INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

MECHANICALENGINEERING

COURSE DESCRIPTOR

Course Title	**COMPUTER INTEGRATED MANUFACTURING**				
Course Code	BCCB12				
Programme	M.Tech				
Semester	II	ME			
Course Type	Core				
Regulation	IARE - R18				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	3	-	-
Chief Coordinator	Dr.K.Raghu Ram Mohan Reddy, Professor, ME				
Course Faculty	Dr.K.Raghu Ram Mohan Reddy, Professor, ME				

I. COURSE OVERVIEW:

Computer Integrated Manufacturing (CIM) encompasses the entire range of product development and manufacturing activities with all the functions being carried out with the help of dedicated software packages. The data required for various functions are passed from one application software to another in a seamless manner. For example, the product data is created during design. This data has to be transferred from the modeling software to manufacturing software without any loss of data. CIM uses a common database wherever feasible and communication technologies to integrate design, manufacturing and associated business functions that combine the automated segments of a factory or a manufacturing facility. CIM reduces the human component of manufacturing and thereby relieves the process of its slow, expensive and error-prone component. CIM stands for a holistic and methodological approach to the activities of the manufacturing enterprise in order to achieve vast improvement in its performance.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	A70328	VII	CAD/CAM	4

III. MARKSDISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Computer Integrated Manufacturing	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	LCD / PPT	✔	Seminars	✔	Videos	✔	MOOCs
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Technical Seminar and Term Paper:
Two seminar presentations and the term paper with overview of topic are conducted during II semester. The evaluation of technical seminar and term paper is for maximum of 5 marks. Marks are awarded by taking average of marks scored in two seminar evaluations.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO1	**Engineering knowledge:** Apply advanced level knowledge, techniques, skills and modern tools in the field of computer aided engineering to critically assess the emerging technological issues.	3	Presentation on Real-world problems
PO2	**Develop Novel Designs:** Have abilities and capabilities in developing and applying computer software and hardware to mechanical design and manufacturing fields.	2	Seminar
PO3	**Analyze Complex Systems:** Conduct experimental and/or analytical study and analyzing results with modern mathematical / scientific methods and use of software tools.	1	Assignments
PO4	**Development of Solutions:** Independently carry out research / investigation and development work to solve practical problems	1	Projects
PO5	**Teamwork and Project Management:** Function on multidisciplinary environments by working cooperatively, creatively and responsibly as a member of a team.	1	Industrial visits

3 = High; 2 = Medium; 1 = Low

VII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	The basic components of CIM and its hardware and software
II	CAD/CAM and its integration with CIM
III	FMS and its applications
IV	Principles of computer aided process planning, JIT and GT

VIII. COURSE OUTCOMES (CLOs):

COs	Course Outcome	CLOs	Course Learning outcome
CO1	Understand the overview of the Computer Integrated Manufacturing	CLO 1	Understand the components of CIM
		CLO 2	Understand the needs and benefits of CIM
		CLO 3	Study the NC,CNC,DNC working
CO2	Understand the integration of CAD and CAM using database exchange models	CLO 4	To Study the CIM soft ware and hardware
		CLO 5	Involve in correlating the Data base for CIM
		CLO 6	Study the integration of CAD, CAM and CIM.
CO3	Apply flexible manufacturing methods in present manufacturing scenario	CLO 7	Understand the FMS concepts
		CLO 8	Distinguish conventional manufacturing and FMS layouts
		CLO 9	Involved for choosing the fixtures for FMS
		CLO 10	Understand material handling systems

			of FMS
CO4	Develop coding and process planning for manufacturing of products	CLO 11	Study the concepts of Group Technology (GT)
		CLO 12	Study the CAPP
		CLO 13	Study the inventory management and JIT
CO5	Understand the inspection monitoring principles of products	CLO 14	Study the various production monitoring systems
		CLO 15	Distinguish contact and non contact inspection methods
		CLO 16	Understand the integration of CAQC with CIM

IX. COURSE LEARNIN G OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
BCCB12.01	CLO 1	Understand the components of CIM	PO 1	3
BCCB12.02	CLO 2	Understand the needs and benefits of CIM	PO 1	3
BCCB12.03	CLO 3	Study the NC,CNC,DNC working	PO 1,PO 2,PO5	3
BCCB12.04	CLO 4	To Study the CIM soft ware and hardware	PO 1,PO 2	2
BCCB12.05	CLO 5	Involve in correlating the Data base for CIM	PO 2	2
BCCB12.06	CLO 6	Study the integration of CAD, CAM and CIM.	PO 1,PO 2,PO 3	2
BCCB12.07	CLO 7	Understand the FMS concepts	PO 2,PO4	2
BCCB12.08	CLO 8	Distinguish conventional manufacturing and FMS layouts	PO 2, PO 3	2
BCCB12.09	CLO 9	Involved for choosing the fixtures for FMS	PO 2	2
BCCB12.10	CLO 10	Understand material handling systems of FMS	PO 1,PO 2, PO 3,PO4	2
BCCB12.11	CLO 11	Study the concepts of Group Technology (GT)	PO 1,PO 2,PO 3	3
BCCB12.12	CLO 12	Study the CAPP	PO 3, PO 4	3
BCCB12.13	CLO 13	Study the inventory management and JIT	PO 2, PO 5	2
BCCB12.14	CLO 14	Study the various production monitoring systems	PO 3,PO 2	3
BCCB12.15	CLO 15	Distinguish contact and non contact inspection methods	PO1,PO 3,	1
BCCB12.16	CLO 16	Understand the integration of CAQC with CIM	PO 2,PO3	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcomes (COs)	Program Outcomes (PO)				
	PO1	PO2	PO3	PO4	PO5
CO1	3	2		1	1
CO2	2	2	2		
CO3	2	2	2	2	
CO4	3	3	3	1	1
CO5	1	3	3		

XI. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcomes (PO)				
	PO1	PO2	PO3	PO4	PO5
CLO1	3	2		1	1
CLO2	3	2		1	1
CLO3	3	2		1	1
CLO4	2	2	2		
CLO5	2	2	2		
CLO6	2	2	2	2	
CLO7	2	2	2	2	
CLO8	2	2	2	2	
CLO9	2	2	2	1	
CLO10	2	2	3	1	
CLO11	3	2	3	1	1
CLO12	3	3	3		1
CLO13	3	3	3		1
CLO14	1	3	3		
CLO15	1	3	3		
CLO16	1	3			

3 = High; 2 = Medium; 1 = Low

XII. ASSESSMENT METHODOLOGIES–DIRECT

CIE Exams	PO1,PO2PO3, PO4	SEE Exams	PO1,PO2,PO3, PO4	Seminars and Term Paper	PO2,PO5
Viva	-	Mini Project	-	Laboratory Practices	-

XIII. ASSESSMENT METHODOLOGIES-INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIV. SYLLABUS

UNIT-I	INTRODUCTION TO CIM
Manufacturing - Types, Manufacturing Systems, CIM Definition, CIM wheel, CIM components, Evolution of CIM, needs of CIM, Benefits of CIM, basic components of NC system, NC motion control system, applications of NC, advantages and disadvantages of NC, computer Numerical control, advantages of CNC, functions of CNC, Direct Numerical Control, components of a DNC system, functions of DNC, advantages of DNC.	
UNIT-II	**CAD**
Development of computers, CIM Hardware & Software, Data-Manufacturing data, types, sources, Structure of data models, Data base and DBMS requirement, RDBMS, SQL, Computer Aided Design - benefits, Graphic Standards, Interfaces, CAD software, Integration of CAD/CAM/CIM.	
UNIT-III	**FLEXIBLE MANUFACTURING SYSTEMS**
FMS concept, Components of FMS, FMS Layouts, FMS planning and implementation, Tool Management systems-Tool monitoring, Work holding devices- Modular fixturing, flexible fixturing, flexibility, quantitative analysis of flexibility, application and benefits of FMS, automated material handling system –AGVs, Guidance methods, AS/RS.	

UNIT-IV	AUTOMATED PROCESS PLANNING
Group Technology, Part families, Part classification and coding, Production flow analysis, Machine cell design, Applications and Benefits of Group Technology, Structure of a Process Planning, Process Planning function, CAPP - Methods of CAPP, CAD based Process Planning, Inventory management - Materials requirements planning - basics of JIT	
UNIT-V	**MONITORING AND QUALITY CONTROL**
Types of production monitoring system, process control & strategies, direct digital control - Supervisory computer control - computer aided quality control - objectives of CAQC, QC and CIM, contact, non-contact inspection methods, CMM and Flexible Inspection systems. Integration of CAQC with CIM.	
Text Books:	
1. Kant Vajpayee. S., "Principles of Computer Integrated Manufacturing", Prentice Hall of India, 1999. 2. Radhakrishnan.P, Subramanyan. S, "CAD/CAM/CIM", New Age International publishers, 2000.	
Reference Books:	
1. Scheer.A.W., 'CIM- Towards the factory of the future' Springer - Verlag, 1994. 2. Daniel Hunt.V., 'Computer Integrated Manufacturing Hand Book', Chapman & Hall, 1989.	

XIV COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1-2	**Classify** manufacturing systems	CLO 1	T1:28.7 R1:2.6
3	**Explain** the needs and benefits of CIM	CLO 2	T1:27.5 R1:2.7
4-5	**Explain** the working principle of NC,CNC,DNC	CLO3	T1:29.6 R1:2.6
6-7	**Compare** functions of NC, CNC,DNC	CLO3	T1:29.7 R1:2.7
7	**Illustrate** CIM wheel	CLO 2	T1:29.8 R1:4.4
8-9	**Illustrate** CAD, CAM &CIM integration	CLO3	T1:29.7 R1:2.7
10-11	**Describe** the Data base models associated to CIM	CLO 6	T1:30.7 R1:4.10
12-13	**Explain** CIM integration methodology.	CLO6	T1:29.8 R1:4.4
14-15	**Compare** RDBMS, SQL	CLO 5	T1:30.7 R1:4.10
16	**Explain** the Graphics standards	CLO 5	T2:33.9 R1:7.5
17-18	**Categorize** CAD & CAM softwares	CLO 6	T2:35.10 R3:8.1
19-20	**Explain** the FMS components	CLO 7	T2:34.10 R2:7.5
20	**Explain** the FMS layouts	CLO 8	T2:35.12 R1:9.2
21-22	**Explain** the tool management systems of FMS	CLO 8	T2:36.1 R2:9.4
23-24	**Describe** the work holing devises of FMS	CLO 9	T2:37.1 R2:9.9

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
25-26	**Explain** the applications and benefits of FMS	CLO 9	T2:37.1 R2:9.9
27	**Explain** automated material handling system –AGVs	CLO 10	T2:27.12 R1:11.9
28	**Explain** the benefits of AS/RS.	CLO 10	T2:27.12 R1:11.9
29	**Explain** Group Technology	CLO 11	T2:27.5 R1:10.2
30	**Explain** Part families, Part classification and coding	CLO 12	T2:27.5 R1:10.2
31-32	**Explain** Opitz parts classification system	CLO 12	T2:27.7 R1:11.3
33	**Explain** MICLASS parts classification system	CLO 12	T2:27.8 R1:11.6
34-35	**Explain** Applications and Benefits of Group Technology	CLO 12	T2:27.12 R1:11.7
36-37	**Illustrate** the Process Planning function, CAPP - Methods of CAPP	CLO 13	T2:27.12 R1:11.8
38	**Illustrate** the Inventory management	CLO 13	T2:27.12 R1:11.8
39-40	**Compare** various Production monitoring systems	CLO 14	T2:27.12 R1:11.10
41-42	**Explain** process control & strategies, direct digital control	CLO 14	T2:27.12 R1:11.10
43	**Distinguish** contact and non contact inspection methods	CLO 15	T3:27.14 R1:12.3
44	**Explain** the objectives of CAQC	CLO 16	T2:27.12 R1:11.10
45	**Explain** the integration of CAQC with CIM	CLO 16	T2:27.14 R1:12.3

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed Actions	Relevance with POs
1	Encourage students to solve real time applications of CIM.	Industrial Visits	PO 3,PO 4

Prepared by:
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