Computer Integrated Manufacturing	L	P	C
	3		3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
ME	7	PCE	PCE-4	MEE-405T
MAE	7	PC	PC	MAC-403

Marking Scheme:
1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To understand the need, scope and importance of computers in machining industry.
2.	To study different codes, their meaning and write the program for turning and milling operation using these codes.
3.	To study the use of CIM and various planning tools for automation of an industry.
4.	To study CAPP, FMS and Group technology tools and various material handling methods in an industry.

Course Outcomes (CO)

CO 1	Understand CNC machines and its various aspects with various terminologies related to its constituting parts in CIM environment.
CO 2	Desing fabrication of CNC programs for turning and milling operations using various canned cycles and study of different feedback system used in CNC machines.
CO 3	Understand importance of CIM environment for automation in industry considering various planning and scheduling function.
CO 4	Apply CAPP approaches in CIM system, importance of FMS & Group technology, study of various material handling system in automated industry.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	3	2	2	-	-	-	-	-	-	-	3
CO 2	3	3	3	3	-	-	-	-	-	-	-	3
CO 3	3	3	2	2	-	-	-	-	-	-	-	3
CO 4	3	3	3	2	-	-	-	-	-	-	-	3

UNIT-1

Functions and Components of CIM System: CIM, Definition, elements of CIM system-benefits, Production system facilities low-medium-high-Manufacturing support systems, Automation in production systems, Automated manufacturing systems-Computerized Manufacturing Support Systems, Reasons for Automating. An overview of CNC machines: Need, benefits & limitations, classification of CNC machines, DNC, Constructional features of CNC machines, Design considerations of CNC machine tools, elements of CNC machine & systems, precision measuring & positioning of CNC, Function of MCU, Machining centre, Turning centre, Tool and pallet changer, Adaptive Control system, Punch tape and reader, Ball screw mechanism.

Computer Integrated Manufacturing Lab	L	P	C
		2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
ME	7	PCE	PCE-4	MEE-405P
MAE	7	PC	PC	MAC-455

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:
1. The course objectives and course outcomes are identical to that of (Computer Integrated Manufacturing) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.

1. To study the basic characteristics of CNC Machine, types of CNC machine.
2. Part programming (in word address format) experiment for turning operation (including operations such as grooving and threading) and running on CNC machine/simulator.
3. Part programming (in word address format) experiment for milling operation (including operations such as engraving a character, pocketing and mirroring) and running on CNC machine/simulator.
4. Part programming (in word address format or APT) experiment for drilling operation (point to point.
5. Part programming (in word address format or APT) experiment for milling operation (contouring).
6. Experiment on Transfer Line/Material Handling.
7. Experiment on difference between ordinary and NC machine, study or retrofitting.
8. Experiment on study of system devices such as motors and feedback devices.
9. Study about the FMS and its applications in industry with a case study.

UNIT- II

Manual part programming: Preparatory and miscellaneous functions- Fanuc control (M Codes and G Codes). Linear interpolation, circular interpolation, canned cycles, cycles of threading & grooving operations, tool compensation, part programming structure, work co-ordinate system, absolute & incremental commands, axis and co-ordinate system, process planning & flow chart for part programming, scaling, rotating, mirroring, copy & special canned cycles for CNC lathe and milling.
Open loop and closed loop systems, Precision in NC positioning systems: Control resolution, Accuracy and repeatability. Actuators: DC servomotor, AC servomotor, stepper motor. Transducers and feedback elements: resolvers, inductosyn optical grating and encoders.

UNIT-III

Automation principles, scheduling functions and strategies, CNC controller & motion control in CNC system. Application of CNC and recent advances in CNC machines. Planning and scheduling functions like APP, MPS, MRP, MRPII and JIT.
Automatically Programmed tool: Terminologies and Part Programming.

UNIT-IV

Group Technology: Definition, Advantages and limitations of GT-Part family formation, Classification and coding-Opitz coding system, Applications & benefits of GT.
Flexible manufacturing system: Scope of FMS, FMS elements, benefits.
Automated Material Handling Systems and Advanced Manufacturing Systems: Industrial Robots, Conveyors, AGVs, Automatic Storage and Retrieval System. Advantages and application in Industries. Inspection and quality control using CMM machine, Machine Vision.

Textbook(s):

1. Mikell P. Groover, "Automation, Production Systems and Computer- Integrated Manufacturing", 2nd Edition, Prentice Hall, 2001.
2. S.K. Sinha, "CNC Programming", Galgotia Publications, 2003.

References:

1. P. Radhakrishnan, "Computer Numerical Control Machine & Computer Aided Manufacturing", New Academic Science Limited.
2. U.Rembold, "Computer Integrated Manufacturing and Engineering", Addison Wesley Publishers, 1993
3. S. Kant Vajpayee, "Principles of Computer Integrated Manufacturing", PHI Learning Private Limited, 2012.
4. M. Adithan, B.S. Pabla, "CNC Machines", New Age.
5. Binit Kumar Jha, "CNC programming made easy", Vikas Publications.
6. T.K. Kundra, P. N.Rao & N.K.Tiwari, "Numerical Control and Computer Aided Manufacturing", TMH.