# INSTITUTE OF AERONAUTICAL ENGINEERING

**(Autonomous)**
Dundigal, Hyderabad -500 043

## MECHANICAL ENGINEERING

## COURSE DESCRIPTOR

| | | | | |
|---|---|---|---|---|
| **Course Title** | **COMPUTER AIDED MACHINING AND ROBOTICS LABORATORY** | | | |
| **Course Code** | BCCB19 | | | |
| **Programme** | M.Tech(CAD/CAM) | | | |
| **Semester** | II | ME | | |
| **Course Type** | Core | | | |
| **Regulation** | IARE - R18 | | | |
| | **Lectures** | **Tutorials** | **Practical** | **Credits** |
| | - | - | 3 | 2 |
| **Course Faculty** | Mr. C. Labesh Kumar, Assistant Professor | | | |

## I. COURSE OVERVIEW:

This course provides knowledge of machining and robotic simulations. It covers the concepts for Part programing for sequence of operation, tool setting, sub routines and use of cycles. Numerical control programing for tool path generation for milling and turning operations. 3-D simulation for operations like picks and place robot.

## II. COURSE PRE-REQUISITES:

| Level | Course Code | Semester | Prerequisites | Credits |
|---|---|---|---|---|
| PG | BCC005 | II | Computer Aided Manufacturing | 3 |

## III. MARKSDISTRIBUTION:

| Subject | SEE Examination | CIA Examination | Total Marks |
|---|---|---|---|
| Computer Aided Machining And Robotics Laboratory | 70 Marks | 30 Marks | 100 |

## IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ✘ | CHALK &TALK | ✔ | VIVA | ✘ | ASSIGNMENTS | ✘ | Moocs |
| ✔ | LCD / PPT | ✘ | SEMINARS | ✘ | MINI PROJECT | ✘ | VIDEOS |
| ✘ | OPEN ENDED EXPERIMENTS | | | | | | |

## V. EVALUATION METHODOLOGY:

**Continuous internal assessment (CIA):**

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, with 20 marks for day to day evaluation and 10 marks for Internal Examination (CIE).

**Semester End Examination (SEE):**

The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the this courses is contains 12 experiments. The question paper pattern is as follows: Two full questions with 'either' 'or' choice will be drawn from each set. Each set contains 4 questions.

**Continuous Internal Assessment (CIA):**

CIA is conducted for a total of 30 marks (Table 1), with 10 marks for Continuous Internal Examination (CIE), 20 marks for Day to Day Evaluation.

Table 1: Assessment pattern for CIA

| **Component** | **Theory** | | **Total Marks** |
|---|---|---|---|
| **Type of Assessment** | CIE Exam | Day to Day Evaluation | |
| **CIA Marks** | 10 | 20 | 30 |

**Continuous Internal Examination (CIE):**

Two CIE exam shall be conducted at the end of the 16$^{th}$ week of the semester. The CIE exam is conducted for 10 marks of 3 hours duration consisting of two sets.

## VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

| **Program Outcomes (POs)** | | **Strength** | **Proficiency assessed by** |
|---|---|---|---|
| PO 1 | Apply the knowledge of mathematics, science, engineering fundamentals, and an engineeringspecialization to the solution of complex engineering problems. | 3 | Lab related Exercises |
| PO 2 | Identify, formulate, review research literature, and analyze complex engineering problemsreaching substantiated conclusions using first principles of mathematics, natural sciences, andengineering sciences | 2 | Lab related Exercises |
| PO 5 | Create, select, and apply appropriate techniques, resources, and modern engineering and IT toolsincluding prediction and modeling to complex engineering activities with an understanding of thelimitations. | 3 | Lab related Exercises |

**3= High; 2 = Medium; 1 = Low**

## VII. COURSEOBJECTIVES:

| **The course should enable the students to:** | |
|---|---|
| I | Create the part model using CAM software. |
| II | Generate computer numerically part program for computer numerically control turning and millingoperation. |
| III | Demonstrate the tool path for turning operation using CAM software |

## VIII. COURSEOUTCOMES (COs):

| **CO Code** | **CO's** | **At the end of the course, the student will have the ability to:** | **PO's Mapped** | **Strength of Mapping** |
|---|---|---|---|---|
| BCC102.01 | CO 1 | Understanding the concepts of machining and robotic simulations | PO1 | 3 |
| BCC102.02 | CO 2 | Understand Part programing for sequence of operation, tool setting, sub routines and | PO1<br>PO5 | 3 |

| CO Code | CO's | At the end of the course, the student will have the ability to: | PO's Mapped | Strength of Mapping |
|---|---|---|---|---|
| | | use of cycles. | | |
| BCC102.03 | CO 3 | Numerical control programing for tool path generation for milling and turning operations | PO1 PO2 | 3 |
| BCC102.04 | CO 4 | 3-D simulation for operations like picks and place robot | PO1 PO2 | 2 |
| BCC102.05 | CO 5 | Practice of robotic languages | PO1 PO2 | 2 |

**3= High; 2 = Medium; 1 = Low**

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

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | |
|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
| CO 1 | 3 | | | | | | |
| CO 2 | 3 | | | | 3 | | |
| CO 3 | 3 | 3 | | | | | |
| CO 4 | 2 | 2 | | | | | |
| CO5 | 2 | 2 | | | | | |

**3= High; 2 = Medium; 1 = Low**

## X. ASSESSMENT METHODOLOGIES–DIRECT:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CIE Exams | PO 1, PO 2, PO 5 | SEE Exams | PO 1, PO 2, PO5 | Assignments | - | Seminars | - |
| Laboratory Practices | PO 1, PO 2, PO 5 | Student Viva | PO 1, PO 2, PO 5 | Mini Project | - | Certification | - |
| Term Paper | - | | | | | | |

## XI. ASSESSMENT METHODOLOGIES–INDIRECT:

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

## XII. SYLLABUS:

| S No. | Experiment |
|---|---|
| 1 | Tool planning and selection of sequences of operation, tool setting on machine-practice |

| | |
|---|---|
| 2 | Practice in part programming and operation of CNC turning machines, sub routines and use of cycles. |
| 3 | Practice in part program and operation of a machine center, joining and selection of sequence ofoperation, tool setting on machine. |
| 4 | Generate APT based NC programming and tool simulation for drilling operation. |
| 5 | Practice in APT based NC programming and tool simulation for facing operation. |
| 6 | Generate of NC code generation and tool path simulation for profile milling operation using CAMsoftware. |
| 7 | Develop NC code and tool path simulation for thread operation using CAM software. |
| 8 | Practice of robotic languages, 3-D Robot Simulation for operation of pick-place robot |

## XIII. COURSE PLAN:

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

| Lecture No. | Learning Objectives | Topics to be covered |
|---|---|---|
| 1-3 | Over view of Tool planning and selection of sequences of operation, tool setting on machine-practice. | Tool planning and selection of sequences of operation, tool setting on machine-practice. |
| 4-6 | Understand part programming and operation of CNC turning machines | Part programming on CNC Turning. |
| 7-9 | Understand sub routines and use of cycles | Part programming on CNC Turning. |
| 10-12 | Understand APT based NC programming and tool simulation for drilling operation. | NC programming and tool simulation for drilling operation. |
| 13-15 | Understand APT based NC programming and tool simulation for facing operation | NC programming and tool simulation for facing operation. |
| 16-18 | Understand the NC code generation and tool path simulation for profile milling operation using CAM software. | NC code generation and tool path simulation for profile milling operation using CAM software. |
| 19-21 | Understand NC code and tool path simulation for thread operation using CAM software. | NC code and tool path simulation for thread operation using CAM software. |
| 22-24 | Understand the characteristics of 3-D Robot Simulation | Demo on 3-D Robot Simulation |
| 25-27 | Understand the concepts of operations in 3-D Robot. | 3-D Robot Simulation operation |
| 28-30 | Understand the functionality of 3-D Robot Simulation operation | Practice of robotic languages |
| 31-33 | Understand robotic languagesfor operation of pick-place. | Designing a program for operation of pick-place. |
| 34-36 | Understand 3-D Robot operation and timers. | Designing a program to understand the operation of 3-D Robot. |
| 37-39 | Internal Lab Exam | CIE-I |

**Prepared by:** **HOD, ME**

Mr. C. Labesh Kumar