	T1
	WED	13.03.2024	4		CNC Milling – Types, Machines axes	T1
9	TUE	19.03.2024	7,8		Machining centers, CNC Turning – Types	T1
	WED	20.03.2024	4		Number of axes, Axes designation	T1
10	TUE	26.03.2024	7,8		Advantages and Disadvantages of CNC Technology - Applications	T1
	WED	27.03.2024	4	U IV	Coordinate Systems and Reference Points -The Ten Steps of CNC Programming	T1
11	TUE	02.04.2024	7,8		Structure Of A Part Program, G Codes and M Codes	T1
	WED	03.04.2024	4		Tool Length Compensation, Cutter Radius And Tool Nose Radius Compensation, Do Loops, Subroutines, Canned Cycles	T1
12	WED	10.04.2024	4		Mirror Image, Parametric Programming, Machining Cycles	T1
13	TUE	16.04.2024	7,8		Programming For Machining Centre And Turning Centre For Well Known Controllers	T1
	WED	17.04.2024	4		Generation of CNC Codes From CAM Packages	T1
	TUE	23.04.2024	8	U V	Introduction To Cutting Tool Materials	T2
	WED	24.04.2024	4		Carbides, Ceramics, CBN, PCD–Inserts	T2
15					PMK, NSH, Qualified Tooling	
	TUE	30.04.2024	7,8		PMK, NSH, Qualified, Semi Qualified And Preset Tooling	T2
16	TUE	07.05.2024	7,8		Tooling System For Machining Centre And Turning Centre	T2
	WED	08.052024	4		Work Holding Devices For Rotating And Fixed Work Parts	T2

COURSE DELIVERY/INSTRUCTIONAL METHODOLOGIES:

✓Chalk & Talk	✓ Stud. Assignments	✓Web Resources
✓ LCD/~~Smartboards~~	✓ Stud. Seminars	☐ Add-On Courses

COURSE ASSESSMENT METHODOLOGIES-DIRECT

✓ University (End Semester) Examination		✓Internal Assessment Tests	
✓ Assignments	✓ Laboratory Practices	✓ Mini/Major Projects	✓Stud. Seminars
☐ Viva Voce	☐ Certifications	☐ Add-On Courses	☐ Others

COURSE ASSESSMENT METHODS

S.N.	Mode of Assessment	Test		Date	Duration		W
1.	Continuous Assessment Theory (25%)	Assessment Test 1			1½ hr		
		Assessment Test 2			1½ hr		
2.	Continuous Assessment Laboratory (Total 25%)	Experiment and Midterm Test			3 hr		
3.	End Semester Examination (50%)	Theory (25%)	Laboratory (25%)		3 hr	3 hr	

COURSE ASSESSMENT METHODOLOGIES-INDIRECT

✓ Assessment of CO (By Feedback, Once)	✓ Student Feedback On Faculty (Once)
☐ Assessment of Mini/Major projects by Ext. Experts	☐ Others

COURSE (EXTRA) ESSENTIAL READINGS:
Will be provided to the students during the class hours.

1) https://archive.nptel.ac.in/courses/112/105/112105211/
2) https://nptel.ac.in/courses/112102103

COURSE EXIT SURVEY (will be collected at end of the course)

The purpose of this survey is to find out from students about their learning experiences and their thoughts about the course.

Rating	1: Slight (Low)	2: Moderate (Medium)	3: Substantial (High
CO1			
CO2			
CO3			
CO4			
CO5			

COURSE POLICY (Compensation Assessment)

1. Attending all the assessment is mandatory for every student
2. Course policy will be followed as per the academic course regulation

COURSE ACADEMIC DISHONESTY AND PLAGIARISM

1. All rules and regulation prescribed by the ACOE, University Departments, are applicabl in the Internal Assessment Tests and University (End Semester) Examinations (https://acoe.annauniv.edu/download_forms/student_forms/Guidelines.pdf)

2. In general, possessing a mobile phone, carrying bits of paper with materials, talking t other students, copying from other students during Internal Assessment Tests and University (End Semester) Examinations will be treated as Malpractice and punishabl as per the rules and regulations. The misuse of Assignment / Project / Seminar works from others is considered as academic dishonesty and will be treated with the rules and regulations of the University.

COURSE ADDITIONAL INFORMATION

Queries / clarifications / discussion (if required) may be e-mailed to / contact the course instructors during their Office Hours.

For Approval

Course Faculty   **Course Coordinator**   **Professor In Charge**

Head of the Department