Ref No:

SRI KRISHNA INSTITUTE OF TECHNOLOGY, BANGALORE

COURSE PLAN

Academic Year 2019-20

Program:	BE-Mechanical Engineering
Semester :	VII
Course Code:	15MEL77
Course Title:	COMPUTER INTEGRATED MANUFACTURING LAB
Credit / L-T-P:	2/1-0-2
Total Contact Hours:	
Course Plan Author:	PRAMOD S N

Academic Evaluation and Monitoring Cell

No. 29, Chimney hills, Hesaraghatta Road, Chikkabanavara
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INSTRUCTIONS TO TEACHERS

- Classroom / Lab activity shall be started after taking attendance.

- Attendance shall only be signed in the classroom by students.
- Three hours attendance should be given to each Lab.
- Use only Blue or Black Pen to fill the attendance.
- Attendance shall be updated on-line & status discussed in DUGC.
- No attendance should be added to late comers.
- Modification of any attendance, over writings, etc is strictly prohibited.
- Updated register is to be brought to every academic review meeting as per the COE.

Table of Contents

Note : Remove “Table of Content” before including in CP Book
Each Laboratory Plan shall be printed and made into a book with cover page
Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

A. LABORATORY INFORMATION

1. Laboratory Overview

Degree:	BE	Program:	ME
Year / Semester :	4/VII	Academic Year:	2018-2019
Course Title:	Computer Integrated Manufacturing	Course Code:	15MEL77
Credit / L-T-P:	2/1-0-2	SEE Duration:	3 Hours
Total Contact Hours:		SEE Marks:	80
CIA Marks:	20	Assignment	
Course Plan Author:	PRAMOD SN	Sign	Dt :
Checked By:		Sign	Dt :

2. Laboratory Content

Expt.	Title of the Experiments	Lab Hours	Concept	Blooms Level
1	Manual CNC part programming for 2 turning Selection and assignment of tools, correction of syntax and logical errors, and verification of tool path.	3	Programming	L2 Understand
2	Manual CNC part programming for 2 milling parts. Selection and assignment of tools, correction of syntax and logical errors, and verification of tool path.	3	Programming	L2 Understand
3	Manual CNC part programming for 2 drilling parts. Selection and assignment of tools, correction of syntax and logical errors, and verification of tool path.	3	Programming	L2 Understand
	PART B			
4	(Only for Demo/Viva voce) FMS (Flexible Manufacturing System): Programming of Automatic storage and Retrieval system (ASRS) and linear shuttle conveyor Interfacing CNC lathe, milling with loading unloading arm and ASRS to be carried out on simple components.	3	Automation	L2 Understand
5	(Only for Demo/Viva voce) Robot programming: Using Teach Pendent & Offline programming to perform pick and place,	3	Robot programming	L2 Understand

3. Laboratory Material

Books & other material as recommended by university (A, B) and additional resources used by Laboratory teacher (C).

Expt.	Details	Expt. in book	Availability
A	**Text books (Title, Authors, Edition, Publisher, Year.)**	-	-
B	**Reference books**		
1	Manual	In dept	
2			
C	**Concept Videos or Simulation for Understanding**		
D	**Software Tools for Design**	-	-
1			
E	**Recent Developments for Research**	-	-
1			
F	**Others (Web, Video, Simulation, Notes etc.)**	-	-
1			

4. Laboratory Prerequisites:

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.
Students must have learnt the following Courses / Topics with described Content . . .

Expt.	Lab. Code	Lab. Name	Topic / Description	Sem	Remarks	Blooms Level
1						

5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area.
Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NPTEL Videos, h. Swayam videos etc.

Expt.	Topic / Description	Area	Remarks	Blooms Level
1				L3

B. Laboratory Instructions

1. General Instructions

SNo	Instructions	Remarks
1	Observation book and Lab record are compulsory.	
2	Students should report to the concerned lab as per the time table.	
3	After completion of the program, certification of the concerned staff in-charge in the observation book is necessary.	
4	Student should bring a notebook of 100 pages and should enter the readings /observations into the notebook while performing the experiment.	
5	The record of observations along with the detailed experimental procedure of the experiment in the Immediate last session should be submitted and certified staff member in-charge.	
6	Should attempt all problems / assignments given in the list session wise.	
7	It is responsibility to create a separate directory to store all the programs, so that nobody else can read or copy.	
8	When the experiment is completed, should disconnect the setup made by them, and should return all the components/instruments taken for the purpose.	
9	Any damage of the equipment or burn-out components will be viewed seriously either by putting penalty or by dismissing the total group of students from the lab for the semester/year	
10	Completed lab assignments should be submitted in the form of a Lab Record in which you have to write the algorithm, program code along with comments and output for various inputs given	

2. Laboratory Specific Instructions

SNo	Specific Instructions	Remarks
1	Start computer	
2	Open the software	
3	Write a program	
4	Check syntax erroe	
5	Complile the program	
6	Run the program	
7	Simulate the program	

C. OBE PARAMETERS

1. Laboratory Outcomes

Expt.	Lab Code #	COs / Experiment Outcome	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level
-	-	**At the end of the experiment, the student should be able to . . .**	-	-	-	-	-
1		Manual part programming -Turning	3	Programming	Demonstrate	Practical Record and IA	L2
2		Manual part programming -Milling	3	programming	Demonstrate	Practical Record and IA	L2
3		Manual part programming -Drilling	3	Programming	Demonstrate	Practical Record and IA	L2
4		FMS and ASRS	3	Automation	Oral	Practical Record and Viva	L1
5		Robot,Hydraulics and Pneumatics	3	Robot Concept	Oral	Practical Record and Viva	L1
-		**Total**	**40**	-	-	-	-

Note: Identify a max of 2 Concepts per unit. Write 1 CO per concept.

2. Laboratory Applications

Expt.	Application Area	CO	Level
1	CNC programming in turning	CO1	L2
2	CNC programming in milling	CO2	L2
3	CNC programming in drilling	CO3	L2
4	Automation	CO4	L2

Note: Write 1 or 2 applications per CO.

3. Mapping And Justification

CO – PO Mapping with mapping Level along with justification for each CO-PO pair.
To attain competency required (as defined in POs) in a specified area and the knowledge & ability required to accomplish it.

Expt.	Mapping		Mapping Level	Justification for each CO-PO pair	Level
-	**CO**	**PO**	-	**'Area': 'Competency' and 'Knowledge' for specified 'Accomplishment'**	-
1	CO1	PO1	L3	Understanding different operations in turning	L2
1	CO1	PO3	L3	Designing a accurate model	L2
2	CO1	PO5	L3	Increase productivity	L2

2	CO2	PO1	L3	Understanding different operations in milling	L2
3	CO2	PO3	L3	Designing a accurate model	L2
3	CO2	PO5	L3	Increase productivity	L2
3	CO3	PO1	L3	Understanding different operations in drilling	L2
4	CO3	PO3	L3	Designing a accurate model	L2
4	CO3	PO5	L3	Increase productivity	L2
4	CO4	PO1	L2	Understanding the process of automated systems	L2
5	CO5	PO1	L2	Usage of Robot	L2

4. Articulation Matrix

CO – PO Mapping with mapping level for each CO-PO pair, with course average attainment.

-	-	Experiment Outcomes	Program Outcomes														-
Expt.	CO.#	**At the end of the experiment student should be able to . . .**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	Level
1	15MEL77.1	Manual part programming -Turning	1	-	1	-	1	-	-	-	-	-	-	-	-	-	-	L2
2	15MEL77.2	Manual part programming -Milling	1	-	1	-	1	-	-	-	-	-	-	-	-	-	-	L2
3	15MEL77.3	Manual part programming -Drilling	1	-	1	-	1	-	-	-	-	-	-	-	-	-	-	L2
4	15MEL77.4	FMS and ASRS	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L2
5	15MEL77.5	Robot,Hydraulics and Pneumatics	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L2
-	**15CSL77**	**Average attainment (1, 2, or 3)**																-
-	*PO, PSO*	*1.Engineering Knowledge; 2.Problem Analysis; 3.Design / Development of Solutions; 4.Conduct Investigations of Complex Problems; 5.Modern Tool Usage; 6.The Engineer and Society; 7.Environment and Sustainability; 8.Ethics; 9.Individual and Teamwork; 10.Communication; 11.Project Management and Finance; 12.Life-long Learning; S1.Software Engineering; S2.Data Base Management; S3.Web Design*															

5. Curricular Gap and Experiments

Topics & contents not covered (from A.4), but essential for the course to address POs and PSOs.

Expt	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1					
2					
3					

Note: Write Gap topics from A.4 and add others also.

6. Experiments Beyond Syllabus

Topics & contents required (from A.5) not addressed, but help students for Placement, GATE, Higher Education, Entrepreneurship, etc.

Expt	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1					
2					
3					

D. COURSE ASSESSMENT

1. Laboratory Coverage

Assessment of learning outcomes for Internal and end semester evaluation. Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

Unit	Title	Teaching Hours	No. of question in Exam							CO	Levels
			CIA-1	CIA-2	CIA-3	Asg-1	Asg-2	Asg-3	SEE		
1	Manual CNC part programming for 2 turning Selection and assignment of tools, correction of syntax and logical errors, and verification of tool path.	03	1	-	-	-	-	-	1	CO1	L2

2	Manual CNC part programming for 2 milling parts. Selection and assignment of tools, correction of syntax and logical errors, and verification of tool path.	03	-	1	-	-	-	-	1	CO2	L2
3	Manual CNC part programming for 2 drilling parts. Selection and assignment of tools, correction of syntax and logical errors, and verification of tool path.	03	-	-	1	-	-	-	1	CO3	L2
4	(Only for Demo/Viva voce) FMS (Flexible Manufacturing System): Programming of Automatic storage and Retrieval system (ASRS) and linear shuttle conveyor Interfacing CNC lathe, milling with loading unloading arm and ASRS to be carried out on simple components.	03	1	1	1	-	-	-	1	CO4	L2
5	(Only for Demo/Viva voce) Robot programming: Using Teach Pendent & Offline programming to perform pick and place	03	1	1	1	-	-	-	1	CO5	L2
-	**Total**	**15**	**3**	**3**	**3**	**-**	**-**	**-**	**5**		**l2**

2. Continuous Internal Assessment (CIA)

Assessment of learning outcomes for Internal exams. Blooms Level in last column shall match with A.2.

Evaluation	Weightage in Marks	CO	Levels
CIA Exam – 1	20	CO1	L2
CIA Exam – 2	20	CO2	L2
CIA Exam – 3	20	CO3	L2
	-	-	-
Other Activities – define – Slip test	-	-	-
Final CIA Marks	**20**	**-**	**-**

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SNo	Description	Marks
1	Observation and Weekly Laboratory Activities	04 Marks
2	Record Writing	08 Marks for each program.
3	Internal Exam Assessment	08 Marks
4	Internal Assessment	20 Marks
5	SEE	80 Marks
-	**Total**	**100Marks**

E. EXPERIMENTS

Experiment 01 : Manual CNC part programming for 2 turning profiles

-	Experiment No.:	1	Marks		Date Planned		Date Conducted	
1	Title	Create turning profile						
2	Course Outcomes	Programming						
3	Aim	Simulation						
4	Material / Equipment Required	Lab Manual/Computer						
5	Theory, Formula, Principle, Concept	Basic of G codes and M codes to writing the c program						
6	Procedure, Program, Activity, Algorithm, Pseudo Code	➓ step 1: start ➓ step 2: write programming ➓ step 3: save the program ➓ step 4: compile ➓ step 5:if error then correct the errors ➓ step 6:run						

		➓ step 7:stop
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	Turning Profiles
8	Observation Table, Look-up Table, Output	Profile simulation
9	Sample Calculations	Programming
10	Graphs, Outputs	Models
11	Results & Analysis	Simulations
12	Application Areas	CNC
13	Remarks	
14	Faculty Signature with Date	

Experiment 02 : Manual CNC part programming for 2 Milling profiles

-	**Experiment No.:**	1	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	Create milling profile						
2	Course Outcomes	Programming						
3	Aim	Simulation						
4	Material / Equipment Required	Lab Manual/Computer						
5	Theory, Formula, Principle, Concept	Basic of G codes and M codes to writing the c program						
6	Procedure, Program, Activity, Algorithm, Pseudo Code	➓ step 1: start ➓ step 2: write programming ➓ step 3: save the program ➓ step 4: compile ➓ step 5:if error then correct the errors ➓ step 6:run ➓ step 7:stop						
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	Milling Profiles						
8	Observation Table, Look-up Table, Output	Profile simulation						
9	Sample Calculations	Programming						
10	Graphs, Outputs	Models						
11	Results & Analysis	Simulations						
12	Application Areas	CNC						
13	Remarks	Create mill profile						
14	Faculty Signature with Date	Programming						

Experiment 03 : Manual CNC part programming for 2 Drilling profiles

-	**Experiment No.:**	1	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	Create drilling profile						
2	Course Outcomes	Programming						

3	Aim	Simulation
4	Material / Equipment Required	Lab Manual/Computer
5	Theory, Formula, Principle, Concept	Basic of G codes and M codes to writing the c program
6	Procedure, Program, Activity, Algorithm, Pseudo Code	➓ step 1: start ➓ step 2: write programming ➓ step 3: save the program ➓ step 4: compile ➓ step 5:if error then correct the errors ➓ step 6:run ➓ step 7:stop
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	Drilling Profiles
8	Observation Table, Look-up Table, Output	Profile simulation
9	Sample Calculations	Programming
10	Graphs, Outputs	Models
11	Results & Analysis	Simulations
12	Application Areas	CNC
13	Remarks	Create drill profile
14	Faculty Signature with Date	Programming

Experiment 04((Viva -voce) : FMS AND ASRS

-	**Experiment No.:**	1	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	**FMS AND ASRS**						
2	Course Outcomes	Automation						
3	Aim	Integration of systems						
4	Material / Equipment Required	CIM Notes						
5	Theory, Formula, Principle, Concept	Concepts of CIM						
6	Procedure, Program, Activity, Algorithm, Pseudo Code	➓ step 1: ➓ step 2: ➓ step 3: ➓ step 4: ➓ step 5: ➓ step 6: ➓ step 7:						
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	-						
8	Observation Table, Look-up Table, Output	-						
9	Sample Calculations	-						
10	Graphs, Outputs	-						
11	Results & Analysis	Knowledge						

12	Application Areas	Automation
13	Remarks	Viva -voce
14	Faculty Signature with Date	

Experiment 05(Viva -voce): Robot Programming,Hydraulic and pneumatics

-	**Experiment No.:**	1	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	**Robot Programming,Hydraulic and pneumatics**						
2	Course Outcomes	Automation						
3	Aim	Programming						
4	Material/ / Equipment Required	Software (M TAB)						
5	Theory, Formula, Principle, Concept	Concepts of CIM and Hydraulics and pneumatics						
6	Procedure, Program, Activity, Algorithm, Pseudo Code	➓ step 1: ➓ step 2: ➓ step 3: ➓ step 4: ➓ step 5: ➓ step 6: ➓ step 7:						
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	-						
8	Observation Table, Look-up Table, Output	-						
9	Sample Calculations	-						
10	Graphs, Outputs	-						
11	Results & Analysis	Knowledge						
12	Application Areas	Automation						
13	Remarks	Viva -voce						
14	Faculty Signature with Date							

F. Content to Experiment Outcomes

1. TLPA Parameters

Table 1: TLPA – Example Course

Expt-#	Course Content or Syllabus (Split module content into 2 parts which have similar concepts)	Content Teaching Hours	Blooms' Learning Levels for Content	Final Blooms' Level	Identified Action Verbs for Learning	Instruction Methods for Learning	Assessment Methods to Measure Learning
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*
1	Manual CNC part programming for 2 turning Selection and assignment of tools, correction of syntax and logical errors, and verification of tool path.	3	L2 (Understand)	L2 (Understand)	Understand	Board and chalk	Record ans simulation
2	Manual CNC part programming for 2 milling parts. Selection and assignment of tools,	3	L2 (Understa	L2 (Unde	Understan d	Board and chalk	Record ans simulation

	correction of syntax and logical errors, and verification of tool path.		nd)	rstand)			
3	Manual CNC part programming for 2 drilling parts. Selection and assignment of tools, correction of syntax and logical errors, and verification of tool path.	3	L2 (Understa nd)	L2 (Unde rstand)	Understan d	Board and chalk	Record ans simulation
4	(Only for Demo/Viva voce) FMS (Flexible Manufacturing System): Programming of Automatic storage and Retrieval system (ASRS) and linear shuttle conveyor Interfacing CNC lathe, milling with loadingunloading arm and ASRS to be carried out on simple components.	3	L2 (Understa nd)	L2 (Unde rstand)	Analyse	Board and chalk	Record ans simulation
5	(Only for Demo/Viva voce) Robot programming: Using Teach Pendent & Offline programming to perform pick and place, stacking of objects (2 programs). Pneumatics and Hydraulics, Electro-Pneumatics: 3 typical experiments on Basics of these topics to be conducted.	3	L2 (Understa nd)	L2 (Unde rstand)	Analyse	Board and chalk	Record ans simulation

2. Concepts and Outcomes:

Table 2: Concept to Outcome – Example Course

Expt - #	Learning or Outcome from study of the Content or Syllabus	Identified Concepts from Content	Final Concept	Concept Justification (What all Learning Happened from the study of Content / Syllabus. A short word for learning or outcome)	CO Components (1.Action Verb, 2.Knowledge, 3.Condition / Methodology, 4.Benchmark)	Course Outcome **Student Should be able to ...**
A	*I*	*J*	*K*	*L*	*M*	*N*
1	Milling programs	Programmi ng	File operations	Will be able to understand the basic of milling profiles	Knowledge	Write a program for milling contor
2	Pocketing programs	Programmi ng	Record Structure	Will be able to understand the basic of pocketing profiles	Knowledge	Write a program for Pocketing contor
3	Turning programs	Programmi ng	Relative Record number	Will be able to understand the basic of turning profiles	Knowledge	Write a program for turning profiles
4	FMS and ASRS	Automation	Automation	Synchronization in manufacturing	Analyses	Understand integration of machines
5	Robot programming, Hydraulics and pnuematics	Flexibility	Flexibility	Interchangability and repetability	Analyses	Analyses of automation in manufacturing