1.0 ADMISSIONS

1.1 Admissions into M.Tech. (CAD/CAM) programme of GITAM University are governed by GITAM University admission regulations.

2.0 ELIGIBILITY CRITERIA

2.1 A pass in B.E. / B. Tech. / AMIE or equivalent in Mechanical / Production / Marine / Metallurgy / Automobile / Aeronautical Engineering

2.2 Admissions into M.Tech. will be based on the following:

(i) Score obtained in GAT (PG), if conducted.
(ii) Performance in qualifying examination / Interview.

The actual weightage to be given to the above items will be decided by the authorities before the commencement of the academic year. Candidates with valid GATE score shall be exempted from appearing for GAT (PG).

3.0 STRUCTURE OF THE M.Tech. PROGRAMME

3.1 The Programme of instruction consists of:

i. A core programme imparting to the student specialization of engineering branch concerned.

ii. An elective programme enabling the students to take up a group of departmental courses of interest to him/her.

iii. Carry out a technical project approved by the Department and submit a report.

3.2 Each academic year consists of two semesters. Every branch of the M.Tech programme has a curriculum and course content (syllabi) for the subjects recommended by the Board of Studies concerned and approved by Academic Council.

3.3 Project Dissertation has to be submitted by each student individually.
4.0 CREDIT BASED SYSTEM

4.1 The course content of individual subjects - theory as well as practicals – is expressed in terms of a specified number of credits. The number of credits assigned to a subject depends on the number of contact hours (lectures & tutorials) per week.

4.2 In general, credits are assigned to the subjects based on the following contact hours per week per semester.

One credit for each Lecture hour.
One credit for two hours of Practicals.
Two credits for three (or more) hours of Practicals.

4.3 The curriculum of M.Tech programme is designed to have a total of 70 -85 credits for the award of M.Tech degree. A student is deemed to have successfully completed a particular semester’s programme of study when he / she earns all the credits of that semester i.e., he / she has no ‘F’ grade in any subject of that semester.

5.0 MEDIUM OF INSTRUCTION

The medium of instruction (including examinations and project reports) shall be English.

6.0 REGISTRATION

Every student has to register himself/herself for each semester individually at the time specified by the College / University.

7.0 CONTINUOUS ASSESSMENT AND EXAMINATIONS

7.1 The assessment of the student’s performance in each course shall be based on continuous evaluation and semester-end examination. The marks for each component of assessment are as shown in the Table 1.
Table 1: Assessment Procedure

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Component of Assessment</th>
<th>Marks Allotted</th>
<th>Type of Assessment</th>
<th>Scheme of Examination/Evaluation</th>
</tr>
</thead>
</table>
| 1      | Theory                  | 40             | Continuous Evaluation | i) Thirty (30) marks for mid Semester examinations. Three mid examinations shall be conducted for 15 marks each; performance in best two shall be taken into consideration.  
ii) Ten (10) marks for Quizzes, Assignments and Presentations. |
|        |                         |                | Semester-end Examination | Sixty (60) marks for Semester-end examinations |
|        |                         | 60             |                   | Total 100 |
| 2      | Practicals              | 100            | Continuous Evaluation | i) Fifty (50) marks for regularity and performance, records and oral presentations in the laboratory. Weightage for each component shall be announced at the beginning of the Semester.  
ii) Ten (10) marks for case studies.  
iii) Forty (40) marks for two tests of 20 marks each (one at the mid-term and the other towards the end of the Semester) conducted by the concerned lab Teacher. |
| 3      | Project work (Interim evaluation – III semester ) | 100           | Continuous Evaluation | i) Forty (40) marks for periodic evaluation on originality, innovation, sincerity and progress of the work, assessed by the Project Supervisor.  
ii) Thirty (30) marks for mid-term evaluation for defending the Project, before a panel of examiners*.  
iii) Thirty (30) marks for final Report presentation and Viva-voce, by a panel of examiners* |
| 4      | Project work (Final evaluation – IV semester ) | 50            | Continuous Evaluation | i) Twenty (20) for periodic evaluation on originality, innovation, sincerity and progress of the work, assessed by the Project Supervisor.  
ii) Fifteen (15) marks for mid-term evaluation for defending the Project, before a panel of examiners*.  
iii) Fifteen (15) marks for interim Report presentation and Viva-voce. |
|        |                         | 50             | Semester-end Examination | Fifty (50) marks for final Report presentation and Viva-voce assessed by external examiners. |
| 5      | Comprehensive Viva      | 100            | Continuous Evaluation | Through five periodic Viva-voce exams for 20 marks each, conducted by a panel of examiners*. The course content for Viva exams shall be announced at the beginning of the Semester. |

*Panel of Examiners shall be appointed by the concerned Head of the Department.*
8.0 REAPPEARANCE

8.1 A Student who has secured ‘F’ Grade in any theory course / Practicals of any semester shall have to reappear for the semester end examination of that course / Practicals along with his / her juniors.

8.2 A student who has secured ‘F’ Grade in Project work shall have to improve his report and reappear for viva – voce Examination of project work at the time of special examination to be conducted in the summer vacation after the last academic year.

9.0 SPECIAL EXAMINATION

9.1 A student who has completed the stipulated period of study for the degree programme concerned and still having failure grade (‘F’) in not more than 5 courses ( Theory / Practicals), may be permitted to appear for the special examination, which shall be conducted in the summer vacation at the end of the last academic year.

9.2 A student having ‘F’ Grade in more than 5 courses (Theory/practicals) shall not be permitted to appear for the special examination.

10.0 ATTENDANCE REQUIREMENTS

10.1 A student whose attendance is less than 75% in all the courses put together in any semester will not be permitted to attend the end - semester examination and he/she will not be allowed to register for subsequent semester of study. He /She has to repeat the semester along with his / her juniors.

10.2 However, the Vice Chancellor on the recommendation of the Principal / Director of the University college / Institute may condone the shortage of attendance to the students whose attendance is between 66% and 74% on genuine medical grounds and on payment of prescribed fee.

11.0 GRADING SYSTEM

11.1 Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester in each course. The letter grades and the corresponding grade points are as given in Table 3.

Table 3: Grades & Grade Points

<table>
<thead>
<tr>
<th>Grade</th>
<th>Grade points</th>
<th>Absolute Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>10</td>
<td>90 and above</td>
</tr>
<tr>
<td>A+</td>
<td>9</td>
<td>80 – 89</td>
</tr>
<tr>
<td>A</td>
<td>8</td>
<td>70 – 79</td>
</tr>
<tr>
<td>B+</td>
<td>7</td>
<td>60 – 69</td>
</tr>
<tr>
<td>B</td>
<td>6</td>
<td>50 – 59</td>
</tr>
<tr>
<td>C</td>
<td>5</td>
<td>40 – 49</td>
</tr>
<tr>
<td>F</td>
<td>Failed, 0</td>
<td>Less than 40</td>
</tr>
</tbody>
</table>
11.2 A student who earns a minimum of 5 grade points (C grade) in a course is declared to have successfully completed the course, and is deemed to have earned the credits assigned to that course. However, a minimum of 24 marks is to be secured at the semester end examination of theory courses in order to pass in the theory course.

12.0 GRADE POINT AVERAGE

12.1 A Grade Point Average (GPA) for the semester will be calculated according to the formula:

\[
\text{GPA} = \frac{\sum [C \times G]}{\sum C}
\]

Where

- \(C\) = number of credits for the course,
- \(G\) = grade points obtained by the student in the course.

12.2 Semester Grade Point Average (SGPA) is awarded to those candidates who pass in all the subjects of the semester.

12.3 To arrive at Cumulative Grade Point Average (CGPA), a similar formula is used considering the student’s performance in all the courses taken in all the semesters completed up to the particular point of time.

12.4 The requirement of CGPA for a student to be declared to have passed on successful completion of the M.Tech programme and for the declaration of the class is as shown in Table 4.

Table 4: CGPA required for award of Degree

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Distinction</td>
<td>(\geq 8.0^*)</td>
</tr>
<tr>
<td>First Class</td>
<td>(\geq 7.0)</td>
</tr>
<tr>
<td>Second Class</td>
<td>(\geq 6.0)</td>
</tr>
<tr>
<td>Pass</td>
<td>(\geq 5.0)</td>
</tr>
</tbody>
</table>

* In addition to the required CGPA of 8.0, the student must have necessarily passed all the courses of every semester in first attempt.
13.0 ELIGIBILITY FOR AWARD OF THE M.TECH DEGREE

13.1 **Duration of the programme:**
A student is ordinarily expected to complete the M Tech. programme in four semesters of two years. However a student may complete the programme in not more than four years including study period.

13.2 However the above regulation may be relaxed by the Vice Chancellor in individual cases for cogent and sufficient reasons.

13.3 Project dissertation shall the submitted on or before the last day of the course. However, it can be extended up to a period of 6 months maximum, with the written permission of the Head of the Department concerned.

13.4 A student shall be eligible for award of the M.Tech degree if he / she fulfils all the following conditions.
   a) Registered and successfully completed all the courses and projects.
   b) Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of his/her study within the stipulated time.
   c) Has no dues to the Institute, hostels, Libraries, NCC / NSS etc, and
   d) No disciplinary action is pending against him / her.

13.5 The degree shall be awarded after approval by the Academic Council.
RULES

1. With regard to the conduct of the end-semester examination in any of the practical courses of the programme, the Head of the Department concerned shall appoint one examiner from the department not connected with the conduct of regular laboratory work, in addition to the teacher who handled the laboratory work during the semester.

2. In respect of all theory examinations, the paper setting shall be done by an external paper setter having a minimum of three years of teaching experience. The panel of paper setters for each course is to be prepared by the Board of Studies of the department concerned and approved by the Academic Council. The paper setters are to be appointed by the Vice Chancellor on the basis of recommendation of Director of Evaluation / Controller of Examinations.

3. The theory papers of end-semester examination will be evaluated by two examiners. The examiners may be internal or external. The average of the two evaluations shall be considered for the award of grade in that course.

4. If the difference of marks awarded by the two examiners of theory course exceeds 12 marks, the paper will have to be referred to third examiner for evaluation. The average of the two nearest evaluations of the three shall be considered for the award of the grade in that course.

5. Panel of examiners of evaluation for each course is to be prepared by the Board of Studies of the department concerned and approved by the Academic Council.

6. The examiner for evaluation should possess post graduate qualification and a minimum of three years teaching experience.

7. The appointment of examiners for evaluation of theory papers will be done by the Vice Chancellor on the basis of recommendation of Director of Evaluation / Controller of Examinations from a panel of examiners approved by the Academic Council.

8. Project work shall be evaluated by two examiners at the semester end examination. One examiner shall be internal and the other be external. The Vice Chancellor can permit appointment of second examiner to be internal when an external examiner is not available.

9. The attendance marks (maximum 5) shall be allotted as follows:

<table>
<thead>
<tr>
<th>Percentage of Attendance</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>76% to 80%</td>
<td>1</td>
</tr>
<tr>
<td>81% to 85%</td>
<td>2</td>
</tr>
<tr>
<td>86% to 90%</td>
<td>3</td>
</tr>
<tr>
<td>91% to 95%</td>
<td>4</td>
</tr>
<tr>
<td>96% to 100%</td>
<td>5</td>
</tr>
</tbody>
</table>
**M.Tech. (CAD/CAM)**  
PROGRAMME CODE: EPRCC200801  
FIRST SEMESTER

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Name of the Course</th>
<th>Periods per week</th>
<th>Duration of exam (hours)</th>
<th>Max. marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lec.</td>
<td>Lab</td>
<td>Total</td>
<td>S</td>
</tr>
<tr>
<td>EPRCC 101/</td>
<td>Computational Methods in Engineering</td>
<td>4</td>
<td>—</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>EPRMD101</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPRCC 102</td>
<td>Computer Aided Design</td>
<td>4</td>
<td>—</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>EPRCC 103</td>
<td>Computer Numerical Control and Adaptive Control</td>
<td>4</td>
<td>—</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>EPRCC 104</td>
<td>Advanced Material Processing</td>
<td>4</td>
<td>—</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>EPRCC 105</td>
<td>Robotics</td>
<td>4</td>
<td>—</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

**Practical / Drawing**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Name of the Course</th>
<th>Periods per week</th>
<th>Duration of exam (hours)</th>
<th>Max. marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lec.</td>
<td>Lab</td>
<td>Total</td>
<td>S</td>
</tr>
<tr>
<td>EPRCC 111/</td>
<td>CAD Lab</td>
<td>—</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>EPRMD111</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPRCC 112</td>
<td>SEMINAR</td>
<td>—</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Total  

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Lec.</th>
<th>Lab</th>
<th>Total</th>
<th>S</th>
<th>C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>6</td>
<td>26</td>
<td>300</td>
<td>400</td>
<td>700</td>
</tr>
</tbody>
</table>

C – Continuous Evaluation  
S - Semester End Examination
### M.Tech. (CAD / CAM)  
**SECOND SEMESTER**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Name of the Course</th>
<th>Periods per week</th>
<th>Duration of exam (hours)</th>
<th>Max. marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPRCC 201</td>
<td>Metrology and Computer Aided Inspection</td>
<td>4 Lec 4 Lab 4 Total</td>
<td>3 S 60 40 100 C 4 Total</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>EPRCC 202</td>
<td>Flexible Manufacturing Systems</td>
<td>4 Lec 4 Lab 4 Total</td>
<td>3 S 60 40 100 C 4 Total</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>EPRCC 203</td>
<td>Rapid Prototyping and Virtual Prototyping</td>
<td>4 Lec 4 Lab 4 Total</td>
<td>3 S 60 40 100 C 4 Total</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>EPRCC 22X</td>
<td>Elective – I</td>
<td>4 Lec 4 Lab 4 Total</td>
<td>3 S 60 40 100 C 4 Total</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>EPRCC 23X</td>
<td>Elective – II</td>
<td>4 Lec 4 Lab 4 Total</td>
<td>3 S 60 40 100 C 4 Total</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Practical / Drawing</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPRCC 211/ EPRMD212</td>
</tr>
<tr>
<td>EPRCC 212</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

**Elective – I:**

<table>
<thead>
<tr>
<th>Sno</th>
<th>Course Code</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EPRCC 221/ EPRMD301 /EPRIE102</td>
<td>Optimization Methods in Engineering</td>
</tr>
<tr>
<td>2</td>
<td>EPRCC 222</td>
<td>Design of Experiments</td>
</tr>
<tr>
<td>3</td>
<td>EPRCC 223</td>
<td>Reliability Engineering</td>
</tr>
<tr>
<td>4</td>
<td>EPRCC 224</td>
<td>Concurrent Engineering</td>
</tr>
</tbody>
</table>

**Elective – II:**

<table>
<thead>
<tr>
<th>Sno</th>
<th>Course Code</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EPRCC 231</td>
<td>Management of Finance, Marketing and Personnel</td>
</tr>
<tr>
<td>2</td>
<td>EPRCC 232</td>
<td>Design of Material Handling Systems</td>
</tr>
<tr>
<td>3</td>
<td>EPRCC 233</td>
<td>Machine Vision and its Applications</td>
</tr>
<tr>
<td>4</td>
<td>EPRCC 234</td>
<td>Computer Aided Process Planning</td>
</tr>
</tbody>
</table>
### M.Tech. (CAD / CAM)
#### THIRD SEMESTER

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Name of the Course</th>
<th>Periods per week</th>
<th>Duration of exam (hours)</th>
<th>Max. marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPRCC 301</td>
<td>Artificial Intelligence in Manufacturing</td>
<td>4</td>
<td>3</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>EPRCC 34X</td>
<td>Elective-III</td>
<td>4</td>
<td>3</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>EPRCC 311</td>
<td>COMPREHENSIVE VIVA VOCE</td>
<td>--</td>
<td>--</td>
<td>100</td>
<td>--</td>
</tr>
<tr>
<td>EPRCC 312</td>
<td>PROJECT</td>
<td>--</td>
<td>--</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>8</strong></td>
<td><strong>8</strong></td>
<td><strong>270</strong></td>
<td><strong>130</strong></td>
</tr>
</tbody>
</table>

**Elective – III:**

<table>
<thead>
<tr>
<th>Sno</th>
<th>Course Code</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EPRCC 341</td>
<td>Microprocessors in Automation</td>
</tr>
<tr>
<td>2</td>
<td>EPRCC 342</td>
<td>Data Communication in CAD/CAM</td>
</tr>
<tr>
<td>3</td>
<td>EPRCC 343</td>
<td>Manufacturing System Design and Control</td>
</tr>
<tr>
<td>4</td>
<td>EPRCC 344</td>
<td>Neural Networks and Fuzzy Techniques</td>
</tr>
</tbody>
</table>

#### FOURTH SEMESTER

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Name of the Course</th>
<th>Periods per week</th>
<th>Duration of exam (hours)</th>
<th>Max. marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPRCC 411</td>
<td>PROJECT</td>
<td>-</td>
<td>-</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>50</strong></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

**Total Credits: 80**
UNIT I
**Modeling, Computers, and Error Analysis:** Mathematical Modeling and Engineering Problem Solving, Approximations and Round-Off Errors, Truncation Errors and the Taylor Series.

**Roots of Equations:** Bracketing Methods – Bisection Method, False Position Method, Incremental searches and Determining Initial Guesses; Open Methods – Fixed Point Iteration, Newton-Raphson Method, Secant Method; Roots of Polynomials – Muller’s Method, Bairstow’s method; Application to practical problems – Ideal and Nonideal gas laws, Vibration Analysis.

UNIT I

UNIT III
**Numerical Differentiation and Integration:** Newton-Cotes Integration Formulas – Trapezoidal Rule, Simpson’s Rules, Integration with Unequal Segments, Open Integration Formulas, Multiple Integrals; Integration of Equations – Newton-Cotes Algorithms for Equations, Romberg Integration, Gauss Quadrature, Improper Integrals; Numerical Differentiation – High Accuracy Differentiation Formulas, Richardson Extrapolation, Derivatives of Unequally spaced Data; Application to practical problems – Integration to Determine the Total Quantity of Heat, Computation of Work.

UNIT IV
**Ordinary Differential Equations:** Runge-Kutta Methods – Euler’s Method, Improvement of Euler’s Method, Runge-Kutta Methods, Systems of Equations, Adaptive Runge-Kutta Methods; Stiffness and Multistep Methods, Boundary-
Value and Eigenvalue Problems, Application to practical problems – The Swinging Pendulum.

UNIT V


**Text Book:**

**References:**
M.Tech. (CAD / CAM) FIRST SEMESTER  
EPRCC 102 : COMPUTER AIDED DESIGN

Hours per week: 4  
Semester End Examination: 60 Marks  
Credits: 4  
Continuous Evaluation: 40 Marks

UNIT I  
**Fundamentals of CAD:** Introduction, Design process, Application of computer for design, Benefits of CAD, CAD tools, CAD hardware, CAD software, Mechanical applications of CAD.

**Geometric modeling - Types and Mathematical Representations of Curves:** Wireframe models, wireframe entities, curve representation, parametric representation of analytic curves and synthetic curves, simple problems.

UNIT II  
**Geometric modeling - Types and Mathematical Representations of Surfaces:** Surface models, surface entities, surface representation, parametric representation of analytic surfaces and synthetic surfaces, simple problems.

UNIT III  
**Geometric modeling - Types and Mathematical Representations of Solids:** Solid models, solid entities, solid representation, fundamentals of solid modeling, half spaces, Boundary Representation (B-rep), Constructive Solid Geometry (CSG), Sweep Representation, Analytic Solid Modeling (ASM).

UNIT IV  
**Graphics Concepts - Geometric Transformations:** Transformation of geometric models, mappings of geometric models, inverse transformations and mappings, projections of geometric models.

**Graphics Concepts - Visual realism:** Model clean-up, hidden line removal, hidden surface removal, hidden solid removal, Shading, Coloring.

UNIT V  
**Mechanical assembly:** Assembly modeling, representation schemes, generation of assembly sequence, assembly analysis.

**Mass property calculations:** Geometrical property formulation, mass property formulation, property evaluation, properties of composite objects.

Text Book:

References:
M.Tech (CAD / CAM) FIRST SEMESTER
EPRCC 103: COMPUTER NUMERICAL CONTROL AND ADAPTIVE CONTROL

Hours per week : 4 Semester End Examination: 60 Marks
Credits: 4 Continuous Evaluation: 40 Marks

UNIT-I:
Introduction: NC, DNC, CNC, Programmed Automations, Machine control unit, Part program, NC tooling. NC machine tools: Nomenclature of NC machine axes, Types of NC machine tools, Machining centres, Automatic tool changes (ATC), Turning centres.

UNIT-II:
Machine control unit & tooling: Functions of MCU, NC actuation systems, Part program to command signal, MCU organization, Computerised numerical control, Transducers for NC machine tools, Tooling for NC machining centres and NC turning machines, Tool presetting. Adaptive control of CNC machine tools – SMART manufacturing. Programmable logic controllers (PLC) – Hardware, ladder logic programming of PLCs using basic functions – timers and counters – Advanced programming with control and arithmetic instructions.

UNIT-III:

UNIT-IV:

UNIT-V:
Computer aided part programming: NC languages: APT, NELAPT, EXAPT, GNC, VNC, Preprocessor, Post processor.

Text book:

Reference:
M.Tech. (CAD / CAM) FIRST SEMESTER
EPRCC 104: ADVANCED MATERIALS AND PROCESSING

Hours per week: 4  Semester End Examination: 60 Marks
Credits: 4  Continuous Evaluation: 40 Marks

UNIT-I

UNIT-II
Hardening in steels- TTT diagrams- other heat treatment processes - formation of alloys in steel and cast irons- non ferrous alloys and their applications special alloys.

UNIT-III
Polymers and polymerization- structure and properties of thermoplastics and thermosets- engineering applications -property modifications- mechanical, thermal behaviour- composites with polymer matrix

UNIT-IV
Ceramics- glasses- glass ceramics- fabrication methods- metal matrix and ceramic matrix composites.

UNIT-V
Processing of polymers- fabrication of composites- processing of ceramics- thermal spraying- ion beam machining- laser and electron beam processing- superplastic forming- thin films and their deposition- diamond coating techniques- tribological applications.

Text books:
1. Material Science and Engineering by L.H.Van Vleck, 5\textsuperscript{th} edition, Addision Wealey(1985)

References:
UNIT-I


UNIT-II


UNIT-III

Robot sensors: 

UNIT-IV

Robot Cell Design and Application: 

UNIT-V

Robot Programming: Methods of Robot Programming – Robot motion planning - configuration space concepts. Robot programming concepts - off line programming and simulation-Case studies in assembly, machine loading/unloading, palletising, deburring etc.
Text book:

References:
M.Tech. (CAD / CAM) FIRST SEMESTER
EPRCC 111/ EPRMD111: CAD LAB

Hours per week: 3
Credits : 2
Continuous Evaluation: 100 Marks

1. Introduction to Modeling packages – Pro-Engineer, Ideas, CATIA, Uni Graphics, Solid Works.
2. 2D-drawings using sketcher options - 3 Exercises
3. 3D-modelling using form features - 3 Exercises
4. Assembly – 3 Exercises
   a) Flange coupling
   b) Knuckle joint
   c) Oldham coupling
5. Drafting - 3 Exercises
6. Introduction to pre-processing software - Hyper mesh
7. 2D-Meshing - 3 Exercises
8. 3D-Meshing - 3 Exercises

M.Tech. (CAD / CAM) FIRST SEMESTER
EPRCC 112: SEMINAR

Credits: 2
Continuous Evaluation: 50 Marks

End Semester Viva-voce - Examination: 50 Marks
M.Tech. (CAD / CAM) SECOND SEMESTER
EPRCC 201: METROLOGY AND COMPUTER AIDED INSPECTION

Hours per week : 4                                          Semester End Examination: 60 Marks
Credits: 4                                                   Continuous Evaluation: 40 Marks

UNIT-I
Metrology concepts - Abbe’s principle - need for high precision measurements - problems associated with high precision measurements.

UNIT-II

UNIT-III
Surface and form metrology - flatness, roughness, waviness, roundness, cylindricity, etc. Computer Aided Metrology- Principles and interfacing, software metrology.

UNIT-IV

UNIT-V
Coordinate Measuring Machine - Types of CMM - Probes used - Applications - Non contact CMM using Electro optical sensors for dimensional metrology - Non contact sensors for surface finish measurements. Image processing and its application in Metrology.

Text book:

References:
1. A.S. T.M.E. Hand Book of Industrial Metrology, Prentice Hall of India, New Delhi
2. Technology of the metal Trade, Wiley Eastern Limited.
M.Tech. (CAD / CAM) SECOND SEMESTER
EPRCC 202 : FLEXIBLE MANUFACTURING SYSTEMS

Hours per week: 4 Semester End Examination: 60 Marks
Credits: 4 Continuous Evaluation: 40 Marks

UNIT-I:
Introduction: The economic justification of FMS, The basic components of FMS and their integration in the data processing system, The concept of the 'total system'. The FMS relational: Economic and technological justification for FMS Management decisions during FMS project planning, design and implementation: Designing the FMS, Data processing design, FMS project and software documentation.

UNIT-II:
Design and Planning of FMS: the role of associated technologies such as GT, JIT and simulation - Installation, Operation and evaluation - Scheduling problems. Control aspects of FMS-DNC of machine tools, cutting tools, robots, quality control and inventories.

UNIT-III:
Distributed processing in FMS: Introduction to database management systems (DBMS) and their application in CAD/CAM and FMS, Distributed systems in FMS. Distributed tool data bases in FMS: The distributed tool data structure with a general purpose tool description facility, Implementation of the FMS tool data base, Application possibilities of the FMS tool data base.

UNIT-IV:
FMS database for clamping devices and fixtures: The FMS clamping device and fixture data base, the analysis and calculation of pallet alignment and work mounting errors, Mating surface description methods for automated design and robotized assembly, Application of industrial robots in FMS, The application of automated guided vehicle (AGV) systems.

UNIT-V:

Text Book:

References:
M.Tech. (CAD / CAM) SECOND SEMESTER
EPRCC 203: RAPID PROTOTYPING AND VIRTUAL PROTOTYPING

Hours per week: 4  Semester End Examination: 60 Marks
Credits: 4  Continuous Evaluation: 40 Marks

UNIT – I

UNIT – II

UNIT – III

UNIT – IV

UNIT – V
Introduction to Virtual prototyping- End to end prototyping-simulation-components of virtual prototyping- effects- economics of virtual prototyping.

Text Books:

References:
2. Joe Cecil, Virtual Engineering, Momentum Press, 2010
M.Tech. (CAD / CAM) SECOND SEMESTER
EPRCC221/ EPRMD301 /EPRIE102: OPTIMIZATION METHODS IN ENGINEERING

Hours per week: 4
Credits: 4
Semester End Examination: 60 Marks
Sessionals: 40 Marks

UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V
Unconventional optimization techniques: Multi-objective optimization - Lexicographic method, Goal programming method, Genetic algorithms, Simulated Annealing, Neural Networks based Optimization.

Text Book:

References:
1. Operations Research- Principles and Practice, Ravindran, Phillips and Solberg, John Wiely
M.Tech. (CAD / CAM) SECOND SEMESTER
EPRCC222: DESIGN OF EXPERIMENTS

Hours per week: 4 Semester End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

UNIT-I

UNIT-II

UNIT-III
LATIN SQUARE AND RELATED DESIGNS. Latin squares and two-way restrictions on randomization. The linear model and assumptions for a one-factor experiment fitted in a Latin square design. ANOVA table.

UNIT-IV
FACTORIAL EXPERIMENTS. Complete factorial experiments in CRD's. Main effects and interactions. One observation per treatment combination. Linear model and analysis. The error term and pooling. The meaning of a significant interaction. The case of n observations per treatment combination. Complete 2f factorial experiments in CRD's. Special notation. Average effect of main effects and interaction. Orthogonal contrasts and sum of squares. Yates's algorithm.

UNIT-V
NESTED AND NESTED – FACTORIAL EXPERIMENTS:
Nested experiments, Nested-factorial experiments, Repeated-measures design and nested-factorial experiments.
Factorial experiment in a randomized block design.

Text Books:

References
UNIT I
Reliability: Definition; Probability Concept; Addition of Probabilities; Complimentary Events; Kolmogorov Axioms.
Failure Data Analysis: Introduction, Mean Failure Rate, Mean Time to Failure (MTTF), Mean Time between Failures (MTBF), Graphical Plots, MTTF in terms of Failure Density, MTTF in Integral Form.

UNIT II
Conditional Probability: Introduction, Multiplication Rule, Independent Events, Venn Diagram, Hazard Rate as conditional probability, Bayes Theorem.

UNIT III
Reliability Improvement & Repairable Systems: Redundancy, Element, Unit and standby

UNIT-IV
Redundancy, Optimization; Reliability – cost trade-off, Introduction to Repairable Systems, Instantaneous Repair Rate, MTTR, Reliability and Availability Functions, Important Applications.

UNIT V
Unit Maintainability and Availability: Introduction, Maintenance Planning, Reliability and Maintainability trade-off.
Text Book:

References
UNIT-I
**Introduction:** Concurrent design of products and systems - Product design - Fabrication and assembly system design - designing production systems for robustness and structure.

UNIT-II
**Strategic approach and technical aspects of product design:** Steps in the strategic approach to product design - Comparison to other product design methods - Assembly sequence generation - Choosing a good assembly sequence - Tolerances and their relation to assembly - Design for material handling and part mating - Creation and evaluation of testing strategies.

UNIT-III
**Basic issues in manufacturing system design:** System design procedure - Design factors - Intangibles - Assembly resource alternatives - Task assignment - Tools and tool changing - Part feeding alternatives - Material handling alternatives - Floor layout and system architecture alternatives.

UNIT-IV
**Design of automated fabrication systems:** Objectives of modern fabrication system design - System design methodology - Preliminary system feasibility study - Perform detailed work content analysis - Define alternative fabrication configurations - Configuration design and layout - Human resource considerations - Evaluate technical performance of solution.

UNIT-V
**Assembly workstation design:** Strategic issues - Technical issues analysis. Case studies: Automobile air conditioning module - Robot assembly of automobile rear axles.

**Text Book:**

**References:**
UNIT-I
Introduction to financial management, Organization of the financial management functions, Business Environment, Financial Environment.

UNIT-II
Issues with working capital, Financing current assets, Capital budgeting, Generating investment project proposals, Project evaluation, selection and monitoring.
Intermediate and long-term financing. Term loans and leases. Provision of loan agreements, equipment financing, Lease financing and its evaluation.

UNIT-III
Marketing mix variables and their importance.
Pricing Strategies: Meaning of pricing, Importance, Objectives, Factors influencing price determination.

UNIT-IV
Advertising Management: Purpose, Factors in advertising, Advertising Portfolio Selection.

UNIT-V
Introduction to personnel management: concept of labour, organization and function of the personnel department, personnel policies.
Manpower planning: Selection, Recruitment, Training. Performance appraisal.
Wage and Salary Administration: Job evaluation and merit rating.
Text Books:


References:

M.Tech. (CAD / CAM) SECOND SEMESTER
EPRCC232: DESIGN OF MATERIAL HANDLING SYSTEMS

Hours per week: 4  
Semester End Examination: 60 Marks
Credits: 4  
Sessionals: 40 Marks

UNIT-I
FLEXIBLE HOISTING APPLIANCES
Type, selection and applications of material handling equipments, choice of material handling equipment – hoisting equipment – components and theory of hoisting equipment – chain and ropes – selection of ropes, pulleys, pulley systems, sprockets and drums.

UNIT-II
LOAD HANDLING EQUIPMENTS AND BRAKES

UNIT-III
SURFACE AND OVERHEAD TRANSPORTATION EQUIPMENTS

UNIT-IV
ELEVATING EQUIPMENTS

UNIT-V
CONVEYING EQUIPMENTS
Text Books:

References
M.Tech. (CAD / CAM) SECOND SEMESTER
EPRCC233: MACHINE VISION AND ITS APPLICATIONS

Hours per week: 4  Semester End Examination: 60 Marks
Credits: 4  Sessionals: 40 Marks

UNIT-I
Introduction to Machine Vision-basics of picture processing, Binary and grey scale images.

UNIT-II
Preprocessing concepts -Digital image, Image representation –Image sampling, Digitization and quantization– Image transforms. Geometrical correction, Grey scale modification, Sharpening and smoothing the images.

UNIT-III

UNIT-IV
Software for measurement and pattern recognition applications with examples -Two and three dimensional measurements, Fourier transform for pattern recognition applications, Image operation studies

UNIT-V

Text Book:

References:
1. Robot Vision by Prof. Alan Pugh (Editor), IFS Ltd., U.K.
INTRODUCTION
Introduction to Process Planning and Production Planning – Process Planning in the Manufacturing cycle - Process Planning and Concurrent Engineering, CAPP, Group Technology.

PART DESIGN REPRESENTATION

PROCESS ENGINEERING AND PROCESS PLANNING

COMPUTER AIDED PROCESS PLANNING SYSTEMS
Logical Design of a Process Planning - Implementation considerations – manufacturing system components, production Volume, No. of production families - CAM-I, CAPP, MIPLAN, APPAS, AUTOPLAN and PRO, CPPP.

AN INTERGRADED PROCESS PLANNING SYSTEMS
Text Book:

References:
1. Introduction to Finite Element Analysis software – ANSYS / NISA / Nastran
2. Static Structural Analysis of 1D problems – bars, trusses, beams and frames
3. Static Structural Analysis of 2D problems – plane stress, plane strain, axisymmetric
4. Static Structural Analysis of 3D problems – various brackets
5. Dynamic Structural Analysis of 1D problems – beams and frames
6. Steady State Thermal Analysis of 1D and 2D models
7. Transient Thermal Analysis of 1D and 2D models
8. Couple Field (Thermal/Structural) Analysis
M.Tech. (CAD / CAM) SECOND SEMESTER
EPRCC 212 : CAM LAB

Hours per week: 3
Credits: 2
Continuous Evaluation : 100 Marks

1. Preparation of manual part programme for turning, drilling and milling
2. To Generate NC programme using Master CAM simulation software for a turning Job using Lathe Version.
   a) step turning, taper turning, drilling
   b) thread cutting, grooving,
   a) face milling, pocketing, drilling, contouring
   b) gear cutting.
5. To Generate NC & APT programme using CATIA Manufacturing software for Prismatic Machining.
6. Machining of one job on CNC Lathe.
7. Machining of one job on CNC Drilling.
8. Robot programming through computer / teaching box method.
UNIT-I
Artificial Intelligence - Definition - Components - Scope - Application Areas; Goals of artificial intelligence – AI techniques – problem representation in AI – Problem reduction and solution techniques

UNIT-II
Knowledge-Based Systems (Expert Systems) - Definition - Justification - Structure – Characterization

UNIT-III
Knowledge Sources – Expert - Knowledge Acquisition- Knowledge Representation - Knowledge Base - Inference Strategies - Forward and Backward Chaining; Expert System Languages - ES Building Tools or Shells; Typical examples of shells.

UNIT-IV
Expert Systems Software for Manufacturing applications in CAD, CAPP, MRP, Adaptive Control, Robotics, Process Control, Fault Diagnosis, Failure Analysis; Process Selection, GT etc. Linking Expert Systems to other software such as DBMS, MIS, MDB; Process Control and Office Automation.

UNIT-V
Case studies of typical applications in Tool selection, Process selection, Part classification, Inventory control, Process Planning etc.

Text book:

References:
M.Tech. (CAD / CAM) THIRD SEMESTER
EPRCC 341: MICROPROCESSORS IN AUTOMATION

Hours per week: 4  
Semester End Examination: 60 Marks  
Credits: 4  
Sessionals: 40 Marks

UNIT-I
Basic features of RISC and CISC Processors & Micro controllers, Organization & Architectural Features of Microprocessor & Micro Controller. Binary data representation: decimal system, binary system, octal system, hexadecimal system, binary coded decimal system, decimal conversion, decimal to Hexadecimal, binary addition and subtraction, binary multiplication and division. Micro controller, difference between micro controller and microprocessor, criteria for choosing a microcontroller, internal architecture of MCS51 microcontroller and its family.

UNIT-II
8051 assembly language programming: instruction set-arithmetic, logical, data transfer branching and Flag manipulation Instructions, addressing modes

UNIT-III
8051 timer/counter, serial communication programming, interrupts structure, interrupt programming, usage of C programming to 8051 family.

UNIT-IV
Real word interfacing: Analog to Digital converter, Digital to Analog converter, Mechanical switches, keypads, LEDs, seven segment display, LCDs, keyboard, DC motor, stepper motor, PWM, External Memory Interface.

UNIT-V
Microcontroller Applications: C programming of Podium timer, microcontroller based menu card, chimney sentinel, counting cars, anonymous voting, efficient lighting using microcontroller, Applications to Industrial Automation.

Text Books:
References:
1. Microprocessors & Interfacing Programming & Hardware by DOUGLAS V.Hall
M.Tech. (CAD / CAM) THIRD SEMESTER
EPRCC 342: DATA COMMUNICATION IN CAD/CAM

Hours per week: 4  Semester End Examination: 60 Marks
Credits: 4         Sessionals: 40 Marks

UNIT I
DIGITAL COMPUTERS & MICRO PROCESSORS
Block diagram - register transfer language - arithmetic, logic and shift micro
operations - instruction code - training and control instruction cycle - I/O and
interrupt design of basic computer. Machine language - assembly language
assembler. Registers ALU and Bus Systems - timing and control signals
machine cycle and timing diagram - functional block diagrams of 80 x 86 and
modes of operation. Features of Pentium Processors

UNIT-II
OPERATING SYSTEM & ENVIRONMENTS
Types - functions - UNIX & WINDOWS NT - Architecture - Graphical User
Interfaces. Compilers - Analysis of the Source program - the phases of a
compiler - cousins of the compiler, the grouping of phases - compiler
construction tools.

UNIT-III
COMMUNICATION MODEL
Data communication and networking - protocols and architecture - data
transmission concepts and terminology - guided transmission media - wireless
transmission – data encoding - asynchronous and synchronous communication

UNIT-IV
COMPUTER NETWORKS
Network structure - network architecture - the OSI reference model services –
network standardization – example - Managing remote systems in network
network file systems -net working in manufacturing.

UNIT-V
INTERNET
Internet services - Protocols - intranet information services - mail based service
system and network requirements - Internet tools - usenet - e-mail - IRC -
www - FTP - Telnet.
Text Book:

References
M.Tech. (CAD / CAM) THIRD SEMESTER
EPRCC 343: MANUFACTURING SYSTEM DESIGN AND CONTROL

Hours per week: 4  Semester End Examination: 60 Marks
Credits: 4  Sessionals: 40 Marks

UNIT-I
Fundamentals: System concept, Hierarchical structure, System design, Decision making procedure, System types in manufacturing environments; Manufacturing Systems: Structural aspects, transformational aspects, procedural aspects, integrated manufacturing systems; Modes of Production- Jobbing / Intermittent /Continuous; Mass Production- Economies of Scale, Optimum production scale, Mass Customization; Multi-Product Small Batch Production- Economies of Scope with Diversification; Logistic Systems- Material flow: conversion / transportation / storage

UNIT-II

UNIT-III
Manufacturing Optimization: Criteria for Evaluation, Optimization of single stagemanufacturing- Unit production time and cost; Optimization of multistage manufacturing system- Scope, basic mathematical models; Cost Estimating- Classical metal cutting cost analysis, Industrial cost estimation practices, Estimating material, setup and cycle times.

UNIT-IV
Information Systems in Manufacturing: Database structures, hierarchical, network, Relational- concepts, keys, relational operations, query languages; Shop Floor Data Collection Systems- Types of data, on-line and off-line data collection, Automatic data collection systems.

UNIT-V
Computer Simulation in Manufacturing System Analysis: Characteristics, Simulation Models, applications of probability and statistics; Design and evaluation methodology of manufacturing systems, General design framework,
Analysis of situation, Setting objectives, Conceptual modeling, Detailed design, Evaluation and Decision.
Modern approaches in Manufacturing: Cellular Manufacturing- Group Technology, Composite part, Rank Order Clustering Technique, Hollier method for GT cell layouts; Flexible Manufacturing- Concept, components, architecture; Lean Production- concept, principles, Agile Manufacturing-concept, principles and considerations for achieving agility.

**Text Book:**

**References:**
M.Tech. (CAD / CAM) THIRD SEMESTER
EPRCC 344: NEURAL NETWORKS AND FUZZY TECHNIQUES

Hours per week: 4          Semester End Examination: 60 Marks
Credits: 4                Sessionals: 40 Marks

UNIT-I:

UNIT-II:

UNIT-III:
Synaptic Dynamics II: Supervised learning, Supervised function estimation, Supervised learning as operant conditioning, Supervised learning as stochastic pattern learning with known class memberships, Supervised learning as stochastic approximation, The back propagation algorithm.

UNIT-IV:
UNIT-V:

Fuzzy associative memories: Fuzzy systems as between-cube mappings, Fuzzy and neural function estimators, Fuzzy Hebb FAMs, Adaptive FAMs: Product-space clustering in FAM cells. Applications in design and structural analysis.

Text Books:
1. Neural Networks & Fuzzy Systems by Bark Kosko, PHI Published in 1994

References:
2. Fuzzy Set Theory & its Application by J. Zimmerman Allied Published Ltd.
M.Tech. (CAD / CAM) THIRD SEMESTER
EPRCC 311: COMPRHENSIVE VIVA VOCE

Credits: 2
Semester End Examination: 100

M.Tech. (CAD / CAM) THIRD SEMESTER
EPRCC 312: PROJECT

Credits: 6
Semester End Examination: 50 Marks
Continuous Evaluation: 50 Marks

M.Tech. (CAD / CAM) FOURTH SEMESTER
EPRCC 411: PROJECT

Credits: 16
Semester End Examination: 50 Marks
Continuous Evaluation: 50 Marks

Each student is required to submit a detailed Thesis report about the work on topic of Thesis as per the guidelines decided by the department. The Thesis work is to be evaluated through Presentations and Viva-Voce during the semester and Final evaluation will be done at the end of semester as per the guidelines decided by the department from time to time.

The candidate has to present/publish one paper in national/international conference/seminar/journal of repute is must before submission. However candidate may visit research labs/institutions with the due permission of chairperson on recommendation of supervisor concerned.