A meeting of the Special Board of Studies of Mechanical Engineering Section, University Polytechnic, was held on **28/03/2019** at 03.00 P.M. in the Conference Room of University Polytechnic, AMU, Aligarh.

The following were present:

- Prof. Arshad Umar (in the Chair)
- Mr. S Abid Hasan
- Dr. Shujaat Yar Khan (Acting Incharge MES)
- Mr. Mazhar Ali (CES Special Invitee)
- Mr. Suhail A Siddiqui
- Mr. Mohd. Asif Hasan
- Dr. Syed Imran Shafiq
- Mr. Mohd. Arif
- Mr. Anis Ahmad Ansari
- Mr. Shailendra Kumar
- Mr. Mohd Gulam Waris Khan
- Mr. Afzar Husain
- Mr. Mohd Shakeb Ashraf
- Mr. S. M Shukat Rafi
- Mr. Abdul Faheem

### AGENDA

<table>
<thead>
<tr>
<th>Item No-01</th>
<th>DECISION</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) The minor modification in the Academic ordinances for Diploma in Mechanical Engineering courses regarding the change in the duration of the end semester examination from the 03 hours to 02 hours.</td>
<td>As per clause 10.2 of academic ordinance CHAPTER XXXVII (D) 2013-14 duration of end semester examination of each theory as well as practical courses shall be of 02 (Two) hours instead of 03 (Three) hours w.e.f. 2019-2020 which will be incorporated in study/teaching and evaluation/examination (Curriculum) scheme of Diploma in Mechanical Engineering as given in Annexure I.</td>
</tr>
<tr>
<td>b) The change in the academic ordinances regarding supplementary examination would be made</td>
<td>The change in the ordinance is given in Annexure II. Further, this change will be applicable w.e.f. 2018-19</td>
</tr>
<tr>
<td>c) The internship training is proposed to be introduced from the Academic session 2019-20 comprising of industrial hands on experience for fulfilling AICTE requirement at the end of 4th semester of Diploma in Mechanical Engineering.</td>
<td>Introduction of provision of internship training is given in Annexure II. Some other minor amendments are also given in Annexure II.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item No-02</th>
<th>DECISION</th>
</tr>
</thead>
<tbody>
<tr>
<td>The reorganized/modification of syllabi for all course of Diploma in Mechanical engineering from 5 units to 4 units out of which the first unit would be of 15 marks and the remaining three units would be of 20 marks each.</td>
<td>Re-organized/modified syllabi of each Theory/Practical course of Diploma in Mechanical Engineering of all semester Annexure (III a) and Diploma in Production, RAC, Plastic &amp; Mechanical V &amp; VI semester of old courses Annexure (III b) &amp; the syllabi of the courses teaching in Electrical Engineering, Civil Engineering, Leather &amp; Footwear Technology, Architecture &amp; Interior Design sections Annexure (III c) are given.</td>
</tr>
</tbody>
</table>

**In-Charge**

Mech. Engg. Section

**Principal**

University Polytechnic
V SEMESTER

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH

Name of the Branch: **Mechanical Engineering**

Semester: **Fifth**

THEORY COURSES:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./ wk.</th>
<th>Evaluation Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>BME-501</td>
<td>Industrial Engineering</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>BME-502</td>
<td>Hydraulics &amp; Pneumatics</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>BME-503</td>
<td>Applied Thermodynamics</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>BME-504</td>
<td>Refrigeration &amp; Air Conditioning</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>BME-505</td>
<td>Production Technology -III</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>20</td>
<td>0</td>
</tr>
</tbody>
</table>

PRACTICAL COURSES:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./ wk.</th>
<th>Evaluation Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>BME-591</td>
<td>Workshop Practice -V</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>BME-592</td>
<td>CAD Lab-II</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>BME-593</td>
<td>Applied Thermodynamics Lab</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>BME-594</td>
<td>Project</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Grant Total</strong></td>
<td>20</td>
<td>13</td>
</tr>
</tbody>
</table>

Period per week: 20+13=33
### VI SEMESTER

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**

Name of the Branch: - Mechanical Engineering  
Semester: - Sixth

#### THEORY COURSES:

<table>
<thead>
<tr>
<th>S.No</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./ wk.</th>
<th>Evaluation Scheme</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>P</td>
<td>Hrs.</td>
</tr>
<tr>
<td>1</td>
<td>BME-601</td>
<td>Industrial Management &amp; Entrepreneurship Development</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>BME-602</td>
<td>Machine Design</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>BME-603</td>
<td>Automobile Engineering</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>BME-604</td>
<td>Machine Tools &amp; Maintenance</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>BCE-605 (a)</td>
<td>Environmental Science and Management</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>BCE-605 (b)</td>
<td>Non-Conventional Energy Sources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BCE-605 (c)</td>
<td>Total Quality Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>19</td>
<td>0</td>
<td>50</td>
</tr>
</tbody>
</table>

**PRACTICAL COURSES:**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./ wk.</th>
<th>Evaluation Scheme</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>P</td>
<td>Hrs.</td>
</tr>
<tr>
<td>1</td>
<td>BME-691</td>
<td>Workshop Practice-VI</td>
<td>0</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>BME-692</td>
<td>Automobile Lab</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>BME-693</td>
<td>Hydraulics &amp; Pneumatics Lab</td>
<td>0</td>
<td>4 (2^*2)</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>BME-694</td>
<td>Project</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>0</td>
<td>15</td>
<td>260</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grant Total</td>
<td>19</td>
<td>15</td>
<td>310</td>
</tr>
</tbody>
</table>

Period per week: 19+15=34

Annexure: I  
Special BOS: 28.03.2019
# V SEMESTER

## STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH

Name of the Branch: **Plastic Technology**

Semester: **Fifth**

### THEORY COURSES:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./ wk.</th>
<th>Evaluation Scheme</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>P</td>
<td>Hrs.</td>
</tr>
<tr>
<td>1</td>
<td>BKE-501</td>
<td>Basic Chemical Engg.</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>BPT-501</td>
<td>Polymer Processing-II</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>BPT-502</td>
<td>Advance Polymer Processing</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>BME-502</td>
<td>Hydraulics &amp; Pneumatics</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>BME-505</td>
<td>Production Technology -III</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>19</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

### PRACTICAL COURSES

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>L</th>
<th>P</th>
<th>Hrs.</th>
<th>Course Work</th>
<th>Mid Sem. Exam</th>
<th>End Sem. Exam</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BKE-591</td>
<td>Basic Chemical Engg Lab</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>50</td>
<td>--</td>
<td>30</td>
<td>80</td>
</tr>
<tr>
<td>2</td>
<td>BPT-591</td>
<td>Polymer Processing Lab-II</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>80</td>
<td>--</td>
<td>40</td>
<td>120</td>
</tr>
<tr>
<td>3</td>
<td>BPT-592</td>
<td>Project</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>80</td>
<td>--</td>
<td>40</td>
<td>120</td>
</tr>
<tr>
<td>4</td>
<td>BME-595</td>
<td>Hydraulics Lab</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>50</td>
<td>--</td>
<td>30</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>0</td>
<td>13</td>
<td>260</td>
<td>--</td>
<td>140</td>
<td>400</td>
<td></td>
</tr>
</tbody>
</table>

|        |            | **Grant Total**          | 20| 13| 310  | 75          | 515            | 900           |       |

Period per week: 20+13=33
# VI SEMESTER

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**

Name of the Branch: - Plastic Technology

Semester: - Sixth

**THEORY COURSES:**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./ wk.</th>
<th>Evaluation Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
</tr>
<tr>
<td>1</td>
<td>BME-601</td>
<td>Industrial Management &amp; Entrepreneurship Development</td>
<td>4 0 2 10 15 75 100</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>BPT-601</td>
<td>Mould Design</td>
<td>4 0 2 10 15 75 100</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>BPT-602</td>
<td>Rheology &amp; Testing of Polymers</td>
<td>4 0 2 10 15 75 100</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>BME-604</td>
<td>Machine Tools &amp; Maintenance</td>
<td>4 0 2 10 15 75 100</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>BCE-605 (A)</td>
<td>Industrial pollution &amp; control</td>
<td>3 0 2 10 15 75 100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BPT-603 (B)</td>
<td>Rubber technology</td>
<td>3 0 2 10 15 75 100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BPT-603 (C)</td>
<td>Polymer composite</td>
<td>3 0 2 10 15 75 100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BPT-603 (D)</td>
<td>Foams and adhesives</td>
<td>3 0 2 10 15 75 100</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>19 0 50 75 375 500</strong></td>
<td></td>
</tr>
</tbody>
</table>

**PRACTICAL COURSES:**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./ wk.</th>
<th>Evaluation Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BPT-691</td>
<td>Mould Construction Lab</td>
<td>0 6 2 80 --</td>
<td>40 120</td>
</tr>
<tr>
<td>2</td>
<td>BPT-692</td>
<td>Rheology &amp; testing of polymers lab</td>
<td>0 4 2 50 --</td>
<td>30 80</td>
</tr>
<tr>
<td>3</td>
<td>BPT-693</td>
<td>Project</td>
<td>0 3 2 80 (2*2) --</td>
<td>40 120</td>
</tr>
<tr>
<td>4</td>
<td>BME-695</td>
<td>CAD Lab-II</td>
<td>0 3 2 50 --</td>
<td>30 80</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>0 15 260 --</strong></td>
<td><strong>140 400</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Grant Total</strong></td>
<td></td>
<td><strong>19 15 310 75 515 900</strong></td>
<td></td>
</tr>
</tbody>
</table>

Period per week: 19+15=34

Annexure: I
Special BOS: 28.03.2019
## V SEMESTER

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**

Name of the Branch: **Production Engineering**  
Semester: **Fifth**

### THEORY COURSES:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./ wk.</th>
<th>Evaluation Scheme</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>BME-501</td>
<td>Industrial Engineering</td>
<td>4 0 2 10 15 75</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>BME-502</td>
<td>Hydraulics &amp; Pneumatics</td>
<td>4 0 2 10 15 75</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>BPE-501</td>
<td>Automation &amp; CAM</td>
<td>4 0 2 10 15 75</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>BPE-502</td>
<td>Tool Design</td>
<td>4 0 2 10 15 75</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>BME-505</td>
<td>Production Technology -III</td>
<td>4 0 2 10 15 75</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>20 0 50 75 375 500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### PRACTICAL COURSES:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./ wk.</th>
<th>Evaluation Scheme</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BME-591</td>
<td>Workshop Practice -V</td>
<td>0 6 2 80 -- 40</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>BPE-591</td>
<td>Industrial Engineering Lab</td>
<td>0 2 2 50 -- 30</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>BME-594</td>
<td>Project</td>
<td>0 3 2 80 -- 40</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>BME-595</td>
<td>Hydraulics Lab</td>
<td>0 2 2 50 -- 30</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>0 13 260 -- 140</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grant Total</td>
<td>20 13 310 75 515 900</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Period per week: 20+13=33

Annexure: 1  
Special BOS: 28.03.2019
VI SEMESTER

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH

Name of the Branch: Production Engineering

Semester: Sixth

THEORY COURSES:

<table>
<thead>
<tr>
<th>S.No</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./wk.</th>
<th>Evaluation Scheme</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L P Hrs. Course Work</td>
<td>Mid Sem. Exam</td>
<td>End Sem. Exam</td>
</tr>
<tr>
<td>1</td>
<td>BME-601</td>
<td>Industrial Management &amp; Entrepreneurship Development</td>
<td>4 0 2 10</td>
<td>15 75</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>BME-602</td>
<td>Machine Design</td>
<td>4 0 2 10</td>
<td>15 75</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>BPE-601</td>
<td>Manufacturing Technology</td>
<td>4 0 2 10</td>
<td>15 75</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>BME-604</td>
<td>Machine Tools &amp; Maintenance</td>
<td>4 0 2 10</td>
<td>15 75</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>BCE-605 (a)</td>
<td>Environmental Science and management</td>
<td>3 0 2 10</td>
<td>15 75</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>BME-605 (B)</td>
<td>Non-Conventional Energy Source</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BME-602 (C)</td>
<td>Total quality management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>19 0 50 75</td>
<td>375</td>
<td>500</td>
</tr>
</tbody>
</table>

PRACTICAL COURSES:

<table>
<thead>
<tr>
<th>S.No</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Pds./wk.</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BME-691</td>
<td>Workshop Practice-VI</td>
<td>0 6 2 80</td>
<td>40 120</td>
</tr>
<tr>
<td>2</td>
<td>BPE-691</td>
<td>Tool Engg. Lab</td>
<td>0 2 2 50</td>
<td>30 80</td>
</tr>
<tr>
<td>3</td>
<td>BME-694</td>
<td>Project</td>
<td>0 3 2 80</td>
<td>40 120</td>
</tr>
<tr>
<td>4</td>
<td>BME-695</td>
<td>CAD Lab-II</td>
<td>0 4 2 (2*2) 50</td>
<td>30 80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>0 15 260</td>
<td>-- 140</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grant Total</td>
<td>19 15 310</td>
<td>75 515 900</td>
</tr>
</tbody>
</table>

Period per week: 19+15=34
# V SEMESTER

## STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH

Name of the Branch (es) :- Refrigeration & Air Conditioning

Semester: **Fifth**

### THEORY COURSES:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./ wk.</th>
<th>Evaluation Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>BME-501</td>
<td>Industrial Engineering</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>BME-502</td>
<td>Hydraulics &amp; Pneumatics</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>BME-503</td>
<td>Applied Thermodynamics</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>BME-504</td>
<td>Refrigeration &amp; Air Conditioning</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>BME-505</td>
<td>Production Technology -III</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>20</td>
<td>0</td>
</tr>
</tbody>
</table>

### PRACTICAL COURSES:

| 1      | BME-591    | Workshop Practice -V          | 0 | 6 | 2    | 80          | --           | 40           | 120   |
| 2      | BME-593    | Refrigeration & Air Conditioning Lab-1 | 0 | 3 | 2    | 50          | --           | 30           | 80    |
| 3      | BME-594    | Project                       | 0 | 3 | 2    | 80          | --           | 40           | 120   |
| 4      | BME-595    | Hydraulics Lab                | 0 | 2 | 2    | 50          | --           | 30           | 80    |
|        |            | **Total**                     | 0 | 13| 260  | --          | 140          | **400**     |
|        |            | **Grant Total**               | 20| 13| 310  | 75          | 515          | **900**     |

Period per week: $20 + 13 = 33$

Annexure: I
Special BOS: 28.03.2019
### VI SEMESTER

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**

Name of the Branch (es): - Refrigeration & Air Conditioning

Semester: - Sixth

#### THEORY COURSES:

<table>
<thead>
<tr>
<th>S.No</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./ wk.</th>
<th>Evaluation Scheme</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>P</td>
<td>Hrs.</td>
</tr>
<tr>
<td>1</td>
<td>BME-601</td>
<td>Industrial Management &amp; Entrepreneurship Development</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>BME-602</td>
<td>Machine Design</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>BRA-601</td>
<td>Refrigeration air conditioning-II</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>BRA-602</td>
<td>Erection, servicing and maintenance</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>BCE-605 (a)</td>
<td>Environmental Science and Management</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>BME-605 (b)</td>
<td>Non-Conventional Energy Sources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BME-605 (c)</td>
<td>Total Quality Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>19</strong></td>
<td>0</td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

#### PRACTICAL COURSES:

<table>
<thead>
<tr>
<th>S.No</th>
<th>Course No.</th>
<th>Course Title</th>
<th>P</th>
<th>Hrs.</th>
<th>Days</th>
<th>Practical Hrs.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BRA-691</td>
<td>Refrigeration &amp; Air Conditioning Lab-II</td>
<td>0</td>
<td>6</td>
<td>2</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>BRA-692</td>
<td>Erection, Servicing &amp; Maintenance Lab</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>3</td>
<td>BME-694</td>
<td>Project</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>BME-695</td>
<td>CAD LAB-II</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>0</strong></td>
<td><strong>15</strong></td>
<td><strong>250</strong></td>
<td><strong>150</strong></td>
<td><strong>400</strong></td>
</tr>
</tbody>
</table>

Grant Total: 19 15 300 75 525 900

Period per week: 19+15=34
# I SEMESTER

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH

Name of the Branch (es): **Mechanical Engineering**

Semester: **First**

## THEORY COURSES:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./ wk.</th>
<th>Evaluation Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>BMA-101</td>
<td>Applied Maths-I</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>BPH-101</td>
<td>Applied Physics-I</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>BCH-101</td>
<td>Applied Chemistry-I</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>BEE-103</td>
<td>Electrical Engg.</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>BME-101</td>
<td>Production Engg-I</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>BME-102</td>
<td>Engg. Drawing-I</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>18</td>
<td>4</td>
</tr>
</tbody>
</table>

## PRACTICAL COURSES:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Hrs.</th>
<th>CourseWork</th>
<th>Mid Sem Exam</th>
<th>End Sem Exam</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BME-191</td>
<td>Workshop Practice-I</td>
<td>2</td>
<td>100</td>
<td>--</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>2</td>
<td>BPH-191</td>
<td>Applied Physics Lab-I</td>
<td>2</td>
<td>30</td>
<td>--</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>BCH-191</td>
<td>Applied Chemistry Lab-I</td>
<td>2</td>
<td>30</td>
<td>--</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>BEE-192</td>
<td>Electrical Engg Lab.</td>
<td>2</td>
<td>30</td>
<td>--</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>12</td>
<td>190</td>
<td>---</td>
<td>110</td>
<td>300</td>
</tr>
</tbody>
</table>

**Grant Total** 18 16 280 80 440 800

Period per week = 18+16= 34

**Note:** - **Definition**

**Course Work:** - Theory Courses: Assignment & Class Work
Lab Courses: Punctuality, Class Work Practical Report & Viva-Voce.

**End Sem. Exam:** - **Lab** Course: Viva-Voce & Practical Performance
II SEMESTER

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH

Name of the Branch(es): Mechanical Engineering

Semester: Second

THEORY COURSES:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./ wk.</th>
<th>Evaluation Scheme</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>P</td>
<td>Hrs.</td>
</tr>
<tr>
<td>1</td>
<td>BMA-201</td>
<td>Applied Maths-II</td>
<td>5</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>BPH-201</td>
<td>Applied Physics-II</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>BCH-201</td>
<td>Applied Chemistry-II</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>BEN-201</td>
<td>English Communications Skills</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>BME-201</td>
<td>Applied Mechanics</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>BME-202</td>
<td>Engg. Drawing -II</td>
<td>2</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>19</td>
<td>4</td>
<td>90</td>
</tr>
</tbody>
</table>

PRACTICAL COURSES:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Duration of end</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>sem. exam</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>BME-291</td>
<td>Workshop Practice -II</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>BPH-291</td>
<td>Applied Physics Lab-II</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>BCH-291</td>
<td>Applied Chemistry Lab-II</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>BME-292</td>
<td>Applied Mechanics Lab</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grant Total</td>
<td>19</td>
<td>16</td>
</tr>
</tbody>
</table>

Period per week: 19 + 16 = 35

Annexure: I
Special BOS: 28.03.2019
### III SEMESTER

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**

Name of the Branch (es): **Mechanical Engineering**

Semester: **Third**

#### THEORY COURSES:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./ wk.</th>
<th>Evaluation Scheme</th>
<th>Duration of end sem. exam</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BMA-301</td>
<td>Applied Maths-III</td>
<td>4 0 2</td>
<td></td>
<td>10 15 75 100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BME-301</td>
<td>Metrology &amp; Quality Control</td>
<td>4 0 2</td>
<td></td>
<td>10 15 75 100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BME-302</td>
<td>Thermodynamics &amp; Heat Transfer</td>
<td>4 0 2</td>
<td></td>
<td>10 15 75 100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BME-303</td>
<td>Production Tech-II</td>
<td>4 0 2</td>
<td></td>
<td>10 15 75 100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BME-304</td>
<td>Machine Drawing-I</td>
<td>2 4 2</td>
<td></td>
<td>50 15 35 100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BCE-306</td>
<td>Environmental Studies</td>
<td>2 0 2</td>
<td></td>
<td>5 10 35 50</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td><strong>16 4</strong></td>
<td></td>
<td><strong>95 85 370 550</strong></td>
<td></td>
</tr>
</tbody>
</table>

#### PRACTICAL COURSES:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Hrs.</th>
<th>Duration of exam</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BME-391</td>
<td>Workshop Practice-III</td>
<td>0 4 2</td>
<td></td>
<td>40 100</td>
</tr>
<tr>
<td>2</td>
<td>BME-392</td>
<td>Thermodynamics &amp; Heat</td>
<td>0 2 2</td>
<td></td>
<td>20 50</td>
</tr>
<tr>
<td>3</td>
<td>BME-393</td>
<td>Metrology Lab</td>
<td>0 4(2*2)</td>
<td></td>
<td>40 100</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td><strong>0 10</strong></td>
<td></td>
<td><strong>150 100 250</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Grant Total</strong></td>
<td><strong>20 14</strong></td>
<td></td>
<td><strong>245 85 470 800</strong></td>
</tr>
</tbody>
</table>

Period per week: 20+14=34
## IV SEMESTER

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**

**Name of the Branch (es):** Mechanical Engineering  
**Semester:** Fourth

### THEORY COURSES:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./ wk.</th>
<th>Evaluation Scheme</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>P</td>
<td>Hrs.</td>
</tr>
<tr>
<td>1</td>
<td>BME-401</td>
<td>Strength of Materials</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>BME-402</td>
<td>Materials Science</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>BME-403</td>
<td>Theory of Machines</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>BME-404</td>
<td>Machine Drawing-II</td>
<td>2</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>BEE-405</td>
<td>Industrial Electronics &amp; Instrumentation</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>17</td>
<td>4</td>
<td>90</td>
</tr>
</tbody>
</table>

### PRACTICAL COURSES:

|        |            |                                                  | L | P | Hrs. | Course Work | Mid Sem. Exam | End Sem. Exam | Total |
| 1      | BME-491    | Workshop Practice-IV                             | 0 | 4 | 2    | 80          | --          | 40 | 120 |
| 2      | BME-492    | CAD Lab-I                                        | 0 | 2 | 2    | 40          | --          | 20 | 60  |
| 3      | BME-493    | Strength of Materials Lab                         | 0 | 2 | 2    | 40          | --          | 20 | 60  |
| 4      | BEE-495    | Electronics Lab.                                 | 0 | 2 | 2    | 40          | --          | 20 | 60  |
|        |            | **Total**                                         | 0 | 10 | 200  | --          | 100         | 300 |
|        |            | **Grant Total**                                   | 17 | 14 | 290  | 75          | 435         | 800 |

Period per week: 17+14=31

Annexure: I  
Special BOS: 28.03.2019
### V SEMESTER

#### STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH

**Name of the Branch (es):** Mechanical Engineering  
**Semester:** Fifth

#### THEORY COURSES:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./ wk.</th>
<th>Evaluation Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>BME-501</td>
<td>Industrial Engineering</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>BME-502</td>
<td>Hydraulics &amp; Pneumatics</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>BME-503</td>
<td>Applied Thermodynamics</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td><strong>ELECTIVE</strong></td>
<td></td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>BME-504</td>
<td>Refrigeration &amp; Air Conditioning</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>BPE-504</td>
<td>Automation &amp; CAM</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>BPT-504</td>
<td>Plastic Tech.-I</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>BME-505</td>
<td>Production Technology -III</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td>20</td>
<td>0</td>
</tr>
</tbody>
</table>

#### PRACTICAL COURSES:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>P</th>
<th>Hrs.</th>
<th>Mid</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BME-591</td>
<td>Workshop Practice -V</td>
<td>6</td>
<td>2</td>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>BME-592</td>
<td>CAD Lab-II</td>
<td>2</td>
<td>2</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>BME-593</td>
<td>Applied Thermodynamics Lab</td>
<td>2</td>
<td>2</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>BME-594</td>
<td>Project</td>
<td>3</td>
<td>2</td>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td>13</td>
<td>260</td>
<td></td>
<td>140</td>
</tr>
<tr>
<td></td>
<td><strong>Grant Total</strong></td>
<td></td>
<td>13</td>
<td>310</td>
<td>75</td>
<td>515</td>
</tr>
</tbody>
</table>

**Period per week:** 20+13=33

Annexure: I  
Special BOS: 28.03.2019
**VI SEMESTER**

**STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH**

Name of the Branch (es): - **Mechanical Engineering**

Semester: - **Sixth**

**THEORY COURSES:**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./wk.</th>
<th>Evaluation Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>BME-601</td>
<td>Industrial Management &amp; Entrepreneurship Development</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>BME-602</td>
<td>Machine Design</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>BME-603</td>
<td>Automobile Engineering</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>BPE-603</td>
<td>Manufacturing Technology</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>BPT-603</td>
<td>Plastic Tech.-II</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>BME-604</td>
<td>Machine Tools &amp; Maintenance</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>BME-605</td>
<td>Non-Conventional Energy Sources</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>BPE-605</td>
<td>Tool Design</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>BPT-605</td>
<td>Plastic Product &amp; Mould</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Total 19 0 50 75 375 500

**PRACTICAL COURSES:**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./wk.</th>
<th>Evaluation Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>BME-691</td>
<td>Workshop Practice-VI</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>BME-692</td>
<td>Automobile Lab</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>BPE-692</td>
<td>Tool Engg. Lab</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>BPT-692</td>
<td>Polymer Testing &amp; Processing Lab</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>BME-693</td>
<td>Hydraulics &amp; Pneumatics Lab</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>BME-694</td>
<td>Project</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Grant Total</td>
<td>19</td>
<td>15</td>
<td>310</td>
</tr>
</tbody>
</table>

Period per week: 19+15=34

Annexure: I
Special BOS: 28.03.2019
### Minor Amendments in Ordinances (Academic) in Chapter XXXVII (D) Relating to Diploma in Engineering Courses

<table>
<thead>
<tr>
<th>Clause No.</th>
<th>Existing Ordinance</th>
<th>Deleted</th>
<th>Added</th>
<th>Proposed Ordinance</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.2</td>
<td>The maximum duration of the program shall be ten (10) semester after admission.</td>
<td></td>
<td>consecutive and duration of end semester examination.</td>
<td>The maximum duration of the program shall be ten (10) consecutive semester after admission.</td>
</tr>
<tr>
<td>6.3 (a)</td>
<td>The curriculum of each branch shall contain a list of courses having a course number, course title, number of contact periods, maximum marks assigned to various component of evaluation.</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil (c)***</td>
</tr>
<tr>
<td>10.4</td>
<td>(a) Nil (b) Nil Nil</td>
<td></td>
<td></td>
<td>Nil (c)***</td>
</tr>
<tr>
<td>12</td>
<td>(i) Supplementary examination shall be held only for those who have cleared all the theory as well as practical courses up to fourth semester and have no more than four courses of theory and practical's combined to clear fifth and sixth semester. (ii) Supplementary examination shall be held only after the final semester (sixth semester).</td>
<td>Nil</td>
<td>(One paper of I/II/III/IV semester plus Three papers of V/VI semester or Four papers of V/VI semester) Diploma Engineering</td>
<td>(i) Supplementary examination shall be held only for those who have no more than four courses of theory and practical combined (One paper of I/II/III/IV semester plus Three papers of V/VI semester or Four papers of V/VI semester) to clear Diploma Engineering.</td>
</tr>
<tr>
<td>15</td>
<td>(a) Nil (b) Nil Nil Nil Nil Nil Nil</td>
<td></td>
<td>Nil (g) Candidate who obtains 75% or more marks in the subject of final semester shall be marked</td>
<td>(i) Supplementary examination shall be held only after the final semester (sixth semester).</td>
</tr>
<tr>
<td></td>
<td>(c) Nil (d) Nil Nil Nil Nil Nil (g)</td>
<td></td>
<td></td>
<td>(a) Nil (b) Nil Nil Nil Nil (g) Candidate who obtains 75% or more marks in the subject of final semester shall be marked</td>
</tr>
</tbody>
</table>
### (c)***

- The students of Diploma in Engineering will have to undergo 04 (Four) weeks summer internship training comprising of industrial hands on experience for fulfilling AICTE requirement at the end of 4th Semester.

- The Committee/TPO, University Polytechnic will issue the list of students who have completed the training and each student would be required to submit a brief report with the certificate of completion of training by the respective industry.

- The evaluation will be done and grades would be awarded as per AICTE norms and marked in the marks sheet of Final Semester.

- It was recommended that the internship training will be introduced from the academic session 2019-20. However, the training would be introduced on experimental basis from the current academic session 2018-19.
Department | Course No. | Course Title | Course Designation | Course Type | Contact Hours
---|---|---|---|---|---
MES, University Polytechnic | BME-101 | Production Engineering-I | Compulsory | Theory | 4 - -

**Course Assessment Method**
1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

**Course Objective**
1. To provide with the students’ fundamental knowledge of the basic operations performed in production shops, like pattern making, moulding, sand casting, forging, smithy, fitting & assembly and basic forming & shaping processes.
2. To familiarize the student with the use of various tools and equipment used in the production shop.
3. To impart knowledge of the various materials & instruments used in the above mentioned production shops.

**Course Outcomes**
On successful completion of the course, students will have the fundamental understanding of the subject and will have the following abilities:
1. Recognize various kinds of timber and the tools used for woodworking in a carpentry shop.
2. Understand the seasoning methods and identify the various defects occurring in timber.
3. Understand the constituents of various types of moulding sands and their uses for mould making.
4. Understand the sand casting process and identify the tools and equipment used in moulding shop.
5. Understanding of hot and cold working processes, and basic forging operations like: upsetting, swaging, bending etc.
6. Knowledge of the forging tools, equipment and safety measures to be observed in a forging shop.
8. Understanding the working of sheet metal processes like; rolling, extrusion, drawing etc.
9. Knowledge of various fitting tools like; chisels, files, hammers, taps, pliers and measuring instruments used in fitting like; dial gauges, radius gauges, surface plates and tri-squares etc.

**UNIT | Topics Covered | Marks**
---|---|---
I | Carpentry & Pattern Making | 15
   - Carpentry tools, Types of Joints, Types of patterns, Materials used for patterns and allowances, Color coding etc.
II | Moulding | 20
III | Smith Forging | 20
   - Introduction, application, forging tools, forging operations, drawing upsetting, swaging, bending etc. Forging defects, their causes and remedies, safety precautions, forgeable materials, advantage and disadvantage of hot working over cold working.
   - Forming and Shaping: introduction, Sheet metal tools and equipment, Cold working processes, shearing, drawing, extrusion, rolling, Advantage & limitation of Sheet metal working; introduction to sheet metal joints, General Principle of Sheet Metal press working, deep drawing of sheets, sheet metal spinning.
IV | Fitting | 20
   - Introduction, Classification of Fitter’s tools, Files, chisels, hammers, hacksaw, drills, taps, dies, die stock, wrenches, pliers, spanners, screw drivers and keys, Surface plate, try square combination set, dial gauge, fillet and radius gauge. Marking methods.

**Text Book and/or Reference Material**

**Additional Learning Source**
1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
3. You tube Videos on related topics :https://www.youtube.com/
Department | Course No. | Course Title | Course Designation | Course Type | Contact Hours |
--- | --- | --- | --- | --- | --- |
MES, University Polytechnic | BME-102 | Engineering Drawing-I | Compulsory | Theory | 2 - 4 |

Course Assessment Method
1. Course Work: 50 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 35 Marks, 02 Hour

Course Objective
1. To provide to the students' fundamental knowledge of engineering drawing, instruments, sheet sizes, different types of scales.
2. To familiarize the student with the geometric construction like parabola, hyperbola, ellipse etc.
3. To impart knowledge of cycloid, epicycloids and hypocycloid.

Course Outcomes
On successful completion of the course, students will have the fundamental understanding of the subject and will have the following abilities:
1. Understanding the technical drawing, drawing instruments, sheet size, layout of standard sheets, different types of lines as per BIS specification and printing of letters.
2. Dimensioning of over all sizes, circles, threaded holes, tapered surface, holes equally spaced on PCD, counter sink hole, counter bore, cylindrical parts, parallel and aligned systems of dimensioning.
3. Understanding the Need & importance of scale, representative fraction, calculation of R.F. for a given scale, types of scales, construction of plane, diagonal and chord scales.
4. Understanding of dividing of line and angle, drawing perpendicular and parallel lines tangent & normal.
5. Construction of plane figure, construction of ellipse by different methods i.e. intersecting arc, concentric circle, rectangle/oblong and directrix focus methods.
6. Construction of involutes of different shapes like polygon and circle etc.
7. Construction of parabola and hyperbola by directrix and rectangle method.
8. Construction of helix on cylinder, Archimedean spiral, cycloid, epicycloids and hypocycloid.

UNIT | Topics Covered | Marks |
--- | --- | --- |
I | Introduction to technical drawing, drawing instruments, size and layout of standard sheets, different types of lines as per BIS specification. Printing of letters, single stroke straight/capital and italic/inclined lettering, free hand lettering (alphabet, numerals and roman) lower case and upper case, single stroke vertical and inclined at 75 degrees in different standard series of 2.5,5,7,10 and 15 mm height, double stroke lettering of 35 mm height in the ratio of 7:4. Necessity of dimensioning, terms and notation, methods and principles, dimensioning of small components, dimensioning of over all sizes, circles, threaded holes, chamfered surface, tapered surface, holes equally spaced on PCD, counter sunk hole, counter bore, cylindrical parts, narrow space and gaps, radii, curve and arches, chain and parallel dimensioning. | 5 |
II | Need & importance of scale, definition of representative fraction, find RF of a given scale, types of scales, construction of plane, diagonal and chords scales. | 10 |
III | Dividing of line and angle, drawing perpendicular and parallel lines tangent & normal and construction of plane figure, construction of ellipse by different methods i.e. intersecting arc, concentric circle, rectangle/oblong and directrix focus and involutes of different shapes i.e. polygon and circle | 10 |
IV | Construction of parabola and hyperbola by directrix and rectangle method, helix on cylinder, Archimedean spiral, cycloid, epicycloids and hypocycloid. Free hand sketching of simple machine parts. Single and double line plan of single story building of two rooms set showing position of doors, windows, ventilation with electric wiring using symbols. | 10 |

Text Book and/or Reference Material
3. Engineering Drawing: By P.S. Gill

Additional Learning Source
1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
3. Teacher concern study materials at www.amu.ac.in
**Course Assessment Method**
1. Course Work: 100 Marks
2. End Semester Exam: 50 Marks, 02 Hour

**Course Objective**
1. Students able to understand different tool & equipment for work shop practice.
2. Students acquire skills for the preparation of different Carpentry/Fitting/Smithy/Moulding.
3. Students able to understand the safety precaution in the workshop.
4. Student acquires skills of Application orientated tasks.

**Course Outcomes**
Upon completion of this course, students will acquire knowledge about:
- To acquire skills in basic engineering practice.
- To identify the hand tools and instruments.
- To acquire measuring skills.
- To acquire practical skills in the trades.
- To provides the knowledge of job materials in various shops.
- To provides the knowledge of core technical subjects for making and working of any type of project.
- Students will be able to analyze the material on the basis of their properties and thus assigning different weight age to their use for technical purposes.
- Learn how to analyze products and be able to improve their manufacturability and make the cost effectively.
- The students will be able to assess the working conditions of any machining process and thus calculating the actual forces involved.

**Topics Covered**

**FITTING SHOP:**
- Safety Precautions to be served in the shop.
- Introduction to fitting, common materials used in fitting shop, identification of materials.
- Description and demonstration of various types of fitting tools.
- Filing a dimensional rectangular/square pieces from a mild flat steel flat.
- Introduction to various tools for chipping and hack sawing.
- Demonstration of chipping and hack sawing operations.

Making a cut out from a square rectangular piece-using hacksaw.

**CARPENTARY SHOP:**
- Safety Precautions to be served in the shop.
- Introduction to various types of wood by demonstration and their identification. Demonstration, function and use of commonly used hand tools.
- Marking, sawing and planning practice.
- Extensive planning practice and chiseling practice.

Preparation of a half lap joint

**SMITHY SHOP:**
- Safety Precautions to be served in the shop.
- Demonstration and detailed explanation of tools and equipment used.
- Forging operations, bending operations, drawing out and preparation, tools used.

Exercises on
- Description and specification of blowers, anvils, swage blocks and hammers
- Demonstration and description of tongs, fullers, swages
- Upsetting at ends only.
- Forging a square headed bolt.
- To forge a L-hook
- To forge square on one/both ends of a circular rod.
- Forge welding, defects in forging and inspection
- To forge a ring (by forge welding) out of a round MS bar.

**Note:** Any three jobs to be completed in one semester

**MOULDING SHOP:**
- Safety Precautions to be served in the shop.
- Introduction of foundry, tool and equipment used in foundry shop, sands used for moulding
- Basic idea of mould and various types of moulding processes
- Demo station of various types of patters and their uses.

Exercises
- Preparation of a simple mould
- Introduction gating and reserving systems and related tool

Exercises
- Making moulds for different types of pattern complete with gating and risering
- Demonstration of melting furnace

**Text Book and/or Reference Material**

**Additional Learning Source**
Department | Course No. | Course Title | Course Designation | Course Type | Contact Hours
--- | --- | --- | --- | --- | ---
MES, University Polytechnic | BME-201 | Applied Mechanics | Compulsory | Theory | 4 - -

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

**Course Objective**

The main course objectives of engineering mechanics are to give:

1. Fundamental of applied mechanics and practical utility.
2. Understand the need of vectorial representation of forces and moments and basics of system of force.
3. Describe static equilibrium of particles and rigid bodies both in one and two dimensions’ system and analytical and graphically approaches related to resultant of system of forces.
4. Describe the effect of Friction on general plane motion.

**Course Outcomes**

On successful completion of the course students will be able to:

1. Understand of the laws and principles of mechanics.
2. Understand the concept of resolution of force components and foundation to moments and its applications.
3. Knowledge of drawing free body diagrams of different engineering problems and determine the resultant of forces and moments.
4. The ability to analyze and solve simple problems related to statically determinate planar frames by using different methods.
5. Understand the foundation of static and kinetic friction and its engineering applications.

**UNIT** | **Topics Covered** | **Marks**
--- | --- | ---
II | System of Forces: Concept of coplanar and non-coplanar forces including parallel forces, concurrent and non-concurrent forces, resultant force, equilibrium of forces, laws of parallelogram of forces, law of triangle of forces and its converse. Law of polygon of forces, solution of simple engineering problems by analytical and graphical methods, Determination of resultant of any number of forces in one plane acting upon a particle, condition of equilibrium of coplanar concurrent forces system. | 20
III | Moment and Couple: Concept of Varignon’s theorem. Generalized theorem of moments, application to simple problems—compound lever, steel yard, beams and wheels, lever safety valve. Moment of couple; properties of a couple; simple applied problems-such as pulley and shaft. Statement of force law of equilibrium, moment law of equilibrium, application of above on rigid body. Definition of statically determinate and indeterminate trusses, Calculation of reaction at the support of trusses graphically/Analytically (Method of joint/ method of section), simple problems. | 20
IV | Friction: Types of friction: static, limiting and dynamic friction, laws of friction, coefficient of friction, angle of friction; problems on equilibrium of a body resting on a rough inclined plane, simple problems on friction, conditions of sliding and toppling. | 20

**Text Book and/or Reference Material**


**Additional Learning Source**

1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
3. Teacher concern study materials at www.amu.ac.in
## Course Assessment Method

1. Course Work: 50 Marks  
2. Mid Semester Exam: 15 Marks, 01 Hour  
3. End Semester Exam: 35 Marks, 02 Hour

## Course Objective

Technical drawing is the language of engineering. The objective of this course is to learn initially the basic principles involved in the projection of points, lines, lamina and solids. As well this course is focused towards the interpenetration of solids, development of surfaces and isometric drawings. It is expected that a student should learn this subject in a very systematic way to develop the skill to express effectively his idea about an object to others through drawings.

## Course Outcomes

On successful completion of the course, students will have the fundamental understanding of the subject and will have the following abilities:
1. Understanding the technical drawing, drawing instruments, sheet size, layout of standard sheets, different types of lines as per BIS specification and printing of letters.
2. Dimensioning of over all sizes, circles, threaded holes, tapered surface, holes equally spaced on PCD, counter sink hole, counter bore, cylindrical parts, parallel and aligned systems of dimensioning.
3. Understanding the Need & importance of scale, representative fraction, calculation of R.F. for a given scale, types of scales, construction of plane, diagonal and chord scales.
4. Understanding of dividing of line and angle, drawing perpendicular and parallel lines tangent & normal.
5. Construction of plane figure, construction of ellipse by different methods i.e. intersecting arc, concentric circle, rectangle/oblong and directrix focus methods.
6. Construction of involutes of different shapes like polygon and circle etc.
7. Construction of parabola and hyperbola by directrix and rectangle method.
8. Construction of helix on cylinder, Archimedean spiral, cycloid, epicycloids and hypocycloid.

## UNIT

<table>
<thead>
<tr>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Principle of orthographic projection, projection of points situated in different quadrants, projection of lines inclined to one plane and parallel to the other and vice versa, projection of planes perpendicular to either of planes</td>
<td>5</td>
</tr>
<tr>
<td>II Projection of solids, such as prism, cube, cylinder and cones with axis perpendicular to horizontal plane or parallel to horizontal plane/vertical plane or both, orthographic views of the given objects</td>
<td>10</td>
</tr>
<tr>
<td>III Need for sectional views, section of solids, cutting plane method of representing sections, drawing of full section, half section, true shape of sections, drawing of different conventions for materials in section, conventional breaks for shafts, pipes, rectangular, square, angle channel etc.</td>
<td>10</td>
</tr>
<tr>
<td>IV Drawing of different development of surfaces, Orthographic and section of machine parts such as V-Book, Glands, wall brackets, keys, pins and cotter Intersection of surfaces, interpenetration of two cylinders. Fundamentals of isometric projection, isometric views from the given orthographic views &amp; oblique drawing of simple objects using of isometric scale.</td>
<td>10</td>
</tr>
</tbody>
</table>

## Text Book and/or Reference Material

3. Engineering Drawing: By P.S. Gill

## Additional Learning Source

1. Nptel Lectures: https://nptel.ac.in/courses/  
2. IIT Video Lectures: www.nptelvideos.in/  
3. Teacher concern study materials at www.amu.ac.in
## Diploma in Mechanical Engineering

### Special BOS 28-3-2019

#### Annexure III- A

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-291</td>
<td>Workshop Practice-II</td>
<td>Compulsory</td>
<td>Practical</td>
<td>-</td>
</tr>
</tbody>
</table>

### Course Assessment Method

1. Course Work: 100 Marks
2. End Semester Exam: 50 Marks, 02 Hour

### Course Objective

1. To identify tools, work material and measuring instruments useful for fitting, welding, carpentry and plumbing practice.
2. To handle tools and instruments and use them to prepare joints of specific shape and size.

### Course Outcomes

1. To select suitable tools and equipment to prepare joints using bench-work tools
2. To produce joints using materials of specific shape and size by a suitable set of operations and check the accuracy of shape and dimensions using.

### Topics Covered

**FITTING SHOP:**
- Different types of blades, uses of blades, methods of fittings of blades.
- Description and demonstration of various types of drills, tap, and dies.
- Selection of dies for tapping and dyeing operations
- Production of a utility job involving all the above operations.

**CARPENTARY SHOP:**
- Care and maintenance of tools, safety measures to be observed.
- Introduction to carpentry joints, their relative advantages and uses
- Preparation of Mortise and Tenon joint/ dovetail and glued joint / Mitre joint

**PAINTING SHOP:**
- Safety Precautions to be served in the shop.
  - Exercise on
  - Preparation of surface.
  - Application of primer coat.
  - Polishing on wood items.
  - Painting on wood items.
  - Painting steel items.
  - Painting the jobs by brush.

**SHEET METAL SHOP:**
- Safety Precautions to be served in the shop
  - Exercise on
  - Introduction & Demonstration of tools and operation in sheet metal shop
  - Cutting, shearing and bending of sheet.
  - To prepare a soap case by the metal sheet.
  - To make a funnel with thin sheet and to solder the seam of the same.
  - To make a cylinder and to solder the same.
  - Preparation of different type of joints such as Lap joint-single seam, double seam. Hemp and wired joints.

Note: Any two jobs to be completed in one semester

### Text Book and/or Reference Material


### Additional Learning Source

1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
3. Teacher concern study materials at www.amu.ac.in
## Diploma in Mechanical Engineering

### Course: Applied Mechanics Lab

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-292</td>
<td>Applied Mechanics Lab</td>
<td>Compulsory</td>
<td>Practical</td>
<td>-</td>
</tr>
</tbody>
</table>

### Course Assessment Method
1. Course Work: 30 Marks
2. End Semester Exam: 20 Marks, 02 Hour

### Course Objective
- To give students practice in applying their knowledge of mathematics, science, and engineering and to expand this knowledge into the vast area of Applied Mechanics.
- To enhance students’ ability to design by requiring the solution of open ended problems.
- To prepare the students for higher level courses such as courses in Mechanics of Solids, Mechanical Design and Structural Analysis.

### Course Outcomes
- Understand basic quantities and idealizations of mechanics and SI system of units;
- Understand Newton's laws of motion;
- Define pressure, stress, moment, torque, work;
- Understand the concept of friction and analyze the equilibrium under frictional forces;
- Express force and position in vector form and determine magnitude and direction of two dimensional vectors;
- Analyze & solve rigid body equilibrium problems;
- Determine the centroid of an area and the second moments of area of simple shapes.

### Topics Covered
**Practical Exercises on the following.**
1. To verify the law polygon of forces.
2. To verify the law of parallelogram and triangle of forces.
3. To verify the law of principle of moments.
4. To find the reaction at supports of a simply supported beam carrying point loads only.
5. To find the forces in the jib & tie of a jib crane.
6. To find the forces in the members of a loaded roof truss. (King /Queen post truss).
7. To find out centre of gravity of regular lamina.
8. To find out centre of gravity of irregular lamina.
9. To find the mechanical advantage, velocity ratio and efficiency of any three of the following machines.
   - Simple wheel & axle.
   - Differential wheel & axle.
   - Differential pulley block.
   - Simple Screw jack.
   - Simple Worm & worm wheel.
   - System of pulleys (any type)

*Note: Number of Experiments depends upon the availability of equipment and time.*

### Text Book and/or Reference Material

### Additional Learning Source
1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
3. Teacher concern study materials at www.amu.ac.in
Diploma in Mechanical Engineering

Course Assessment Method
1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

Course Objective
1. Describe the evolution of quality standards and metrology
2. Describe key points and timelines for the evolution of the quality system as we know it today
3. Define what a quality system is and why it is utilized. Identify and provide the uses for various quality tools such as check sheets, pareto charts, flowchart, cause and effect diagrams, histogram, scatter diagram and control charts

Course Outcomes
1. Demonstrate different measurement techniques.
2. Reproduce the fundamental knowledge on metrology techniques.
3. Apply statistical process control and acceptance sampling procedures in a manufacturing environment to improve quality of processes / products.
4. Identify suitable metrological methods for measuring the components.
5. Explain the acceptance test for machines.
6. Outline the working of various optical measuring instruments.

UNIT | Topics Covered | Marks
--- | --- | ---
I | INTRODUCTION | 15
Meaning & Scope of Metrology. Units and Standards of Measurement. Meaning of Precision, Accuracy, range, sensitivity, and readability, Criteria for selection of instruments, interchange ability, Basic concept of Limits, fits & Tolerance; Classification of Fits: clearance fit, transition fit, & interference fit, GO & NOT-GO gauges; Brief description of snap, Plug & ring gauges; Taylor’s principle of Gauge Design.

II | MEASUREMENT | 20
Classification of measuring instruments, Linear Measurement, Slip Gauges; Surface Plate; Comparators: mechanical, electrical, & Optical (Description of any one of each type).
Introduction to Interferometry: Principle of interference and its use in measurements. Angle Measurement; Instruments Used for angle measurement; Bevel Protractor; Since Bar, Sine-Centre, Auto-Collimator. Measurement of Straightness, Square-ness, & Parallelism (By any one method).

III | SCREW THREAD MEASUREMENT | 20
Introduction, Measurement of Minor & Major diameter, Flank angle, measurement of external threads only by any one method, Instruments used for above.

IV | QUALITY CONTROL | 20
Introduction, types of inspection, Statistical Quality Control (SQC), Control Charts (Control charts for attributes, & control charts for variables), applications of control charts, Sample Inspection, Single & double sampling plans.

Text Book and/or Reference Material
6. Precision Measurements: By A.W. Judge

Additional Learning Source
**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

**Course Objective**

To present a comprehensive and rigorous treatment of thermodynamics while retaining an engineering perspective. To lay the groundwork for subsequent studies in such fields as fluid mechanics, heat transfer, ref. & A/C and to prepare the students to effectively use thermodynamics in the practice of engineering. To develop an intuitive understanding of thermodynamics by emphasizing the physics and physical arguments. To present a wealth of real world examples to give students a feel for how thermodynamics is applied in engineering practice.

**Course Outcomes**

1. Apply the various laws of Thermodynamics to various processes in the thermodynamics and real systems.
2. Apply the concept of Entropy, Enthalpy and Internal Energy.
3. Calculate heat, work and other thermodynamics Properties.
4. Have knowledge of steam generators, steam formation, steam conditions and to estimate the steam properties.
5. Have scientific concepts of temperature, heat and heat transfer through various modes.
6. Handle the H-C fuels, their combustion process and to estimate the stoichiometric air required.

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
</table>

**Text Book and/or Reference Material**


**Additional Learning Source**

1. [https://nptel.ac.in/downloads/112108148/#](https://nptel.ac.in/downloads/112108148/#)
2. [https://swayam.gov.in/course/3808-engineering-thermodynamics](https://swayam.gov.in/course/3808-engineering-thermodynamics)
## Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

## Course Objective

On successful completion of the course, students will have the fundamental understanding of the subject and will have the following abilities:

1. Understanding of machine tools, cutting tools, cooling fluids and materials used.
2. Recognize various angles of a single point cutting tool and understand their significance.
3. Identify the types of chips formed during machining and tool wears and tool life.
4. Understand the working principle of lathe machines and the use of various parts of lathe like the bed, headstock, tailstock and carriage etc.
5. Knowledge of various lathe operations like simple turning, taper turning, facing and thread cutting etc.
6. Knowledge of various types of drilling machines, drilling tools and drilling operations.
7. Understanding of various types of boring machines, tools and boring operations.
8. Understand the working and constructional details of Shaper, planer, slotter machines and machining time calculations.

## Course Outcomes

### UNIT

<table>
<thead>
<tr>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION Introduction Features of Machine Tool, Elements of Cutting Process, Geometry of single Point Cutting Tool, Types of Chips, Wear of tools and tool life. Concept of Machinability, Cutting tool materials, Cutting fluids: Introduction, function, types and application.</td>
<td>15</td>
</tr>
<tr>
<td>LAMHE</td>
<td></td>
</tr>
<tr>
<td>BORING MACHINES Introduction, types of boring machines, description of horizontal boring machine, operations, tools, and attachment.</td>
<td></td>
</tr>
<tr>
<td>SHAPER, PLANER AND SLOTTER Working principle of each machine, quick return mechanism of shaper, basic parts their description and functions, drive mechanism (hydraulic, mechanical), various tools, work holding devices, operations, speed, feed and machining time.</td>
<td>20</td>
</tr>
<tr>
<td>DRILLING MACHINES Introduction, Types of drilling machines, description of radial. Drilling machine, drilling tool, drill, reamer, operations performed on drilling machines.</td>
<td></td>
</tr>
<tr>
<td>WELDING Weld edge preparation, Introduction to various welding processes with procedure equipment and applications such as Gas welding, Electric arc welding, Resistance Welding-Spot welding, Flash butt, Thermit welding, Carbon arc welding, Metal-Inert-Gas welding (MIG), Tungsten inert gas welding (TIG), Atomic Hydrogen arc welding, Stud welding, Laser Beam, Electron Beam Welding, Explosion Welding, Ultrasonic Welding, under water welding, Submerged Arc welding, various types of electrodes used in various processes. Selection of electrode from catalogue, current and voltage setting from welder's hand book.</td>
<td>20</td>
</tr>
<tr>
<td>TESTING OF WELDS (a) Destructive methods. (b) Non-destructive methods-visual, X-ray, Gamma-ray, Magnetic particles, flaw detection, fluorescent, dye penetration and ultrasonic testing.</td>
<td></td>
</tr>
</tbody>
</table>

### Text Book and/or Reference Material

3. Mfg. Engg & Technology: By Kalpakjian
5. Welding Technology: By O.P.Khanna

### Additional Learning Source

1. Nptel Lectures: [https://nptel.ac.in/courses/](https://nptel.ac.in/courses/)
2. IIT Video Lectures: [www.nptelvideos.in/](http://www.nptelvideos.in/)
3. You tube Videos on related topics: [https://www.youtube.com/](https://www.youtube.com/)
Course Assessment Method
1. Course Work: 50 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 35 Marks, 02 Hour

Course Objective
1. Provide the fundamental concepts of machine drawing elaborating on how to concretize the idea of new structures such as a machine element.
2. Study the conventions and rules to be followed by engineers for making accurate drawings.
3. Understand the basic dimensioning practices that have to be followed in the preparation of drawings.
4. Help the student in the visualization of assembly and sub assembly of various machine elements.
5. Train the students in the preparation of assembly drawings

Course Outcomes
At the end of the course, students are able to:
1. Helping the student in drafting their technical ideas
2. Creating knowledge about the various practices with regard to the dimensioning, sectioning and development of views.
3. Understanding the importance of the linking functional and visualization aspects in the preparation of the part drawings
4. Preparation of the part or assembly drawings as per the conventions.

UNIT | Topics Covered | Marks
--- | --- | ---
I | Planning of drawing sheet, selection of scale on the drawing sheet. | 5
| Conventional symbols used in machine drawing. | |
| Sectioning: Different types of sectioning. | |
| Pipe Fittings: Different types of pipe fitting and symbols. | |
II | Forms of Screw Threads: Screw thread nomenclature, Forms of threads, Right hand and left-hand threads. | 10
| Nuts and Bolts: Different assembled views of hexagonal and square headed nuts And bolts, Types of Studs and Nuts. | |
| Set Screws: Sketches of different forms set-screws. | |
| Locking Devices: Sketches of various types of locking devices like Castle nut, locking by split pin, swan Nut, locking plate, screws, etc. | |
| Rivet heads: Types of structural and general purpose rivet heads | |
| Riveted Joints: Lap, butt, single riveted, double riveted, single cover, double cover | |
III | Detail and Assembly Drawing: Drawing exercise on the following Pipe Joints: (two sheets) | 20
| • Socket & Spigot Joints. | |
| • Flanged Joint. | |
| Keys, Cotter Pin Joints: | |
| • Socket & spigot joints | |
| • Knuckle Joint | |
| Couplings: | |
| • Box or Muff Coupling and Split muff coupling | |
| • Protective type flange coupling | |

Text Book and/or Reference Material
• Machine Drawing by N.D Bhatt.
• Machine Drawing by R. K. Dhawan (S. Chand Publishers)
• Machine Drawing by Narayana, Kannaiah. (Willey Publications)

Additional Learning Source
https://ocw.mit.edu/courses/mechanical-engineering/2-007-design-and-manufacturing-i-spring-2009/related-resources/drawing_and_sketching/
Diploma in Mechanical Engineering
Special BOS 28-3-2019
Annexure III- A

Department | Course No. | Course Title | Course Designation | Course Type | Contact Hours | L | T | P
---|---|---|---|---|---|---|---|---
MES, University Polytechnic | BME-391 | Workshop Practice-III | Compulsory | Practical | - | - | 4

Course Assessment Method
1. Course Work: 60 Marks
2. End Semester Exam: 40 Marks, 02 Hour

Course Objective
Upon completion of this course, students will acquire knowledge about:
- To acquire skills in basic engineering practice.
- To identify the hand tools and instruments.
- To acquire measuring skills.
- To acquire practical skills in the trades.
- To provide the knowledge of job materials in various shops.
- To provide the knowledge of core technical subjects for making and working of any type of project.
- Students will be able to analyze the material on the basis of their properties and thus assigning different weight age to their use for technical purposes.
- Understand modern manufacturing operations, including their capabilities, limitations, and how to design economically.
- Gain insight into how designers influence manufacturing schedule and cost, and cost of different components.
- Learn how to analyze products and be able to improve their manufacturability and make the cost effectively.
- The students will be able to assess the working conditions of any machining process and thus calculating the actual forces involved.

Course Outcomes
1. Perform plain turning, step turning, knurling, eccentric turning, chamfering and facing operations on lathe.
2. Prepare setup and fabricate composite job using milling, shaping and drilling machine.
4. Prepare sand casting setup using split pattern for simple component.
5. Perform joining of two plate using TIG/MIG welding.
6. Demonstrate cutting of a sheet metal using flame cutting.
7. Students are familiar to make the assembly by using different fitting tools and operations.

Topics Covered
PATTERN MAKING
- Demonstration and study of Tools &equipment.
- Study of Pattern allowances and Materials
- Preparation of single piece pattern.
- Preparation of two-piece pattern.

MACHINE SHOP
- Safety Precautions in machine shop.
- Study of lathe & shaper.
- Grinding of single point cutting tool.
- Exercise on plane turning/step turning and facing.
- Shaping and sizing of CI block on shaper.

WELDING SHOP
- Safely precautions in welding.
- Study of welding equipment.
- Study welding joints.
- Practice of arc welding.
- Preparation of edges and welding a lap pint by arch welding.

FITTING SHOP
- Study of measuring tools.
- Preparation of an assembly of Male, Female mating parts.

Text Book and/or Reference Material
3. Mfg. Engg & Technology: By Kalpakjian

Additional Learning Source
Course Assessment Method

1. Course Work: 30 Marks
2. End Semester Exam: 20 Marks, 02 Hour

Course Objective

1. Learn to classify different types of internal combustion engines and their applications.
2. Apply principles of thermodynamics, fluid mechanics, and heat transfer to the design and analysis of engines and engine components.
3. Become aware of the relevance of environmental and social issues on the design process of internal combustion engines.

Course Outcomes

1. Differentiate the internal combustion engines based on the classification parameters.
2. Analyze the internal combustion engine cycles and performance parameters.
3. Explain the combustion characteristics of internal combustion engines and identify the abnormalities in combustion.
4. Identify the exhaust pollutants.
5. Illustrate the measuring instruments appropriately while working on internal combustion engines.

Topics Covered

Practical Exercises on the following
1. Nestlé Boiler / Different Model of Boilers.
2. Study on Diesel Engines
3. Study on Petrol Engines
4. Thermal conductivity of Metal Rod.
5. Thermal conductivity by composite wall apparatus.
6. Heat Exchanger (Parallel& Counter flow)

Text Book and/or Reference Material


Additional Learning Source
### Course Assessment Method

1. **Course Work:** 60 Marks
2. **End Semester Exam:** 40 Marks, 02 Hour

### Course Objective

1. Identify the uncertainties in dimensional metrology and define the measurement standards; describe the fundamentals of dimensional and geometrical tolerances;
2. Measure length and angles using line-graduated instruments, i.e. vernier callipers, micrometers, bevel protractor, sine bar and surface plates;
3. Use comparative length-measuring instruments, i.e. dial indicator, to measure variations in the distance between two or more surfaces;

### Course Outcomes

On successful completion of the course, the student will be able to,

1. Illustrate on different metrological tools and perform measurements in quality impulsion.
2. Describe and explain the working of precision instruments.
3. Outline electronic comparator, optical flat, surface roughness, gear thickness measuring instruments.
4. Demonstrate the statistical quality control chart.
5. Distinguish with the different instruments that are available for linear, angular, roundness and roughness measurements.
6. Locate appropriate measuring instrument according to a specific requirement.

### Topics Covered

**Practical Exercises on the following**

To perform practical exercises on the following:

1. Measurement of diameter of the given job with the help of Vernier caliper.
2. Measurement of required height of different shapes of the given job with the help of Vernier height gauge.
3. Measurement of required outside & inside diameter of the given job with the help of outside micrometer & inside micrometer.
4. Measurement of required inside diameter of the given job with the help of Bore micrometer and to check the circular shape of the hole i.e. ovality check.
5. Measurement of depth of a hole cavity in the given job with the help of depth gauge and depths micrometer.
6. Measurement of the required angle of the given job with the help of Bevel protector.
7. Measurement of the internal diameter of a hole in the given job at the various section with the help of Bore Gauge and check the ovality and taper effect.
8. Measurement of the included angle of given taper plug gauges with the help of sine bar:
   - Taper plug gauge of small-included angle.
   - Taper plug gauge of large included angle.
9. Measurement of angle of taper and diameters at both ends of a taper plug gauge using rollers and micrometer.
10. Measurement of included angle and diameter of taper ring gauge at both ends with balls, depth gauge and height gauge.
11. Measurement of the effective diameter of a thread by:
    (a) Screw thread micrometer.
    (b) Three wire method.
12. Study of flatness of slip gauges and micrometer anvil faces using optical flat.
13. Study of mechanical comparator and determine that the given pieces are within specified limits of tolerances.
14. Study of tool marker’s microscope and to measure the following:
    (a) Pitch of a thread.
    (b) Angle of thread.
15. Measurement of gear tooth thickness (Chordal thickness).
16. Study of gear tooth form by constant chord method.
17. Measurement and study of surface finish of given pieces and to assess it by the method of comparison/surface roughness tester.

### Text Book and/or Reference Material


### Additional Learning Source
### Diploma in Mechanical Engineering

**Diploma in Mechanical Engineering**

**Special BOS 28-3-2019**

**Annexure III- A**

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-401</td>
<td>Strength of Materials</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4 - -</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

**Course Objective**

- To familiarize the student with the basic concepts pertaining to mechanical properties and behaviour of engineering materials under the application of external loads.
- To create awareness among students about various pressure vessels and axial load bearing members like columns and struts.

**Course Outcomes**

After taking this course, the student should be able to

- Calculate stresses in various load conditions. Also, the students develop better understanding about various mechanical properties of the materials.
- Calculate shear force, bending moment, moment of inertia and bending stresses at different sections of the beams.
- Understand the concept pertaining to different types of loads, strain energy and torsion in shafts.
- Know different types of axial load bearing members like columns and struts along with different types of pressure vessels.

**UNIT | Topics Covered | Marks**

<table>
<thead>
<tr>
<th>I</th>
<th>Stress Strain and Mechanical Properties of Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Concept of Stress and strains. Definition of tension, compression, shear, bending, torsion, volumetric strain and lateral strain, poisons ratio. Definitions and detail analysis of stress strain curves for mild steel, cast Iron and rubber.</td>
</tr>
<tr>
<td></td>
<td>Properties of materials; ductility, brittleness, tenacity, toughness, hardness. Determination of stresses and elongation of bars and columns subjected to direct external load only, equivalent modulus and stresses in compound bars. Temperature stresses in compound bars. Simple problems</td>
</tr>
<tr>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>II</th>
<th>Shear Force and Bending Moment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shear force and bending moment diagrams and relations for concentrated and uniformly distributed loads on simply supported beams, cantilever and overhanging beams.</td>
</tr>
<tr>
<td></td>
<td>Theory of simple Bending; Examples of components subjected to simple bending such as beam, axle, carriage spring etc. Assumptions made in the theory of simple bending, derivation of bending formula. Moment of Inertia, Definitions; neutral axis, section modulus, Bending stresses at different layers from neutral axis for various beam sections.</td>
</tr>
<tr>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>III</th>
<th>Strain Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Definitions/ concept of strain energy, resilience, proof resilience, modulus of resilience, impact/ shock load.</td>
</tr>
<tr>
<td></td>
<td>Stress energy in a material subjected to un-axial tension and uniform shear stresses.</td>
</tr>
<tr>
<td></td>
<td>Torsion; Strength of solid and hollow circular shafts, torsion equation, polar modulus of section, Advantage of hollow shaft over solid shaft for same strength.</td>
</tr>
<tr>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IV</th>
<th>Columns and Struts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Definitions of long and short columns, slenderness ratio, equivalent length, critical load, collapsing load, end conditions of columns. Application of Euler’s and Rankine’s formula with simple problems (no derivation).</td>
</tr>
<tr>
<td></td>
<td>Thin Cylindrical and spherical shells</td>
</tr>
<tr>
<td></td>
<td>Difference between thick and thin shells, cylindrical and spherical shell, thin spherical shells subjected to internal pressure, longitudinal stresses, circumferential or hoop stresses, and volumetric strains</td>
</tr>
<tr>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

**Text Book and/or Reference Material**

1. SOM by R.K. Rajput, S. Chand Publications

**Additional Learning Source**

### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

### Course Objective

1. Discussed the relationship between the properties, structure and processes of engineering materials.
2. Study the fundamentals of selecting materials based on engineering design criteria.
3. Study the Basic concepts behind the chemistry and mechanical properties of metals, non-metals, and their applications.
4. Study the codes and standards, to analyze and interpret the material data related to development of new materials using heat treatment processes.

### Course Outcomes

1. Student should be able to Conceptually explain the classification schemes that are used to categorize engineering materials.
2. Student should be able to explain the differences in the mechanical behavior of engineering materials based upon bond type, structure, composition, and processing.
3. Student should be able to understand the basic properties, applications of metals, Non- metals, Ferrous and Non-ferrous metals.
4. Student should be able to analyze and interpret the heat treatment curves and other data required to understand the micro mechanics of material.

### Topics Covered

#### UNIT I: INTRODUCTION TO ENGINEERING MATERIALS.
- Classification: Metal and Non-metal, Ferrous and Non-ferrous metals, Alloys and Miscellaneous materials.
- Basic properties, examples and Application of materials. Plastics: - Thermostet and thermoplastic materials, Ceramics; Clay, Oxides, Carbides and Nitrides. Composites; Reinforcing fibbers and Matrix materials, Metal-Polymer, Ceramic-Polymer, Metal Ceramic, Polymer to polymer and Metal to Metal Composites (at least one example of each) Insulating Materials.
- Mechanical properties: Strength, Elasticity, Plasticity, toughness, stiffness, ductility, Malleability, brittleness, hardness fatigue and creep. Thermal conductivity and insulating properties.
- Electrical conductivity and insulating properties. Practical considerations for selection of material for industrial use. Relation of structure of metals to their properties. Basic idea of arrangement of atoms in metals. Types of crystal structure, crystal lattice.
- Formation of grains: Dendritic solidification of metals, grain and grain boundary, effect of grain size on properties of metals.

#### UNIT II: FERROUS METALS AND ALLOYS
- Classification of ferrous metals. Flow diagrams for the manufacture of ferrous metals (Pig Iron, wrought iron, Cast iron and steel) from their ores. Steels: Definition and classification of steels. Composition, Properties and uses of plain carbon steels. Effects of alloying elements (such as Al, Cr, Ni, V, W, Mo, Si, Mn, S and P, and Cu) on the properties of steels. Alloy steels: Definition and classification of alloy steels, composition properties and uses of HSS stainless steels, heat resistant steels and spring steels.

#### UNIT III: NON- FERROUS METALS AND ALLOYS

#### UNIT IV: HEAT TREATMENT

### Text Book and/or Reference Material

3. Material Science: By K.M. Gupta

### Additional Learning Source

**Diploma in Mechanical Engineering**

**Special BOS 28-3-2019**

**Annexure III- A**

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-402</td>
<td>Materials Science</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4</td>
</tr>
</tbody>
</table>

**Course Work: 10 Marks**

**Course Type**

**Marks**

**Topics Covered**

**Text Book and/or Reference Material**

3. Material Science: By K.M. Gupta

**Additional Learning Source**

**Mechanical Engineering Section, University Polytechnic, AMU Aligarh, India**
Diploma in Mechanical Engineering
Special BOS 28-3-2019
Annexure III- A

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-403</td>
<td>Theory of Machines</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Course Assessment Method
1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

Course Objective
1. To impart basic knowledge on the actual mechanisms and their kinematic characteristics (displacement, velocity and acceleration) used in the analysis, design and development of machines and to study existing machines for better understanding.
2. To familiarize higher pairs and lower pairs.
3. To impart basic knowledge on power transmission by belt drive system.
4. To impart basic knowledge on clutches, breaks, governors and dynamometers.
5. To impart basic knowledge on importance of flywheel and its analysis.
6. To impart basic knowledge on lubrication and bearings.
7. To impart basic knowledge on gear drive system.

Course Outcomes
1. The students will be able to select appropriate combination of mechanism to analyze and design new machines and to study existing machines for improvements.
2. The students will have the basic knowledge on terminology of flywheel and to design a flywheel.
3. The students will have the basic knowledge to select a governor for any engine or turbine and to design the governor.
4. The students will have the basic knowledge to select a clutch for any system and to design the clutch.
5. The students will have the basic knowledge to select a braking device for any system and to design the braking system.
6. The students will have the basic knowledge to select a lubrication system for any mechanical machine / system and to design the lubrication system.
7. The students will have the basic knowledge to select a bearing for any mechanical machine / system and to design the bearing.

UNIT | Topics Covered | Marks
--- | --- | ---
I | SIMPLE MECHANISMS | 15
Simple Mechanism: Introduction: Definition of theory of Machines, Kinetics, Kinematics, Dynamics, Links, Kinematic pairs, lower and higher pairs, Kinematic Chains, Constrained motion, Mechanisms, Inversions of mechanism (four bar mechanism, single slider crank mechanism and double slider crank mechanism). |

II | CLUTCHES, BRAKES AND DYNAMOMETER | 20
Friction: Definition and its necessity.
Clutches: Introduction Single Plate clutch-its construction and working Equation of maximum torque (uniform wear and uniform pressure), Multiple pate clutch-its construction and working, Equation of torque (Derivation), single problems on above types. Description of Centrifugal clutch.
Dynamometer: Description and types, Description of Pony brake dynamometer and Rope dynamometer. |

III | POWER TRANSMISSION DEVICES | 20
Belt Drives: Flat and V-belt drive, Types of flat belt drives, Velocity ratio, Slip of belts, Length of Belts, Ratio of tension power transmitted condition for maximum power transmission simple problems on above topics.
Gear trains: Simple and Compound gear trains, velocity ratio, train value.
FLYWHEEL
Flywheel: Definition, its purpose and need, Coefficient of fluctuation of speed, Energy stored in a flywheel (with derivation), Simple problems. |

IV | GOVERNOR | 20
Definition and its function, Description, working, simple problems on watt, porter and Hartnell Governor. Terms related to governor-stability, sensitiveness, isochronism and hunting, Differentiation between Flywheel and Governor.
LUBRICATION AND BEARINGS
Lubrication: Types of Lubrications, Details of Hydrodynamic, Boundary and Hydrostatic lubrications. Lubricating oils, Greases and their characteristics.
Bearing: Function and Classification, Journal bearing, Various terms used, bearing characteristics, bearing friction and Bearing modulus.
Rolling Contact bearing- types, Bearing life, rating life, Basic load rating, Advantages and disadvantages |

Text Book and/or Reference Material
2. R. S. Khurmi, J. K. Gupta
5. Theory of Machine, Dr. Jagdish Lal

Additional Learning Source
2. https://nptel.ac.in/courses/112106137/38
**Department** | **Course No.** | **Course Title** | **Course Designation** | **Course Type** | **Contact Hours**
--- | --- | --- | --- | --- | ---
MES, University Polytechnic | BME-404 | Machine Drawing-II | Compulsory | Theory | L: 2, T: -4

**Course Assessment Method**
1. Course Work: 50 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 35 Marks, 02 Hour

**Course Objective**
- To develop the technical skills necessary to generate an engineering drawing and an engineering assembly with geometric dimensioning and tolerances
- To introduce the elements of engineering communications; including a graphical representation of machines and its elements

**Course Outcomes**

After taking this course, the student should be able to
- Develop skills to draw profiles and displacement diagrams of different types of Cams and Followers.
- Develop skills to draw a gear profile using different methods.
- Improve skills to visualize, communicate ideas and information of engineering components through machine drawing.

**UNIT** | **Topics Covered** | **Marks**
--- | --- | ---
I | **CAM PROFILE** (Three Sheets)
  Cam profiles of the following cases:
  Profile of a disc cam with knife-edge follower and their displacement diagram
  Profile of the cam for Roller Follower
  Profile of the cam for offset Roller follower and its displacement diagram | 20
II | **GEAR PROFILE** (Three Sheets)
  Gear profiles of the following cases:
  Involute gear profile of a spur gear by the approximate method of construction.
  Involute gear profile of a spur gear using Base circle method of construction
  Rack & Pinion | 20
III | **Details and Assembly Drawing:** Practical exercises on drawing from details to the assembly of the following: (Nine sheets)
  Engine Parts
  Boiler Mountings
  Bearing
  Stop Valve
  Lathe Machine Parts
  Screw Jack | 60

**Text Book and/or Reference Material**
- Machine Drawing by R.K. Dhawan (S. Chand Publishers)
- Machine Drawing by Narayana, Kannaiah. (Willey Publications)

**Additional Learning Source**
https://ocw.mit.edu/courses/mechanical-engineering/2-007-design-and-manufacturing-i-spring-2009/related-resources/drawing_and_sketching/
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-491</td>
<td>Workshop Practice-IV</td>
<td>Compulsory</td>
<td>Practical</td>
<td>- - 4</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

**Course Objective**

Upon completion of this course, students will acquire knowledge about:

- To acquire skills in basic engineering practice.
- To identify the hand tools and instruments.
- To acquire measuring skills.
- To acquire practical skills in the trades.
- To provide the knowledge of job materials in various shops.
- To provide the knowledge of core technical subjects for making and working of any type of project.
- Students will be able to analyze the material on the basis of their properties and thus assigning different weight age to their use for technical purposes.
- Understand modern manufacturing operations, including their capabilities, limitations, and how to design economically.
- Gain insight into how designers influence manufacturing schedule and cost, and cost of different components.
- Learn how to analyze products and be able to improve their manufacturability and make the cost effectively.
- The students will be able to assess the working conditions of any machining process and thus calculating the actual forces involved.

**Course Outcomes**

1. Perform plain turning, step turning, knurling, eccentric turning, chamfering and facing operations on lathe.
2. Prepare setup and fabricate composite job using milling, shaping and drilling machine.
4. Prepare sand casting setup using split pattern for simple component.
5. Perform joining of two plate using TIG/MIG welding.
6. Demonstrate cutting of a sheet metal using flame cutting.
7. Students are familiar to make the assembly by using different fitting tools and operations.

**Topics Covered**

**PATTERN MAKING**

- Demonstration and study of wood working machines
- Preparation of two piece split pattern.
- Preparation of self-core pattern.

**MACHINE SHOP**

- Study of slotter and radial drilling machine.
- Exercise on taper turning/thread cutting/knurling/ drilling.
- Preparation of V-Block on shaper.
- Cutting of a key way by slotter.

**WELDING SHOP**

- Study of resistance welding equipment.
- Preparation of edges for butt and T joint & corner joint.
- Preparation of butt joint and corner joints.
- Demonstration of spot welding, flash butt welding.

**FITTING SHOP**

- Study and demonstration of tap and dies.
- Making internal and external thread by tapping and dying.
- Preparation of a utility job involving various operations.

**Text Book and/or Reference Material**

3. Mfg. Engg & Technology: By Kalpakjian

**Additional Learning Source**
Course Assessment Method

1. Course Work: 40 Marks
2. End Semester Exam: 20 Marks, 02 Hour

Course Objective

This module is dedicated to graphics and includes CAD. This course is aimed at to make the student understand dimensioned projections, learn how to create two-dimensional images of objects using first and third angle orthographic projection as well as isometric, perspective and auxiliary projection, to interpret the meaning and intent of tolerance dimensions and geometric tolerance symbolism and to create and edit drawings using drafting software of CAD.

Course Outcomes

1. Creatively comprehend geometrical details of common engineering objects.
3. Interpret the meaning and intent of tolerance dimensions and geometric tolerance symbolism;
4. Create the engineering drawings for simple engineering objects using CAD
5. manage screen menus and commands using CAD
6. Operate data entry modes and define drawings geometrically in terms of Cartesian, polar and relative coordinates in CAD
7. Create and edit drawings making selections of objects, discriminating by layering and using entities,

Topics Covered

1. Management of screen menus commands
2. Introduction to drawing entities
3. Co-ordinate systems: Cartesian, polar and relative coordinates
4. Drawing limits, units of measurement and scale
5. Layering: organizing and maintaining the integrity of drawings
6. Design of prototype drawings as templates.
7. Editing/modifying drawing entities: selection of objects, object snap modes, editing commands,
8. Dimensioning: use of annotations, dimension types, properties and placement, adding text to drawing.

Text Book and/or Reference Material

Davies, B. L., Yarwood, A., Engineering Drawing and Computer Graphics, Van Nostrand Reinhold (UK), 1986

Additional Learning Source
### Department Course No. Course Title Course Designation Course Type Contact Hours
MES, University Polytechnic BME-493 Strength of Materials Lab Compulsory Practical - - 2

### Course Assessment Method
1. Course Work: 40 Marks
2. End Semester Exam: 20 Marks, 02 Hour

### Course Objective
1. To understand the procedure of doing different tests like hardness, compression, torsion, tension and impact etc. in various materials.
2. To impart knowledge about the testing of springs and beams and behavior of materials.

### Course Outcomes
On successful completion of the course, the student will be able to:
1. Describe the behavior of materials upon normal external loads.
2. Predict the behavior of the material under impact conditions.
3. Recognize the mechanical behavior of materials.

### Topics Covered
1. Tensile Test
2. Compression Test
3. Hardness Test
4. Impact Value Test
5. Bending Moment
6. Deflection of Beam
7. Simply Supported Beam
8. Fixed Beam
9. Three Hinge Arches
10. Portal Frame
11. Influence Line Diagrams

### Text Book and/or Reference Material
1. SOM by R.K. Rajput, S. Chand Publications

### Additional Learning Source
1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
3. Teacher concern study materials on www.amu.ac.in
Diploma in Mechanical Engineering

Course Assessment Method
1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

Course Objective
- To familiarize the student with the basic concepts of management applied to contemporary organizations.
- To create awareness among students about various facets of entrepreneurship as an alternative career option as well as to highlight the merits of pursuing such an option.

Course Outcomes
After taking this course, the student should be able to
- Develop knowledge of scientific management. Distinguish and appreciate different industrial ownership.
- Cultivate knowledge of money management. Set up technically and financially sound decisions by comparing and analyzing alternatives on cost, depreciation, incentives, wages, etc.
- Define and apply the techniques and skills necessary for human resource management in contemporary organizations.
- Understand the traits, role, and significance of an entrepreneur. Gain sufficient knowledge to plan an enterprise and able to write a project report.

UNIT | Topics Covered | Marks |
--- | --- | --- |
I | INDUSTRIAL MANAGEMENT: Introduction to industrial management, Management of men material and machines, Scientific management and its principles, Functions of management, Structure of industrial organization, Types and applications. INDUSTRIAL OWNERSHIP: Introduction to Ownership and its types: Partnership organization, Joint Stock Company, Private Limited Companies, Public Limited Companies, Private sector and Public sector organization, Concept of the heavy, medium, small scale, cottage and village industries. | 15 |
II | FINANCIAL MANAGEMENT: Sources of finance, Elements of costs, Prime cost, Factory cost, Other overheads, Total cost, selling price and problems on them Depreciation, Classification and methods of providing depreciation, Problems. WAGES AND INCENTIVES: Job evaluation and merit ratings, Definition and objectives, Ranking and point rating methods, Introduction to wages, Types of wages, Introduction to incentives, Types of incentives, Problems based on Halsey and Rowan systems. | 20 |
III | HUMAN RESOURCE MANAGEMENT: Objectives of HRM, Staff development, Training strategies and methods. LABOUR AND INDUSTRIAL LAWS: Importance and necessity, Types of Labour laws and disputes, Brief description of the Acts such as Factories Act 1948, Workmen’s Compensation Act 1923, Minimum wage Act 1948, Employee’s provident fund Act 1952. ACCIDENTS: Introduction, Classification, Causes and Effects of accidents, Types of industrial hazards. | 20 |
IV | ENTREPRENEURSHIP DEVELOPMENT: Concept of entrepreneurship, Characteristics of entrepreneur, Role of Entrepreneur, Role of entrepreneurs in Economic Development; Entrepreneurship in India, Entrepreneurship – its Barriers, Preparation of project report, Steps of planning a small to medium enterprises. (SMEs). MOTIVATION AND LEADERSHIP: Definition of motivation, Methods for improving motivation, Definition of leadership, Functions of leadership, Manager as a leader. | 20 |

Text Book and/or Reference Material
- Industrial Engineering and Production Management by Mart and Telsang (S. Chand Pub.)
- Industrial Engineering and Management by D. Ravi Shankar (Galgotia Pub.)
- Industrial Engineering and Production Management by M. Mahajan (Dhanpat Rai Pub.)
- Industrial Engineering by N.J. Manek (Laxmi Pub.)
- Industrial Engineering and Management by O.P. Khanna (Dhanpat Rai Pub.)

Additional Learning Source
1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
Department: MES, University Polytechnic  
Course No.: BME-502  
Course Title: Hydraulics & Pneumatics  
Course Designation: Compulsory  
Course Type: Theory  
Contact Hours: L4 T - P -  

Course Assessment Method
1. Course Work: 10 Marks  
2. Mid Semester Exam: 15 Marks, 01 Hour  
3. End Semester Exam: 75 Marks, 02 Hour

Course Objective
1) To develop a concept of fluid and an understanding of fluid motion.  
2) Development of principles of fluid statics and their applications  
3) Development of principles of manometry and their applications  
4) To provide knowledge of kinematic aspects of fluid motion.  
5) To provide basic knowledge of incompressible flow in circular pipes.  
6) Impart knowledge of basic principles of operation of various types of Hydraulic machines (Turbines and Pumps).  
7) Providing knowledge of classification of Hydraulic machines on the basis of (i) principle of operation (ii) type of flow and (iii) their intended usage.  
8) Providing basic knowledge of Pneumatic systems and their different types of components.

Course Outcomes
1) Understand and apply basic fluid properties and fluid statics, differentiates about different type of manometer and calculate the pressure at various sections and levels.  
2) Analyze fluid kinematics and perform calculations in 1 D fluid flow.  
3) Understand about type of orifice, Losses in the pipe and discuss about Hydraulic Ram system. Surge tank.  
4) Define basic principles of operation of different types of Pumps, Turbines along with their classification and pneumatic systems and their applications.

UNIT | Topics Covered | Marks |
--- | --- | --- |
I | Introduction: Fluid, types of fluids, Difference between fluid mechanics and hydraulics. Properties of Fluid: Mass density, weight density (specific weight), specific volume, specific gravity, viscosity, kinematic & dynamic viscosity, surface tension, and their units. Intensity of pressure, pressure head, center of pressure, total pressure on horizontal & vertical flat surfaces (without proof) and simple problems on them. Pressure Measurement: Pressure (Atmospheric, Gauge, Absolute, Vacuum), Pascal’s law and its paradox. Pressure Measuring Devices: Piezometric tube, simple manometer, differential manometer, inverted differential manometer, simple problems on them. | 15 |
II | Flow of fluids: Types of fluid flow, steady & unsteady, uniform & non-uniform, laminar & turbulent flows, rate of flow & its units, continuity equation for 1-D steady flow, Reynolds no & Its significance, Energy of liquid in motion total energy, velocity head, pressure head, potential head, Bernoulli’s theorem (Statement & proof), its applications & assumptions, discharge measurement with the help of venturimeter, problem on the same. | 20 |
III | Flow through Orifices: Types of orifices, hydraulic coefficients, relationship between Cc, Cv & Cd, Vena-contracts. Flow through Pipes: Minor & major losses, loss of head in pipes due to sudden enlargement, sudden contraction, obstruction in flow path and pipe fitting (without proof), problems, water hammering in pipes & surge tanks. | 20 |
IV | Hydraulic Machines: Concept of hydraulic pumps, construction and working of centrifugal pumps and reciprocating pumps, Selection of pumps. Concept of hydraulic Turbines- Classification, construction & description of main components of Pelton, Francis & Kaplan Turbines. Description and application of hydraulic ram, hydraulic accumulator and hydraulic press. Pneumatic System: Basic elements of pneumatic system and their functions such as- Air Compressor (Types & selection), generation of compressed air, Air-filters, Pressure regulators and Lubricators, their necessity in pneumatic circuits, Application of Pneumatics, Characteristic / features of pneumatic system. Pneumatic valves, pneumatic actuators (Brief idea only), pneumatic system safety, cleanliness and preventive maintenance. | 20 |

Text Book and/or Reference Material
7. Hydraulic & Hydraulic Machines by Bansal.  

Additional Learning Source
1. Teacher concern study material at [www.amu.ac.in](http://www.amu.ac.in)  
2. Web links to e-learning nptel like ([https://nptel.ac.in/courses/112105171/](https://nptel.ac.in/courses/112105171/))
### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

### Course Objective

1. This course aims to provide a good platform to mechanical engineering students to understand, model and appreciate concept of dynamics involved in thermal energy transformation.
2. To integrate the concepts, laws and methodologies from the basic course in thermodynamics into analysis of cyclic processes.
3. To apply the thermodynamic concepts into various applications like air compressor, IC engine, gas turbine, steam nozzles, turbines and condensers.

### Course Outcomes

1. Apply the thermodynamic laws in engineering applications.
2. Explain the process of gas and vapor power cycles and solve problems.
3. Explain the functions of steam nozzles, turbines and condensers.
4. Explain the operation of a single stage and multistage air compressors.
5. Explain the functioning and features of IC engine. Calculate performance parameters of IC engines.
6. To instill upon to envisage appropriate experiments related to heat engines.
7. Explain the flow in gas turbines and solve problems.

### UNIT Topics Covered

#### I Gas Power and Vapour Power Cycles
- Gas power cycles: Air standard efficiency, Description of Otto cycle, Diesel cycle and Dual combustion cycles.

#### II Steam Nozzles, Turbines and Condensers
- Steam nozzles: Introduction. Types of nozzles, velocity of steam at exit of the nozzle, mass of steam discharge through nozzle, condition of maximum discharge through a nozzle, maximum discharge through a nozzle. Problems

#### III Air Compressors

#### IV I.C. Engine and Gas Turbine

### Text Book and/or Reference Material


### Additional Learning Source

1. https://nptel.ac.in/courses/112106133/
**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

**Course Objective**

1. To provide fundamental knowledge of refrigeration and air conditioning.
2. To familiarize with different refrigeration cycles, properties and designation of refrigerants.
3. To impart knowledge of Psychrometry and its applications in air conditioning.
4. To introduce HVAC systems and perform air conditioning load calculations.

**Course Outcomes**

On successful completion of the course, students will have a broad and fundamental understanding of the subject and will have the following abilities:

1. Understand the basic principles and applications of refrigeration systems.
2. Fully understand the working principles of different refrigeration cycles.
3. Understand the properties, uses and designation of refrigerants.
4. Perform calculations for vapour compression refrigeration systems.
5. Analyze the air conditioning processes using principles of Psychrometry.
6. Evaluate cooling and heating loads in an air conditioning system.
7. Ability to compute heating / cooling loads under actual conditions.

**UNIT**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Refrigeration Cycles: Principles of refrigeration, unit of refrigeration, various methods of refrigeration. Air refrigeration systems – Reversed Carnot and Bell Coleman cycles. Vapour compression refrigeration system and analysis of its cycle. Effects of sub cooling and superheating, Vapour absorption refrigeration system.</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td>Refrigeration Components and Refrigerants: Refrigeration components and controls such as Compressor, Condenser, Evaporator and Throttling valve and Thermostat. Introduction to refrigerants and their desirable properties, primary and secondary refrigerants. Nomenclature of refrigerants. Important properties of some common refrigerants such as R-11, R-22, R-502, R-134a and NH3.</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td>Load Calculations, HVAC and Air-distribution Systems. Air conditioning load calculations; Cooling and heating load calculations. Description of various types of loads – sensible and latent heat loads, sensible heat factor, Apparatus dew point. HVAC classification of air conditioning systems. Air distribution systems; Simple description of filters, dampers, fans, blowers, air resistors (Grilles).</td>
<td>20</td>
</tr>
</tbody>
</table>

**Text Book and/or Reference Material**


**Additional Learning Source**

1. Nptel Lectures https://nptel.ac.in/courses/
2. IIT Video Lectures www.nptelvideos.in/
3. You tube Videos on related topics. https://www.youtube.com/
### Course Details

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BPE-504</td>
<td>Automation &amp; CAM</td>
<td>Elective I (B)</td>
<td>Theory</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Course Assessment Method
1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

#### Course Objective
1. To introduce the basic automation, CNC machine and part programing
2. To introduce the basic concepts, parts of robots and types of robots
3. To make the students familiar with the various drive systems for robot, sensors and their applications in robots, programming of robots
4. To discuss about the various applications of robots, justification, implementation and safety of robot.

#### Course Outcomes
1. On successful completion of the course, the student will be able to,
2. Automation, part programming of CNC machines.
3. Classify and characterize the robots based on the configuration and work volume
4. Explain and solve the problems related to robot design and control.
5. Illustrate the working of the transmission system in a robot.
6. Discuss the concept of vision system and image processing.
7. Write programs for automatic functioning of a robot.
8. Design a working model of a robot using the concepts and principles learnt.

### Topics Covered

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>AUTOMATION&lt;br&gt;Introduction to Automation; Reasons for Automating; Automation Principles and strategies; Automation Migration Strategy; Levels of Automation; Types of Automated Manufacturing Systems.</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td>NUMERICAL CONTROL&lt;br&gt;Introduction to Numerical control of Machines; Computerized Numerical Control (CNC) and Direct Numerical Control (DNC); Advantages and Disadvantages of CNC Machines; Parts suitable for CNC Machines; Basic Components of Numerical Control System; Classification of Numerical Control Machines.</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td>NUMERICAL CONTROL PART PROGRAMMING&lt;br&gt;Manual Part Programming and Computer Aided Part Programming; Advantages of Computer Aided Part Programming over Manual Part Programming.&lt;br&gt;CNC MACHINES&lt;br&gt;Construction details of CNC Machines; Tooling for CNC Machines; Maintenance of CNC Machines.</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td>CAM and FMS: Concept of CAD, CAM, FMS, CIM, Computer Aided Process Planning (CAPP), JIT and Group Technology (GT), and their advantages.&lt;br&gt;ROBOTICS: Definition; Different Types of configuration; Basic robot motions; Degrees of freedom; Main parts of robot; Applications of Robots in different manufacturing processes, Advantages of robots.</td>
<td>20</td>
</tr>
</tbody>
</table>

#### Text Book and/or Reference Material
1. CNC Machines by M. Adithan.
2. Production Automation and CIM by Groover.

#### Additional Learning Source
1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
3. Teacher concern study materials at www.amu.ac.in
Department | Course No. | Course Title | Course Designation | Course Type | Contact Hours |
--- | --- | --- | --- | --- | --- |
MES, University Polytechnic | BPT-504 | Plastic Tech.-I | Elective I (C) | Theory | 4 - - |

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

**Course Objective**

To provide an updated curriculum in plastic technology to the students with the following objectives:

The objective of this course is to provide an integrated view of polymer chemistry, including the polymerization reaction, structure, properties and applications of various polymers.

**Course Outcomes**

On successful completion of the course, students will have a broad and fundamental understanding of the subject of plastic technology. The student will have the following abilities:

1. Understand the basic concept of polymer science.
2. Understand about synthesis, properties and applications of commodity plastic materials.
3. Understand about polymerization, structure, manufacturing, characteristic and applications of engineering plastic.
4. Understand the chemical reaction, properties and applications of high performance and thermo sets plastics.

**UNIT** | **Topics Covered** | **Marks**
--- | --- | ---
I | Polymer Science: Introduction to polymer materials, Concept of Monomer and Polymer, Classifications of polymers, Degree of polymerization, molecular weight, Glass Transition Temperature (Tg), Melting Point (Tm), Advantages of plastic materials over metals, Applications of plastic materials in various fields. | 15 |
II | Commodity Plastics: Polymerization, Properties and Applications: Polyethylene (PE), Polypropylene (PP), Polyvinyl chloride (PVC), Polystyrene (PS) Poly-methyl-metha-crylate (PMMA) | 20 |
III | Engineering Plastics: Polymerization, Properties and Applications Acrylonitrile Butadiene (ABS) Polyethylene terephthalate (PET), Polycarbonate (PC), Polyamides (Nylon) | 20 |
IV | Specialty Plastics: Polymerization, Properties and Applications Poly-sulphones (PSO), Polyether ether ketone (PEEK), Thermoplastic Polyurethane (TPU), Polytetrafluoroethylene (PTFE) Thermosets Plastics: Polymerization, Properties and Applications Phenol formaldehyde, Epoxy Resin, Unsaturated Polyester Resin. | 20 |

**Text Book and/or Reference Material**

3. Outlines Polymer Technology by R. Sinha
5. Brydson, J.A “ Plastics Material”

**Additional Learning Source**

1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
3. You tube Videos on related topics.: https://www.youtube.com/
### Diploma in Mechanical Engineering

**Course Title:** Production Technology-III  
**Course Code:** BME-505  
**Department:** MES, University Polytechnic

#### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

#### Course Objective

To impart basic knowledge and understanding about the primary manufacturing processes such as casting, joining, and forming and their relevance in current manufacturing industry.

1. To understand the working of machine tools such as lathe, shaper, planner, slotter, milling, hobbing, and grinding.
2. To know the basic concepts of NC and CNC machine tool programming and computer aided part programming.

#### Course Outcomes

On successful completion of the course, the student will be able to,

1. Explain the features and applications of lathe, milling, drilling and broaching machines.
2. Discuss features and applications of jigs and fixtures, capstan and turret lathes, broaching machine.
3. Write the programming to control and operate CNC machines.

#### UNIT

<table>
<thead>
<tr>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I</strong> GRINDING MACHINES</td>
<td>15</td>
</tr>
<tr>
<td>Introduction; Classification of Abrasives; Basic concept of Bond, Grit, Structure and Grade of Abrasives; Selection of grinding wheel; Trueing and Dressing of Grinding wheel; Specification of grinding wheels; Grinding Machines: Brief description of Cylindrical grinder, Centre-less grinder; Surface grinder, Tool and Cutter grinder.</td>
<td></td>
</tr>
<tr>
<td><strong>II</strong> JIGS AND FIXTURES: Introduction; Difference between a jig and a fixture; Important considerations in jig and fixture design; Main elements of jigs and fixtures. Clamping &amp; locating devices types of jigs. Brief idea of milling &amp; grinding fixture CAPSTAN AND TURRET LATHES</td>
<td>20</td>
</tr>
<tr>
<td>Introduction; Principal Parts of Capstan and Turret lathes; Differences between a Turret and a Capstan Lathe; Tool layout. BROACHING AND BROACHING MACHINES</td>
<td></td>
</tr>
<tr>
<td>Introduction; Classification of Broaches; Principle of Broaching; Methods of Broaching; Classification of Broaching machines; Broaching versus other machining operations; Applications of Broaching.</td>
<td></td>
</tr>
<tr>
<td><strong>III</strong> NUMERICAL CONTROL MACHINE TOOLS: Introduction; Elements of NC machine tool system; Brief description and classification of NC systems; Basic concept of manual and computer assisted part-programming. ROBOTS: Introduction; Main components of a robot; Applications of robot.</td>
<td>20</td>
</tr>
<tr>
<td><strong>IV</strong> UNCONVENTIONAL METHODS OF MACHINING Introduction; Classification of unconventional machining methods; Common unconventional machining methods; Brief description of Electro-Discharge machining (EDM) and Electro-Chemical machining. POWDER METALLURGY: Brief description; Applications, advantages and disadvantages of powder metallurgy.</td>
<td>20</td>
</tr>
</tbody>
</table>

#### Text Book and/or Reference Material

3. Mfg. Engg & Technology: By Kalpakjian
5. CNC machines: By M. Adithan

#### Additional Learning Source

1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
3. Teacher concern study materials at www.amu.ac.in
### Diploma in Mechanical Engineering

**Department**: MES, University Polytechnic

**Course No.**: BME-591

**Course Title**: Workshop Practice-V

**Course Designation**: Compulsory

**Course Type**: Practical

**Contact Hours**: 6

#### Course Assessment Method
1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

#### Course Objective
To impart hands-on practical exposure on manufacturing processes and equipment.

#### Course Outcomes

1. To apply some of the manufactures process directly in the industry for preparation of complicated jobs.
2. At the end of the lab learn preparation of various jobs using various manufacturing process.
3. The student will be trained to implement similar features in preparation of jobs can be extended to implement in the preparation of complicated jobs.

#### Topics Covered

**MACHINE SHOP**

- Demonstration and study of lathe and shaper.
  - Step turning, parallel Turning, Taper turning and Grooving.

**WELDING SHOP**

- Study of various Gas cutting and welding equipment: -Welding transformer, Generator/rectifier, Gas cylinder, Gas cutting machines, Cutting torches etc., various electrodes and filler metals and fluxes.
- TIG Welding practice of Non-Ferrous metals, like Copper, Brass and Aluminium.
- Practice of Gas cutting manually.
- Practice of MIG welding
- Practice of stud welding
- Practice of gas welding.
- Practice of Arc cutting.

Note: Any three jobs to be completed

**FOUNDRY SHOP**

- Making sands moulds of different forms with different types of pattern using: (i) Floor Moulding. (ii)Three Box (or more) Moulding.
- Making and setting of cores of different types.
- Casting practice of Nonferrous metals.

**CNC MACHINE TOOLS LAB**

- Study and sketch of CNC lathe and milling machine.
- Study of G codes and M codes.
- Part programming, for different operations.

Programme editing & simulation on CNC lathe and milling machine.

#### Text Book and/or Reference Material
3. CNC machines: By M. Adithan

#### Additional Learning Source
4. Nptel Lectures: https://nptel.ac.in/courses/
5. IIT Video Lectures: www.nptelvideos.in/
6. Teacher concern study materials at www.amu.ac.in
### Course Assessment Method

1. Course Work: 50 Marks  
2. End Semester Exam: 30 Marks, 02 Hour

### Course Objective

The general objectives of the course are to enable the students to:

1. Understand the basic fundamentals of computer aided design and manufacturing.  
2. To learn 2D & 3D transformations of the basic entities like line, circle, ellipse etc.  
3. To understand the different geometric modeling techniques like solid modeling, surface modeling, feature based modeling etc. and to visualize how the components look like before its manufacturing or fabrication.

### Course Outcomes

Upon completion of this course the student will be able to:

1. Describe basic structure of CAD workstation, Memory types, input/output devices and display devices and computer graphics.  
2. Acquire the knowledge of geometric modeling and Execute the steps required in CAD software for developing 2D and 3D models and perform transformations.

### Topics Covered

This course is aiming to provide hands on training in AutoCAD/CREO/Solid Edge/NX(Solid Edge/NX-Combined or Optionally Available)  

- **AUTOCAD: 2D Drawing, Isometric and 3D Drawing.**  
- **CREO: Sketcher, Part and Surface Modeling, Assembly and Sheet Metal Design, Drafting and Detailing.**  
- **SOLID EDGE: Sketcher, Part Modeling, Surface Modeling, Sheet Metal Design, Assembly, Drafting and Detailing.**  
- **NX: Sketcher, Part Modeling, Surface Modeling, Sheet Metal Design, Assembly, Drafting and Detailing.**

### Text Book and/or Reference Material

- Nptel Lectures: [https://nptel.ac.in/courses/](https://nptel.ac.in/courses/)  
- IIT Video Lectures: [www.nptelvideos.in/](http://www.nptelvideos.in/)

### Additional Learning Source

1. Nptel Lectures: [https://nptel.ac.in/courses/](https://nptel.ac.in/courses/)  
2. IIT Video Lectures: [www.nptelvideos.in/](http://www.nptelvideos.in/)  
3. Teacher concern study materials at [www.amu.ac.in](http://www.amu.ac.in)
Diploma in Mechanical Engineering

Course Assessment Method
1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

Course Objective
This course is designed to introduce a basic study of the phenomena of heat and mass transfer, to develop methodologies for solving a wide variety of practical engineering problems, and to provide useful information concerning the performance and design of particular systems and processes.

Course Outcomes
Upon successful completion of this course, the student will be able to:
1. Understand the basic laws of heat transfer.
2. Account for the consequence of heat transfer in thermal analyses of engineering systems.
3. Analyze problems involving steady state heat conduction in simple geometries.
5. Obtain numerical solutions for conduction and radiation heat transfer problems.
6. Understand the fundamentals of convective heat transfer process.
7. Evaluate heat transfer coefficients for natural convection.
8. Evaluate heat transfer coefficients for forced convection inside ducts.
9. Evaluate heat transfer coefficients for forced convection over exterior surfaces.
10. Analyze heat exchanger performance by using the method of log mean temperature difference.
12. Calculate radiation heat transfer between black body surfaces.
13. Calculate radiation heat exchange between gray body surfaces.

Topics Covered

Practical Exercises on the following
1. Ruston Diesel Engine / Harvest Diesel Engine.
2. Morse test on Petrol Engine.
4. Reciprocating Air Compressor
5. Mechanical Heat Pump
6. Refrigeration Tutor
7. Air Conditioning Tutor
8. Vapour Absorption System
9. Ice Plant Tutor

Text Book and/or Reference Material

Additional Learning Source
1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
3. Teacher concern study materials at www.amu.ac.in
Diploma in Mechanical Engineering
Special BOS 28-3-2019
Annexure III- A

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-594</td>
<td>Project</td>
<td>Compulsory</td>
<td>Practical</td>
<td>- - 3</td>
</tr>
</tbody>
</table>

Course Assessment Method

1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

Course Objective

The students shall be able to
i. Understand the method of applying engineering knowledge to solve specific problems.
ii. Apply engineering and management principles while executing the project.
iii. Demonstrate good verbal presentation and technical report writing skills.
iv. Identify and solve complex engineering problems using professionally prescribed standards.

Course Outcomes

After going through this course the students will be able to
1: Conceptualize, design and implement solutions for specific problems.
2: Communicate the solutions through presentations and technical reports.
3: Apply project and resource managements skills, professional ethics, societal concerns
4: Synthesize self-learning, sustainable solutions and demonstrate lifelong learning

Topics Covered

GUIDELINES
i. Project will have to be done by a group comprising of maximum ten students only in their area of interest.
ii. Each group has to select a contemporary topic that will use the technical knowledge of their program of specialization.
iii. Allocation of the guides preferably in accordance with the expertise of the faculty.
iv. The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the IV semester.
v. The number of projects that a faculty can guide would be limited to two groups.
vi. The project can be carried out on-campus or in an industry or an organization with prior approval from the Principal through Section Incharge.
vii. The project shall be finalized by the students before the start of the V semester and shall be completed and submitted at least one month before the last teaching day of the VI semester, date of which shall be notified in the academic calendar.
viii. The assessment of performance of students should be made at least twice in each semester i.e. V and VI and each internal assessment shall be for 80 marks. The student shall present the final project live as also using overheads project or power point presentation on LCD to the internal examiners as also the external examiner.
ix. The evaluation committee shall consist of faculty members constituted by the college which would comprise of at least three members comprising of the student’s guide, one internal examiner & one external examiner passed by Board of studies. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately to the controller of examinations in a sealed envelope.

Text Book and/or Reference Material

Additional Learning Source
### Diploma in Mechanical Engineering

#### Course Title: Industrial Management & Entrepreneur Development

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-601</td>
<td>Industrial Management &amp; Entrepreneur Development</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4 - -</td>
</tr>
</tbody>
</table>

### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

### Course Objective

1. To improve students’ understanding of Industrial engineering and management terminologies.
2. To understand the application of Industrial Engineering techniques for service & Manufacturing sectors.
3. To prepare students for their professional roles as Industrial engineers.

### Course Outcomes

1. Understanding of the basics of Industrial engineering and its components like productivity, plant location, plant layout and Material Handling.
2. Identifying the principles of Work Study and able to conduct motion study and time study.
3. Acquiring analytical skills and able to use the analytical tools used in project planning and control.
4. Gain knowledge to analyze cost/revenue data and carry out economic analysis for decision making.

#### UNIT Topics Covered Marks

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>Introduction to Industrial Engg.:</strong> Definition, Application and Industry Classification. <strong>Production and Productivity:</strong> Definition, Production system, its characteristics, Product Life Cycle, Factors influencing productivity and measurement of productivity. <strong>Plant Location:</strong> Introduction, Factors affecting plant location. <strong>Plant Layout:</strong> Definition, Types of layouts, advantages and disadvantages of different layouts. <strong>Material Handling:</strong> Introduction, Material handling equipment, their types, functions and selection.</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td><strong>Work Study</strong>&lt;br&gt;<strong>Method Study:</strong> Definition, objectives and need of method study, Role of method study in improving productivity, Procedure of conducting method study, Process charts and diagrams, Process chart symbols, (Flow process chart, Multi-activity chart, Right and Left-hand chart and flow diagram), Examples. Introduction to Therbligs. <strong>Time Study:</strong> Definition, Objectives and procedure of conducting time study, System of performance rating, various allowances, Calculation of standard time. <strong>Ergonomics:</strong> Definition, objectives and applications, Design of workplace layout, Man-Machine system, Role of work environment on human performance.</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td><strong>Planning and Control:</strong> An introduction to production, planning and control, its need and objectives, comparison between production planning and production control, Concept of Scheduling, Routing, Dispatching and Expediting, Techniques/methods of PPC like CPM and PERT, terminology related with CPM and PERT, Simple problems on them. <strong>Break Even Analysis:</strong> Introduction, Break-even chart, Break-even point, Margin of safety, Simple problems on them.</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td><strong>Forecasting:</strong> Introduction to sales forecasting, definition, types, applications, need and limitations. <strong>Inventory Control:</strong> Introduction, types, objectives, need, terminology used in inventory control, Economic Order Quantity (EOQ), Lot size of production for minimum cost, simple problems on EOQ.</td>
<td>20</td>
</tr>
</tbody>
</table>

### Text Book and/or Reference Material

1. Industrial Engineering and Management by D. Ravi Shankar (Galgotia Pub.)
2. Industrial Engineering and Production Management by M. Mahajan (Dhanpat Rai Pub.)
3. Industrial Engineering and Management by O.P. Khanna (Dhanpat Rai Pub.).
4. Industrial Management by H.S. Bawa
5. Industrial Management by Mittal

### Additional Learning Source

- Teacher concern study materials: [https://www.amu.ac.in/polyshowstudym.jsp?did=106&eid=10604](https://www.amu.ac.in/polyshowstudym.jsp?did=106&eid=10604)
Diploma in Mechanical Engineering
Special BOS 28-3-2019
Annexure III- A

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-602</td>
<td>Machine Design</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4 - -</td>
</tr>
</tbody>
</table>

**Course Assessment Method**
1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

**Course Objective**
1. To familiarize the various steps involved in the Design Process.
2. To understand the principles involved in evaluating the shape and dimensions of a component.
3. To satisfy functional and strength requirements.
4. To learn to use standard practices and standard data.
5. To learn to Codes and standards of machine components.

**Course Outcomes**
On successful completion of the course, the student will be able to,
1. Describe the design process, material selection, calculation of stresses and stress concentrations under variable loading.
2. Design the shafts under various types of loading.
3. Differentiate between rigid and flexible couplings.
4. Analyze the knuckle joint and Cotter joint.
5. Examine the riveted joints and welded joints for vessels and steel structures.
Summarize the knowledge in helical and leaf spring.

**UNIT** | **Topics Covered** | **Marks**
--- | --- | ---
I | INTRODUCTION Design: Definition, type of designs, necessary of design Design procedure. Practical Examples related with design procedure. Characteristics of a good designer. Design terminology: Stress, strain, factor of safety, factors affecting factor of safety, stress concentration, methods to reduce stress concentration, fatigue, endurance limit. General design considerations, codes and standards. Selection of materials | 15 |
II | DESIGN OF SHAFT Design of shaft: Types of shaft materials, types of loading, effect of keyway on shaft strength, design of shaft under various types of loading. DESIGN OF KEYS AND COUPLINGS Design of keys: Types, Materials, function and design of keys. Necessity, advantages and types of couplings, design of Oldham and flanged couplings (Protected and unprotected) | 20 |
IV | SPRINGS Introduction, Types of spring, Material for helical spring, standard size of spring wire, Terms used in compression spring, end connection for compression helical springs, end connection for tension helical springs, stresses in helical springs of circular wire, energy stored in helical string of circular wire, stress & deflection in helical spring of non-circular wire, construction of leaf spring, eqvalved stresses in spring levers (Nipping) length of leaf spring leaves, simple problems | 20 |

**Text Book and/or Reference Material**
1. Machine Design by S.K. Bhandari

**Additional Learning Source**
1. [https://www.youtube.com/watch?v=6$dv_65stfvc](https://www.youtube.com/watch?v=6$dv_65stfvc)
2. [https://www.youtube.com/watch?v=7qhckPEXqPn](https://www.youtube.com/watch?v=7qhckPEXqPn)
## Course Objective

To provide an updated curriculum in automotive engineering to the students with the following objectives:

1. To study in detail the automotive engineering fundamentals and get fully familiarized with the wide variety of the conventional and modern systems used in automobiles. This includes engine construction, cooling and lubrication systems, transmission and driveline, suspension, steering and braking systems etc.
2. To acquire good knowledge of modern systems used in an automobile like, CDI, DI, MPFI, CRDI and Hybrid electric systems etc.
3. The knowledge acquired will help students find a career in automotive industry and further help him excel in this field.

## Course Outcomes

On successful completion of the course, students will have a broad and fundamental understanding of the subject of automobile engineering. The student will have the following abilities:

1. Understand fully the vehicle chassis, construction and the various layouts of the vehicle.
2. Understand the Construction, working and other details about Internal Combustion Engines
3. Understand the constructional details and working principle of various fuels feed systems for petrol engines; carbureted fuel systems and various fuel injection systems like Fi and MPFI.
4. Understanding of the various starting and ignition systems employed in automobiles.
5. Have a good understanding of the various fuel injection systems in diesel engines like IDI, DI and CRDI systems.
6. Identify the various transmission and driveline components and understand their constructional features and working.
7. Understand the constructional details and working of various types of clutches; cone clutch, plate clutch, and centrifugal clutch.
8. Understand the construction and working principle of various types of transmissions; sliding mesh, constant mesh and synchromesh types and differential transmission.
9. Have a thorough understanding of the necessity and working of the cooling and lubrication system in automobile
10. Identify the wheels, tyres and various wheel alignment angles like caster camber, toe etc.
11. Appraise the modern trends in automobile engineering like, electric-hybrids, electric vehicles and magnetic track vehicles.

### UNIT Topics Covered

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>INTRODUCTION</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Detailed description of main units of an automobile, Frame- Necessity and construction, automobile engines and their classification, Components of an engine, their materials and functions. Description of V-type, radial, transverse and OHC engines. Suspension system, its classification. Function and working of shock absorber, Air suspension and independent suspension.</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td>ELECTRICAL SYSTEM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Concept of ignition, working of condenser, ignition coil, distributor, spark plug, C.B. point, principle of firing order, construction and function of storage battery, battery charging and testing, starter motor, Bendix drive (brief description), Function of magneto-ignition system, dynamo, alternator, cut-out and control of voltage and current. Common electrical faults.</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td>TRANSMISSION AND BRAKING SYSTEM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clutches and their classifications, Types of gear box, working of sliding mesh, constant mesh, synchromesh gear box. Working of propeller shaft, universal joint, differential and rear axle. Function and requirements of wheel, Type of tyres. Wheel Alignment for checking camber, caster angle, toe-in and toe out. Steering gears- types and working, power steering. Concept and requirement of brakes. Classification of brakes, working of mechanical, hydraulic, vacuum assisted brakes, disc brakes. Bleeding of brakes.</td>
<td>20</td>
</tr>
</tbody>
</table>

### Text Book and/or Reference Material


### Additional Learning Source

1. Nptel Lectures:https://nptel.ac.in/courses/
2. IIT Video Lectures:www.nptelvideos.in/
3. YouTube Videos on related topics:https://www.youtube.com/
Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

Course Objective
To give a brief recap and an insight into certain newer unconventional areas of Production.

Course Outcomes
This is an elective course for the pursuers of Diploma in Mechanical Engineering, who are specially interested in the area of Manufacturing. It touches upon certain unconventional methods of manufacturing, in particular drawing, rolling, casting and welding. As the students already have a ‘hands on’ experience, in the Mechanical Workshop, the endeavor is let them have an actual feel of areas such as extrusion plus the intricate details of mould design, cores, runners and risers, as also the short falls and defects than can creep in. The area of Production/Manufacturing is arguably one of the backbones of Mechanical Engineering that is widely put into practice and at the end of this course, the pupils will be ready for the practical applications and the job industry.

UNIT

Topics Covered

Marks

I
Introduction: Metal working as a metal shaping method-its advantage and scope, Recrystallization process (Brief idea)
Rolling: Elementary theory of Rolling: - Flat rolling, roll force and power requirement (without derivation), Materials for rolling and rolls.
Characteristics of Rolling: Draught and reduction, contact area, contact angle (without derivation) hot rolling and cold rolling, Pack rolling, defects in roll plates and sheets rolling Mills: Types of rolling mills, lubricants in rolling, thread rolling: flow chart of rolled stock production.
Drawing: Wire drawing process, wire drawing dies, die materials, rod drawing, tube drawing lubricants, defects and remedies in drawing process.

15

II
Extrusion: Introduction, types of extrusion: direct, Indirect, hydrostatic & tube extrusion (only brief idea) extrusion forces (without derivation), hot and cold extrusion, impact extrusion, die design (without derivation) die materials and lubrication, Principle, merits and demerits of hydrostatic extrusion defects, Extrusion equipment: - Presses die.
Forging: Introduction, types of forging: open die forging, closed die forging, precision forging, coining, forging force (without derivation).
Related forging operations: Heading Piercing hobbling forging die design and geometry (without derivation) die materials and lubrication, forging defects.

20

III
Foundry Technology: Introduction, Solidifications of metals, effects of cooling rates, solidification time, introduction to moulding tools.
Types of moulds:- Expandable moulds, Permanent moulds, composite moulds, major components of sand moulds.
Pattern Making: Introduction to cores, core boxes, and core materials, core prints and positioning of cores, Mechanism of pattern withdrawal, elements of gating system.
Risering: Risers and its uses, types of riders.

20

IV
Special Moulding / Casting Process: Carbon dioxide (Co2) moulding: - Principle, working and application, advantages, and Limitations of CO2 moulding.
Shell Moulding: - Principle, working applications, advantages and limitations
Centrifugal Casting: Methods, advantage and its applications.
Die-Casting: Hot and cold chamber die casting (Principles and working only), advantages and applications.
Welding Technology: Introduction, types of welding processes, advantages of welding, Gas cutting process, Thermo it welding and its applications.
Ultrasonic Welding, Explosive welding, Laser beam welding, Elementary idea of underwater welding and cutting.

20

Text Book and/or Reference Material
1) Materials and Manufacturing Technology. by Kalpakjian
2) Workshop and Technology Vol-I: by S.K.Hajara

Additional Learning Source
1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
3. Teacher concern study materials at www.amu.ac.in
Department  | Course No. | Course Title  | Course Designation | Course Type | Contact Hours |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BPT-603</td>
<td>Plastic Tech.-II</td>
<td>Elective II (C)</td>
<td>Theory</td>
<td>4 - -</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

**Course Objective**

To provide an updated curriculum in plastic technology to the students with the following objectives:

The objective of this course is to provide concept of various plastic processing techniques and testing methods.

**Course Outcomes**

On successful completion of the course, students will have a broad and fundamental understanding of the subject of plastic technology. Thestudent will have the following abilities:

1. Understand and apply the basic concept of plastic processing and extrusion process.
2. Understand and apply injection moulding process and machine specifications.
3. Understand the concept of blow moulding, thermoforming, processing of thermosets and reinforcement.
4. Understand and apply the concept of plastic testing.

**UNIT**  
**Topics Covered** | **Marks**
---|---
**I** | **Plastic Processing:** Basic concept of plastic processing –Classification of plastic moulding techniques. **Extrusion Process:** Introduction to extrusion, extrusion screw design features, L/D ratio, compression ratio, breaker plate–screen pack, Die &amp; its functions. Extrusion process for production of plastic products such as-film - blow film, pipes, Wire &amp; Cable Coating. | 15

**II** | **Injection Moulding:** Principle and process of injection moulding for thermoplastic materials, injection moulding machine, machine specifications - projected area, plasticizing capacity, shot weight, Day light, mould clamping system, injection pressure. | 20

**III** | **Blow moulding:** Introduction to blow moulding, concept of extrusion blows moulding and injection blow moulding. Thermoforming, processing of thermosetting materials, reinforcement. | 20

**IV** | **Testing of Plastics:** Introduction to Properties &amp; Testing of Plastic, Mechanical and thermal testing of plastic materials. | 20

**Text Book and/or Reference Material**

1. Plastics Engineering Hand Book - by Society of the Plastic Industry Inc.

**Additional Learning Source**

1. Nptel Lectures  
   https://nptel.ac.in/courses/
2. IIT Video Lectures  
   www.nptelvideos.in/
3. You tube Videos on related topics.  
   https://www.youtube.com/
### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

### Course Objective:

This course contributes to the following program learning outcomes:

1. This course aims to develop knowledge about milling machine, its types and operations.
2. This course will develop concept of installation, testing and maintenance of machines.
3. The course will also be helpful in understanding the basic idea of reliability engineering.

### Course Outcomes:

Upon the completion of this course the students will be able to:

1. Explain the features and operation of milling machine and its types.
2. Explain the necessary steps involved in installation of machine tool.
3. Explain alignment test performed on various machine tools.
4. Explain the concept of reliability, maintainability and availability.
5. Explain maintenance as applied to various machine parts.
6. Explain reasons of equipment replacement and methods used in replacement analysis.

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>MILLING MACHINE</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Introduction, classification and specifications. Description of main parts of column &amp; Knee type,</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>INDEXING</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Dividing Head, common methods of indexing. Simple, compound and differential indexing giving suitable examples.</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>INSTALLATION AND TESTING OF MACHINES</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Introduction, reading of information manual, Location, Foundation for machine tools, Different types of machine foundations, Factors affecting the type and size of foundation, Foundation plan (Erection drawing), Preparing the foundation, Damping and isolation of vibration, Erection and transportation, Levelling and aligning. Introduction, Sites for testing, Measuring instruments used for alignment test, Alignment test on lathe machine, drilling machine and milling machine.</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>RELIABILITY ENGINEERING</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Basic concept and importance of reliability, failure rate, mean time to failure (MTTF), mean time between failures (MTBF), System reliability, Reliability analysis, Reliability improvement, availability and maintainability of mechanical system; Types and causes of failure. Failure analysis MAINTENANCE</td>
<td></td>
</tr>
</tbody>
</table>

### Text Book and/or Reference Material


### Additional Learning Source
## Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

## Course Objective

The energy has become an important and one of the basic infrastructures for the economic development of the country. It is imperative for the sustained growth of the economy. This course envisages various conventional sources of energy, energy crises and environmental aspects. It explains the new and non-conventional (renewable)sources of energy, available in nature. Outline division aspects and utilization of renewable energy sources for both domestic and industrial applications.

## Course Outcomes

1. Identify the energy demand and relate with available energy resources.
2. Describe the environmental aspects of using conventional energy sources and their prospects and limitations.
3. Know the need of non-conventional (renewable) energy sources.
4. To explain the various renewable energy sources and to analyze their harnessing.
5. Describe the utilization of various renewable energy sources for both domestic and industrial applications.

### UNIT

<table>
<thead>
<tr>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy and its Sources</td>
<td>15</td>
</tr>
<tr>
<td>Nuclear Power Reactors and MHD Systems</td>
<td>20</td>
</tr>
<tr>
<td>Solar Energy and Geothermal Energy</td>
<td>20</td>
</tr>
<tr>
<td>Introduction and estimation of Geothermal Energy</td>
<td>20</td>
</tr>
</tbody>
</table>

### Text Book and/or Reference Material

1. “Non-conventional energy sources”, G. D. Rai, Khanna Publisher, New Delhi.
2. “Non-conventional resources of energy”, G. S. Sawhney, PHI Learning Pvt. Ltd.

### Additional Learning Source

1. https://www.lecturenotes.in/subject/57/non-conventional-energy-systems-nces
2. https://nptel.ac.in/noc/individual_course.php?id=noc18-ge09
### Diploma in Mechanical Engineering

**Special BOS 28-3-2019**

**Annexure III- A**

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BPE-605</td>
<td>Tool Design</td>
<td>Elective III (B)</td>
<td>Theory</td>
<td>4 L - T - P</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

**Course Objective**

1. To know different reference systems used in single point tools, drill bits and milling cutters.
2. To know the forces in different tools while material removal or plastic deformation on the job.
3. To select proper material for the design of the tool and dies and to design of those as per the requirements.

**Course Outcomes**

In this subject the students basically going to tool used in machining and dies in metal forming processes. In machining portion, they are going to learn about geometry of cutting tool: ASA, ORS, NRS and WRS systems for a single point cutting tool and multipoint tools i.e. milling cutters. SRS, DRS and WRS for a twist drill and conversion equations from one system to the other; mechanics of machining: different forces in turning, milling and drilling. MCD for conversion of forces from one reference to the other and equipment used to measure forces in turning, milling, drilling and grinding processes; heat generation in machining: source, cause and effect of heat generation in machining; tool failure methods tool life and tool materials; types of chips and control of chip while machining using different possible chip breakers in the tools.

In design of different dies required in metal forming, a brief knowledge on metal forming will be established. According to requirement in the process the design considerations are to be taken and different dies are designed with proper selection of the die materials.

**UNIT**

<table>
<thead>
<tr>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I</strong> BASICS OF JIGS AND FIXTURES</td>
<td>15</td>
</tr>
<tr>
<td>Importance of jigs &amp; fixtures, principles of location, locating devices, v-location, conical location, principle of 6 point location &amp; cylindrical location, support pins and jack pins, locating pins, diamond pin locators, bush locators, purpose of clamping, types of clamps i.e. lever clamp, bridge clamp, edge clamp, screw clamp, latch clamp, hinged clamp, quick acting clamp, and clamping methods, devices.</td>
<td></td>
</tr>
<tr>
<td><strong>II</strong> DESIGN OF JIGS AND FIXTURES</td>
<td>20</td>
</tr>
<tr>
<td>Fundamentals principles or general consideration in the design of drill jig &amp; fixture, location and clamping devices, clip control, bushes, types of drill jig i.e., template, plate type, swinging leaf, box, channel, index, parts/main elements of drill jig, types of bushes, different types of fixtures i.e. turning, milling, boring, grinding, welding etc.</td>
<td></td>
</tr>
<tr>
<td><strong>III</strong> INTRODUCTION OF POWER PRESS TOOLS</td>
<td>20</td>
</tr>
<tr>
<td>Introduction to press cutting operations, cutting action in punch and die operations, die clearance, angular clearance, cutting force, bending force, drawing force, blank development, elements of press tool, die sets, introduction of different types of press tools i.e., blanking, piercing, compound, progressive, combination, drawing, inverted etc., different types of operations.</td>
<td></td>
</tr>
<tr>
<td>DESIGNING OF POWER PRESS TOOLS</td>
<td></td>
</tr>
<tr>
<td>Requirement of press tool design, die &amp; punch clearance for different materials, designing of different types of punch, pilots, stripper plate, pressure pads, punch and die mountings, dowel pins, die block &amp; punch, strip layout, methods of reducing cutting force, calculation of blank development, blanking force, bending force, bending methods, bending tools, spring back, bend allowance, forming and drawing force,.</td>
<td></td>
</tr>
<tr>
<td><strong>IV</strong> MOULDING (PLASTIC DIES)</td>
<td>20</td>
</tr>
<tr>
<td>Types of moulds for processing the thermosetting and thermoplastic materials, criteria for selection of processing methods, materials of mould parts, elementary ideas of construction of different types of moulds used for plastic components, layout of product, development of core, cavity, parting line, runner, sprue, gate, cooling of mould, ejector pin system of product.</td>
<td></td>
</tr>
<tr>
<td>DIE CASTING</td>
<td></td>
</tr>
<tr>
<td>Know how about die casting, elements of die casting tools and their description, material for die casting tools, designing of parting line, draft, fillet and corner radii shrinkage allowance, die wear allowance, cavities, flash, die inserts, cooling system in tool, ejection system of product.</td>
<td></td>
</tr>
</tbody>
</table>

**Text Book and/or Reference Material**

5. Tool Design: by Cyril Donaldson
6. Jigs & Fixture: by P.H. Joshi

**Additional Learning Source**
Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

Course Objective

1. To develop an understanding of the basic concept of polymer products and its various design aspects.
2. To understand the concept of moulds and dies and their types.
3. To enable the students to design moulds for various polymer processing techniques.

Course Outcomes

1. Upon successful completion of the course the students will be able to:
2. Have the knowledge of the design limitations and requirements for plastic products.
3. Develop an understanding of the components of an injection mould and the difference between various mould types based on various moulding techniques.
4. Identify the requirements for blow moulds and compression moulds.

UNIT | Topics Covered | Marks
--- | --- | ---
I | PLASTIC PRODUCT DESIGN: Brief idea of plastic product design, Product design features such as surface finish, texturing, positioning of holes, ribs and bosses, radii and fillets, taper and draft, wall thickness, moulded threads. | 15
II | INJECTION MOULD: Introduction, parting line. Feed system- sprue, gate, types of sprue and gate, runner, types of runners. Runner balancing. Product ejection system, mould cooling system. Types of moulds: two plates mould, three plates mould, split mould and hotrunner mould | 20
IV | EXTRUSION DIES: Introduction to extrusion dies and its features. Die design for rods, pipes, wire coating and sheets. Types of dies- hollow die, offset dies and co-axial dies. Die land, die swell, die head mandrel, breaker plate. | 20

Text Book and/or Reference Material

1. Injection mould design engineering: By David Kazmer
2. The Mould Design Guide: By Peter Jones

Additional Learning Source

1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
3. Teacher concern study materials at www.amu.ac.in
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-691</td>
<td>Workshop Practice-VI</td>
<td>Compulsory</td>
<td>Practical</td>
<td>-</td>
</tr>
</tbody>
</table>

**Course Assessment Method**
1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

**Course Objective**
1. To impart students with the knowledge of various machine tools and its operations.
2. To familiarize with the selection of suitable production process for the desired component
3. To impart hands-on practical exposure on manufacturing processes and equipment. By undergoing this lab the students will learn to use the CNC machines efficiently for manufacturing desired products and knowledge of programming and use of CNC tooling.

**Course Outcomes**
1. Perform plain turning, step turning, knurling, eccentric turning, chamfering and facing operations on lathe.
2. Prepare setup and fabricate composite job using milling, shaping and drilling machine.
4. Prepare sand casting setup using split pattern for simple component.
5. Perform joining of two plate using TIG/MIG welding.
6. Demonstrate cutting of a sheet metal using flame cutting
7. Appreciate the importance of CNC lathe and CNC Milling machines
8. Understand the codes (G-code and M-Code) used in CNC machines for programming
9. Develop Programming skills and crate a component for required drawing, Simulate the prepared part programme using available simulation software’s. And Prepare the parts on CNC

**Topics Covered**

**MACHINE SHOP**
1. Threading, Drilling & Knurling on lathe machine
2. Angular machining on Shaper
3. Key Way Cutting boring on slotting machine
4. To Grind Lathe Tools (All Angles), Shaper/Planer Tools and drill bit
5. Spur Gear Cutting on milling machine

WELDING SHOP
1. Practice of Welding pipe joints, Pipes
2. Study of Welding defects
3. Inspection and Tests of welded joints

**FOUNDRY SHOP**
1. Moulding and casting practice
2. Cleaning, inspection and non-destructive testing:
   - Dye penetration test for casting
   - Magnetic flaw detection test/ Ultra sound flaw detection test for castings

**CNC MACHINE TOOLS LAB**
Program feeding, editing, Simulation and execution for different operations.
1. Linear interpolation and circular interpolation on milling machine.
2. Point to point drilling process on milling.
3. Grooving and threading on CNC lathe machine.

**Text Book and/or Reference Material**

**Additional Learning Source**
Department | Course No. | Course Title | Course Designation | Course Type | Contact Hours
--- | --- | --- | --- | --- | ---
MES, University Polytechnic | BME-692 | Automobile Lab | Elective Lab (A) | Practical | 2

**Course Assessment Method**
1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

**Course Objective**
1. To make the student understand about the various components of petrol engine and diesel engine by dismantling and assembling the parts like carburetor, alternator, water pump etc. and we have the multi cylinder diesel and petrol engines for easy learning.
2. To make the student understand about the various electrical components of an automobile and the wiring circuits and to test the starter motor, ignition system, batteries etc.

**Course Outcomes**
On successful completion of the course, the student will be able to,
1. Describe, explain and demonstrate the various aspects of automobile components and system which include engine components, fuel and ignition systems, transmission systems and steering systems, suspension and braking systems and electrical and electronics system.

**Topics Covered**
Practical Exercises on the following
1. Electrical System of a Patrol Car
2. Synchronmesh Gear Box
3. Carburetor
4. Differential Gear Box
5. Ignition system of Petrol Engine
6. Fuel system of Diesel Engine
7. Mechanical Fuel Pump
8. Chassis of Diesel Engine
9. Chassis of Petrol Car Engine
10. Hydraulics Brake System & Disc Brake System

**Text Book and/or Reference Material**

**Additional Learning Source**
1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
3. Teacher concern study materials at www.amu.ac.in
### Department Course No. Course Title Course Designation Course Type Contact Hours
MES, University Polytechnic BPE-692 Tool Engg. Lab Elective Lab (B) Practical - - 2

### Course Assessment Method
1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

### Course Objective
The main course objectives of tool engineering lab are to give:
1. Basic understanding for the designing of different devices helpful for different type of processes.
2. CAD modelling for the devices or supporting and guiding tool for the different mechanical processes.
3. To provide environment and provide supporting raw material for the design of different type of jigs.

### Course Outcomes
On successful completion of the course students will be able to:
1. Understand the design criteria and requirements of materials for the different jigs and fixture.
2. Design the different types of drill jig required for mass production.
3. Design the welding fixture, milling fixture for different operation/processes.
4. Understand the limitations of designing and machines constrained in which these jigs and fixtures are used.

### Topics Covered
Practical Exercises on production of the following:
1. Drill Jigs.
2. Welding Fixture.

### Text Book and/or Reference Material

### Additional Learning Source
1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
3. Teacher concern study materials at www.amu.ac.in
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BPT-692</td>
<td>Polymer Testing &amp; Processing Lab</td>
<td>Elective Lab (C)</td>
<td>Practical</td>
<td>- - 2</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

**Course Objective**

The lab course essentially exposes the students to various testing equipment and to activities related to each testing machine. The course also includes the measurement of rheological properties using MFI apparatus, VSP apparatus, etc. The course gives hands on training of moulding polymeric materials.

**Course Outcomes**

After completion of this lab course, students will be aware of standard test methods such as tensile, flexural and impact properties, creep properties; softening point, heat distortion temperature. The course will develop a broad understanding of the mechanical, thermal, and electrical properties of polymeric materials and their evaluation by various standard test methods. Moreover, students will develop capability to operate injection moulding machine, extruder, vacuum forming machine etc. for moulding of different polymer products.

**Topics Covered**

1. To identify thermoplastics and thermosets form the given samples by heating and burning tests.
2. To study characteristics of the given sample of thermoplastic by drop test, specific gravity test, opacity, heating, burning and solubility tests.
3. To wash the given monomer samples and prepare a thermoplastic polymer by bulk polymerization.
4. To wash the given monomer samples and prepare a thermoplastic polymer by solution polymerization.
5. To perform tensile test over the given tensile specimen of plastic and to draw the graph applied load versus elongation.
6. To determine the impact failure weight of the given polymer film with the help of falling dart impact tester.
7. To calculate the coefficient of friction of the given polymer film by friction tester.
8. To calculate the melt flow index (MFI) of the given thermoplastic sample.
9. To determine vicat softening point of the given plastic material by using vicat softening apparatus and to draw the graph penetration versus temperature.
10. To determine the heat deflection temperature of the given polymer sample by HDT apparatus and to draw the graph penetration versus temperature.
11. To study the working principle of cooling tower and calculate the efficiency of the given cooling tower.
12. To study the working principle of injection moulding and to operate injection moulding machine (Hand operated & Automatic screw type).
13. To study the working principle of extrusion process and to operate single screw extruder machine.
14. To study and operate vacuum forming machine and make 20 numbers of plastic cup from the given sheet by the vacuum forming machine.
15. To study and operate of the plastic granulator and calculate the energy consumed in grinding the given plastic material and to draw the graph energy versus time.

**Text Book and/or Reference Material**

3. Outlines Polymer Technology by R. Sinha
5. Brydson, J.A “ Plastics Material”

**Additional Learning Source**

1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
3. Teacher concern study materials at www.amu.ac.in
**Course Assessment Method**
1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

**Course Objective**
1. The cognitive objective of this course is for each student to comprehend foundational knowledge needed to perform stated entry-level industry competencies.
2. The performance objective of this course is for each student to apply foundational knowledge to hydraulic and pneumatic problems and exercises encountered in class.

**Course Outcomes**
On successful completion of the course, the student will be able to,
1. Recall various fluid properties and identify the appropriate fluid power system for particular application.
2. Recognize the suitable pump and actuators for particular application.
3. Select various control valves such as pressure control, flow control, direction control valves and use them in hydraulic and pneumatic circuit development.
4. Analyze the hydraulic and pneumatic circuit for energy efficiency.
5. Select the appropriate control system like electrical, electronics, and PLC to control the fluid power system.
6. Trouble-shoot and identify maintenance problems associated with fluid power system.

**Topics Covered**
**Practical Exercises on the following**
1. Bernoulli’s Theorem
2. Orifice Meter / Venturi Meter.
4. Coefficient friction of Pipe Line.
5. Reynolds Experiments.
6. Mouth piece.
7. Easy & Sharp bend.
8. Rectangular / Triangular Notch.
11. Francis Turbine.
13. Reciprocating Pump.
15. Pneumatic Bench.

**Text Book and/or Reference Material**
7. Hydraulic & Hydraulic Machines by Bansal.
8. A text book of Hydraulics by Bawa

**Additional Learning Source**
1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
3. Teacher concern study materials at www.amu.ac.in
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-694</td>
<td>Project</td>
<td>Compulsory</td>
<td>Practical</td>
<td>- - 3</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

**Course Objective**

To develop design skills according to a Conceive-Design-Implement-Operate (CDIO) compliant methodology. To implement engineering skill and knowledge to complete the identified project work while encouraging creativity and innovation. To develop spirit of team work, communication skills through group-based activity and foster self-directing learning and critical evaluation.

**Course Outcomes**

On successful completion of the course, the student will be able to,
1. Identify real world problems of mechanical engineering and related systems.
2. Interpret the working of mechanical engineering systems.
3. Apply the principles of mechanical engineering in real world systems.
4. Criticize and experiment to arrive at solutions for real world mechanical engineering problems.
5. Analyze and evaluate to obtain solution for problems in mechanical engineering systems.

**Topics Covered**

1. Students shall complete the project work as they have allotted in V semester.
2. The project shall be completed and submitted at least one month before the last teaching day of the VI semester, date of which shall be notified in the academic calendar.
3. The assessment of performance of students should be made in VI semester and shall be of 80 marks. The student shall present the final project live as also using overheads project or power point presentation on LCD to the internal examiners as also the external examiner.
4. The evaluation committee shall consist of faculty members constituted by the college, which would comprise of at-least three members, the student’s guide, one internal examiner & one external examiner passed by Board of studies. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately to the controller of examinations in a sealed envelope.

**Text Book and/or Reference Material**

**Additional Learning Source**

1. Nptel Lectures: https://nptel.ac.in/courses/
2. IIT Video Lectures: www.nptelvideos.in/
3. Teacher concern study materials at www.amu.ac.in
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-501</td>
<td>Industrial Engineering</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4 - -</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

**UNIT** | **Topics Covered** | **Marks**
---|---|---
I | INDUSTRIAL MANAGEMENT: Introduction to industrial management, Management of men material and machines, Scientific management and its principles, Functions of management, Structure of industrial organization, Types and applications. INDUSTRIAL OWNERSHIP: Introduction to Ownership and its types: Partnership organization, Joint Stock Company, Private Limited Companies, Public Limited Companies, Private sector and Public sector organization, Concept of the heavy, medium, small scale, cottage and village industries. | 15 |
II | FINANCIAL MANAGEMENT: Sources of finance, Elements of costs, Prime cost, Factory cost, Other overheads, Total cost, selling price and problems on them Depreciation, Classification and methods of providing depreciation, Problems. WAGES AND INCENTIVES: Job evaluation and merit ratings, Definition and objectives, Ranking and point rating methods, Introduction to wages, Types of wages, Introduction to incentives, Types of incentives, Problems based on Halsey and Rowan systems. | 20 |
III | HUMAN RESOURCE MANAGEMENT: Objectives of HRM, Staff development, Training strategies and methods. LABOUR AND INDUSTRIAL LAWS: Importance and necessity, Types of Labour laws and disputes, Brief description of the Acts such as Factories Act 1948, Workmen’s Compensation Act 1923, Minimum wage Act 1948, Employee’s provident fund Act 1952. ACCIDENTS: Introduction, Classification, Causes and Effects of accidents, Types of industrial hazards. | 20 |
IV | ENTREPRENEURSHIP DEVELOPMENT: Concept of entrepreneurship, Characteristics of entrepreneur, Role of Entrepreneur, Role of entrepreneurs in Economic Development: Entrepreneurship in India, Entrepreneurship – its Barriers, Preparation of project report, Steps of planning a small to medium enterprises. (SMEs). MOTIVATION AND LEADERSHIP: Definition of motivation, Methods for improving motivation, Definition of leadership, Functions of leadership, Manager as a leader. | 20 |

**Text Book and/or Reference Material**

- Industrial Engineering and Production Management by Mart and Telsang (S. Chand Pub.)
- Industrial Engineering and Management by D. Ravi Shankar (Galgotia Pub.)
- Industrial Engineering and Production Management by M. Mahajan (Dhanpat Rai Pub.)
- Industrial Engineering by N.J. Manek (Laxmi Pub.)
- Industrial Engineering and Management by O.P. Khanna (Dhanpat Rai Pub.)
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-502</td>
<td>Hydraulics &amp; Pneumatics</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4 - -</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

**UNIT** | **Topics Covered** | **Marks**
--- | --- | ---
I | Introduction: Fluid, types of fluids, Difference between fluid mechanics and hydraulics. Properties of Fluid: Mass density, weight density (specific weight), specific volume, specific gravity, viscosity, kinematic & dynamic viscosity, surface tension, and their units. Intensity of pressure, pressure bead, center of pressure, total pressure on horizontal & vertical flat surfaces (without proof) and simple problems on them. Pressure Measurement: Pressure (Atmospheric, Gauge, Absolute, Vacuum), Pascal’s law and its paradox. Pressure Measuring Devices: Piezometric tube, simple manometer, differential manometer, inverted differential manometer, simple problems on them. | 15
II | Flow of fluids: Types of fluid flow, steady & unsteady, uniform & non-uniform, laminar & turbulent flows, rate of flow & its units, continuity equation for I-D steady flow, Reynolds no & its significance, Energy of liquid in motion total energy, velocity head, pressure head, potential head, Bernoulli’s theorem (Statement & proof), its applications & assumptions, discharge measurement with the help of venturimeter, problem on the same. | 20
III | Flow through Orifices: Types of orifices, hydraulic coefficients, relationship between Cc, Cv& Cd, Vena-contracts. Flow through Pipes: Minor & major losses, loss of head in pipes due to sudden enlargement, sudden contraction, obstruction in flow path and pipe fitting (without proof), problems, water hammering in pipes & surge tanks. | 20
IV | Hydraulic Machines: Concept of hydraulic pumps, construction and working of centrifugal pumps and reciprocating pumps, Selection of pumps. Concept of hydraulic Turbines- Classification, construction & description of main components of Pelton, Francis & Kaplan Turbines. Description and application of hydraulic ram, hydraulic accumulator and hydraulic press. Pneumatic System: Basic elements of pneumatic system and their functions such as- Air Compressor (Types & selection), generation of compressed air, Air-filters, Pressure regulators and Lubricators, their necessity in pneumatic circuits, Application of Pneumatics, Characteristic / features of pneumatic system. Pneumatic valves, pneumatic actuators (Brief idea only), pneumatic system safety, cleanliness and preventive maintenance. | 20

**Text Book and/or Reference Material**

15. Hydraulic & Hydraulic Machines by Bansal.
## Diploma in Mechanical Engineering

### Special BOS 28-3-2019

**Annexure III- B**

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-503</td>
<td>Applied Thermodynamics</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4 L - T - P</td>
</tr>
</tbody>
</table>

### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

### UNIT Topics Covered

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td><strong>Steam Nozzles, Turbines and Condensers</strong>&lt;br&gt;<strong>Steam nozzles</strong>: Introduction. Types of nozzles, velocity of steam at exit of the nozzle, mass of steam discharge through nozzle, condition of maximum discharge through a nozzle, maximum discharge through a nozzle. Problems&lt;br&gt;<strong>Steam turbines</strong>: Principal of operation of impulse and reaction turbines. Pressure, Velocity and Pressure-velocity compounding, their advantages. Steam condensers: Functions of condenser in a steam power plant. Types of condenser. Comparison of jet and surface condenser. Quantity of cooling water required. Effects of air leakage in condenser. Problems.</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td><strong>Air Compressors</strong>&lt;br&gt;Industrial uses of compressed air. Classification of air compressors. Description of single reciprocating compressors. Effect of clearance, work done and volumetric efficiency. Description of multi-stage compressors. Advantages of multistage compression. Condition for maximum efficiency. Problems. Introduction to rotary compressors. Description of axial flow and centrifugal compressor.</td>
<td>20</td>
</tr>
</tbody>
</table>

### Text Book and/or Reference Material

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-504</td>
<td>Refrigeration &amp; Air Conditioning</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>Refrigeration Cycles</strong>: Principles of refrigeration, unit of refrigeration, various methods of refrigeration. Air refrigeration systems – Reversed Carnot and Bell Coleman cycles. Vapour compression refrigeration system and analysis of its cycle. Effects of sub cooling and superheating, Vapour absorption refrigeration system.</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td><strong>Refrigeration Components and Refrigerants</strong>: Refrigeration components and controls such as Compressor, Condenser, Evaporator and Throttling valve and Thermostat. Introduction to refrigerants and their desirable properties, primary and secondary refrigerants. Nomenclature of refrigerants. Important properties of some common refrigerants such as R-11, R-22, R-502, R-134a and NH3.</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td><strong>Psychometric</strong>: Psychometric properties of air, psychrometric processes and their representation on psychrometric chart. Bypass factor, Mixing of air streams. Brief idea of metabolism in human body. Introduction to human comfort and comfort air conditioning.</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td><strong>Load Calculations, HVAC and Air-distribution Systems</strong>: Air conditioning load calculations; Cooling and heating load calculations. Description of various types of loads – sensible and latent heat loads, sensible heat factor, Apparatus dew point. HVAC classification of air conditioning systems. Air distribution systems; Simple description of filters, dampers, fans, blowers, air resisters (Grilles).</td>
<td>20</td>
</tr>
</tbody>
</table>

**Text Book and/or Reference Material**

# Diploma in Mechanical Engineering

**Course:** Production Technology-III

**Course Code:** BME-505

**Course Type:** Compulsory

**Contact Hours:** 4 L - 4 T - 0 P

### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

### UNIT I: GRINDING MACHINES

- **Topics Covered:** Introduction; Classification of Abrasives; Basic concept of Bond, Grit, Structure and Grade of Abrasives; Selection of grinding wheel; Trueing and Dressing of Grinding wheel; Specification of grinding wheels; Grinding Machines: Brief description of Cylindrical grinder, Centre-less grinder; Surface grinder, Tool and Cutter grinder.

### UNIT II: JIGS AND FIXTURES

- **Topics Covered:** Introduction; Difference between a jig and a fixture; Important considerations in jig and fixture design; Main elements of jigs and fixtures. Clamping & locating devices types of jigs. Brief idea of milling & grinding fixture

### UNIT III: CAPSTAN AND TURRET LATHES

- **Topics Covered:** Introduction; Principal Parts of Capstan and Turret lathes; Differences between a Turret and a Capstan Lathe; Tool layout.

### UNIT IV: BROACHING AND BROACHING MACHINES

- **Topics Covered:** Introduction; Classification of Broaches; Principle of Broaching; Methods of Broaching; Classification of Broaching machines; Broaching versus other machining operations; Applications of Broaching.

### UNIT V: NUMERICAL CONTROL MACHINE TOOLS

- **Topics Covered:** Introduction; Elements of NC machine tool system; Brief description and classification of NC systems; Basic concept of manual and computer assisted part-programming.

### UNIT VI: ROBOTS

- **Topics Covered:** Introduction; Main components of a robot; Applications of robot.

### UNIT VII: UNCONVENTIONAL METHODS OF MACHINING

- **Topics Covered:** Introduction; Classification of unconventional machining methods; Common unconventional machining methods; Brief description of Electro-Discharge machining (EDM) and Electro-Chemical machining.

### UNIT VIII: POWDER METALLURGY

- **Topics Covered:** Brief description; Applications, advantages and disadvantages of powder metallurgy

### Text Book and/or Reference Material

3. Mfg. Engg & Technology: By Kalpakjian
5. CNC machines: By M. Adithan
### Course Assessment Method
1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

### Topics Covered
#### MACHINE SHOP
Demonstration and study of lathe and shaper.
1. Step turning, parallel Turning, Taper turning and Grooving.

#### WELDING SHOP
1. Study of various Gas cutting and welding equipment: -Welding transformer, Generator/rectifier, Gas cylinder, Gas cutting machines, Cutting torches etc., various electrodes and filler metals and fluxes.
2. TIG Welding practice of Non-Ferrous metals, like Copper, Brass and Aluminium.
3. Practice of Gas cutting manually.
4. Practice of MIG welding
5. Practice of stud welding
6. Practice of gas welding.
7. Practice of Arc cutting.
Note: Any three jobs to be completed

#### FOUNDRY SHOP
1. Making sands moulds of different forms with different types of pattern using- (i) Floor Moulding. (ii)Three Box (or more) Moulding.
2. Making and setting of cores of different types.
3. Casting practice of Nonferrous metals.

#### CNC MACHINE TOOLS LAB
1. Study and sketch of CNC lathe and milling machine.
2. Study of G codes and M codes.
3. Part programming, for different operations.
Programme editing & simulation on CNC lathe and milling machine.

### Text Book and/or Reference Material
3. CNC machines: By M. Adithan
Diploma in Mechanical Engineering
Special BOS 28-3-2019
Annexure III- B

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-592</td>
<td>CAD Lab-II</td>
<td>Compulsory</td>
<td>Practical</td>
<td>- - 2</td>
</tr>
</tbody>
</table>

Course Assessment Method
1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

Topics Covered
This course is aiming to provide hands on training in AutoCAD/CREO/Solid Edge/NX(Solid Edge/NX-Combined or Optionally Available)

Text Book and/or Reference Material
### Course Assessment Method

1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

### Course Objective

This course is designed to introduce a basic study of the phenomena of heat and mass transfer, to develop methodologies for solving a wide variety of practical engineering problems, and to provide useful information concerning the performance and design of particular systems and processes.

### Course Outcomes

Upon successful completion of this course, the student will be able to:

1. Understand the basic laws of heat transfer.
2. Account for the consequence of heat transfer in thermal analyses of engineering systems.
3. Analyze problems involving steady state heat conduction in simple geometries.
5. Obtain numerical solutions for conduction and radiation heat transfer problems.
6. Understand the fundamentals of convective heat transfer process.
7. Evaluate heat transfer coefficients for natural convection.
8. Evaluate heat transfer coefficients for forced convection inside ducts.
9. Evaluate heat transfer coefficients for forced convection over exterior surfaces.
10. Analyze heat exchanger performance by using the method of log mean temperature difference.
12. Calculate radiation heat transfer between black body surfaces.
13. Calculate radiation heat exchange between gray body surfaces.

### Topics Covered

**Practical Exercises on the following**

1. Ruston Diesel Engine / Harvest Diesel Engine.
2. Morse test on Petrol Engine.
4. Reciprocating Air Compressor
5. Mechanical Heat Pump
6. Refrigeration Tutor
7. Air Conditioning Tutor
8. Vapour Absorption System
9. Ice Plant Tutor

### Text Book and/or Reference Material

### Course Assessment Method

1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

### Topics Covered

**GUIDELINES**

i. Project will have to be done by a group comprising of maximum ten students only in their area of interest.

ii. Each group has to select a contemporary topic that will use the technical knowledge of their program of specialization.

iii. Allocation of the guides preferably in accordance with the expertise of the faculty.

iv. The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the IV semester.

v. The number of projects that a faculty can guide would be limited to two groups.

vi. The project can be carried out on-campus or in an industry or an organization with prior approval from the Principal through Section Incharge.

vii. The project shall be finalized by the students before the start of the V semester and shall be completed and submitted at least one month before the last teaching day of the VI semester, date of which shall be notified in the academic calendar.

viii. The assessment of performance of students should be made at least twice in each semester i.e. V and VI and each internal assessment shall be for 80 marks. The student shall present the final project live as also using overheads project or power point presentation on LCD to the internal examiners as also the external examiner.

ix. The evaluation committee shall consist of faculty members constituted by the college which would comprise of at-least three members comprising of the student’s guide, one internal examiner & one external examiner passed by Board of studies. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately to the controller of examinations in a sealed envelope.

### Text Book and/or Reference Material
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-601</td>
<td>Industrial Management &amp; Entrepreneur Development</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4 - -</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

**UNIT** | **Topics Covered** | **Marks**
--- | --- | ---
I | **Introduction to Industrial Engg.** Definition, Application and Industry Classification. **Production and Productivity:** Definition, Production system, its characteristics, Product Life Cycle, Factors influencing productivity and measurement of productivity. **Plant Location:** Introduction, Factors affecting plant location. **Plant Layout:** Definition, Types of layouts, advantages and disadvantages of different layouts. **Material Handling:** Introduction, Material handling equipment, their types, functions and selection. | 15 |
II | **Work Study Method Study:** Definition, objectives and need of method study, Role of method study in improving productivity, Procedure of conducting method study, Process charts and diagrams, Process chart symbols, (Flow process chart, Multi-activity chart, Right and Left-hand chart and flow diagram), Examples. Introduction to Therbligs. **Time Study:** Definition, Objectives and procedure of conducting time study, System of performance rating, various allowances, Calculation of standard time. **Ergonomics:** Definition, objectives and applications, Design of workplace layout, Man-Machine system, Role of work environment on human performance. | 20 |
III | **Planning and Control:** An introduction to production, planning and control, its need and objectives, comparison between production planning and production control, Concept of Scheduling, Routing, Dispatching and Expediting, Techniques/methods of PPC like CPM and PERT, terminology related with CPM and PERT, Simple problems on them. **Break Even Analysis:** Introduction, Break-even chart, Break-even point, Margin of safety, Simple problems on them. | 20 |
IV | **Forecasting:** Introduction to sales forecasting, definition, types, applications, need and limitations. **Inventory Control:** Introduction, types, objectives, need, terminology used in inventory control, Economic Order Quantity (EOQ), Lot size of production for minimum cost, simple problems on EOQ. | 20 |

**Text Book and/or Reference Material**

1. Industrial Engineering and Management by D. Ravi Shankar (Galgotia Pub.)
2. Industrial Engineering and Production Management by M. Mahajan (Dhanpat Rai Pub.)
3. Industrial Engineering and Management by O.P. Khanna (Dhanpat Rai Pub.).
4. Industrial Management by H.S. Bawa
5. Industrial Management by Mittal
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-602</td>
<td>Machine Design</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4 - -</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

**UNIT** | **Topics Covered** | **Marks**
---|---|---
I | INTRODUCTION  
Design: Definition, type of designs, necessary of design  
Design procedure.  
Practical Examples related with design procedure.  
Characteristics of a good designer.  
Design terminology: Stress, strain, factor of safety, factors affecting factor of safety, stress concentration, methods to reduce stress concentration, fatigue, endurance limit.  
General design considerations, codes and standards. Selection of materials | 15
II | DESIGN OF SHAFT  
Design of shaft: Types of shaft materials, types of loading, effect of keyway on shaft strength, design of shaft under various types of loading.  
DESIGN OF KEYS AND COUPLINGS  
Design of keys: Types, Materials, function and design of keys.  
Necessity, advantages and types of couplings, design of Oldham and flanged couplings (Protected and unprotected) | 20
III | DESIGN OF JOINTS  
Types of joints, Temporary and permanent, utility of joints, design of simple cotter and Knuckle joint.  
Welded Joints: Types of welded joints, strength of parallel and transverse fillet welds, strength of combined parallel and transverse welds under axial loading.  
Riveted Joints: Leak proofing of riveted joints caulking and fullering  
Different modes of failure of riveted joint.  
Design of riveted joints: lap and butt joints.  
Design of boiler joints i.e circumferential and longitudinal joints | 20
IV | SPRINGS  
Introduction, Types of spring, Material for helical spring, standard size of spring wire, Terms used in compression spring, end connection for compression helical springs, end connection for tension helical springs, stresses in helical springs of circular wire, energy stored in helical string of circular wire, stress & defection in helical spring of non-circular wire, construction of leaf spring, equvalved stresses in spring levers (Nipping) length of leaf spring leaves, simple problems | 20

**Text Book and/or Reference Material**

1. Machine Design by S.K. Bhandari
### Diploma in Mechanical Engineering

**Special BOS 28-3-2019**

**Annexure III- B**

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-603</td>
<td>Automobile Engineering</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4 - -</td>
</tr>
</tbody>
</table>

#### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>INTRODUCTION: Detailed description of main units of an automobile, Frame- Necessity and construction, automobile engines and their classification, Components of an engine, their materials and functions. Description of V-type, radial, transverse and OHC engines. Suspension system, its classification. Function and working of shock absorber, Air suspension and independent suspension.</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td>ELECTRICAL SYSTEM: Concept of ignition, working of condenser, ignition coil, distributor, spark plug, C.B. point, principle of firing order, construction and function of storage battery, battery charging and testing, starter motor, Bendix drive (brief description), Function of magneto-ignition system, dynamo, alternator, cut-out and control of voltage and current. Common electrical faults.</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td>TRANSMISSION AND BRAKING SYSTEM: Clutches and their classifications, Types of gear box, working of sliding mesh, constant mesh, synchromesh gear box. Working of propeller shaft, universal joint, differential and rear axle. Function and requirements of wheel, Type of tyres. Wheel Alignment for checking camber, caster angle, toe-in and toe out. Steering gears- types and working, power steering. Concept and requirement of brakes. Classification of brakes, working of mechanical, hydraulic, vacuum assisted brakes, disc brakes. Bleeding of brakes.</td>
<td>20</td>
</tr>
</tbody>
</table>

#### Text Book and/or Reference Material

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-604</td>
<td>Machine Tools &amp; Maintenance</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4</td>
</tr>
</tbody>
</table>

### Course Assessment Method
1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

### UNIT Topics Covered

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
</table>
| I    | **MILLING MACHINE**  
Introduction, classification and specifications. Description of main parts of column & Knee type, Horizontal and vertical spindle milling machines. Milling cutters: types and specifications.  
Operations performed on milling machines.                                                                                      | 15    |
| II   | **INDEXING**  
Dividing Head, common methods of indexing. Simple, compound and differential indexing giving suitable examples.  
Manufacture of Gears: Application of milling, hobbling, hot rolling hot forging and casting.  
Micro Finishing Processes: Principle and application of lapping and honing, Polishing, Superfinishing, Burnishing, Galvanizing, Anodizing and Tin Plating. | 20    |
| III  | **INSTALLATION AND TESTING OF MACHINES**  
Introduction, reading of information manual, Location, Foundation for machine tools, Different types of machine foundations, Factors affecting the type and size of foundation, Foundation plan (Erection drawing), Preparing the foundation, Damping and isolation of vibration, Erection and transportation, Levelling and aligning. Introduction, Sites for testing, Measuring instruments used for alignment test, Alignment test on lathe machine, drilling machine and milling machine. | 20    |
| IV   | **RELIABILITY ENGINEERING**  
Basic concept and importance of reliability, failure rate, mean time to failure (MTTF), mean time between failures (MTBF), System reliability, Reliability analysis, Reliability improvement, availability and maintainability of mechanical system; Types and causes of failure. Failure analysis  
**MAINTENANCE**  
Maintenance objectives and types, Role of maintenance engineer, Maintenance procedure, need of planned maintenance, recent developments in maintenance engineering, maintenance of various machine parts (belt drive, chain drive, gear drive and shaft coupling). Maintenance stages of Pipes and pipe joints, pumps and lathe machine, Maintenance records, Computerization of maintenance. Reasons of equipment replacement, group replacement, replacement in anticipation of failure. Guidelines in replacement studies and methods of replacement studies. | 20    |

### Text Book and/or Reference Material
## Course Assessment Method

1. Course Work: 10 Marks  
2. Mid Semester Exam: 15 Marks, 01 Hour  
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

## Text Book and/or Reference Material

1. 

---

**Department** | **Course No.** | **Course Title** | **Course Designation** | **Course Type** | **Contact Hours** |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BCE-605 (a)</td>
<td>Environmental Science and Management</td>
<td>Elective (a)</td>
<td>Theory</td>
<td>3 - -</td>
</tr>
</tbody>
</table>

Diploma in Mechanical Engineering  
Special BOS 28-3-2019  
Annexure III- B
### Course Assessment Method
1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

### UNIT
<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Energy and its Sources&lt;br&gt;Introduction to the Energy and present energy crises. Conventional Energy Sources and limitations of using these sources. The need of Non-Conventional Energy Sources (NCES). Introduction to various non-conventional i.e. renewable energy sources. Comparison of NCES with the conventional source. Advancements made in recent time.</td>
<td>15</td>
</tr>
<tr>
<td>IV</td>
<td>Introduction and estimation of Geothermal Energy. Nature of geothermal fields and applications of geothermal energy of tidal power generation.</td>
<td>20</td>
</tr>
</tbody>
</table>

### Text Book and/or Reference Material
1. “Non-conventional energy sources”, G. D. RAI, Khanna Publisher, New Delhi.
2. “Non-conventional resources of energy”, G. S. SAWHNEY, PHI Learning Pvt. Ltd.
### Diploma in Mechanical Engineering

**Special BOS 28-3-2019**

**Annexure III- B**

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-605 (c)</td>
<td>Total Quality Management</td>
<td>Elective (c)</td>
<td>Theory</td>
<td>3</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

**Text Book and/or Reference Material**
### Diploma in Mechanical Engineering

#### Special BOS 28-3-2019

#### Annexure III- B

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-691</td>
<td>Workshop Practice-VI</td>
<td>Compulsory</td>
<td>Practical</td>
<td>- 0 6</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

**Topics Covered**

**MACHINE SHOP**

1. Threading, Drilling & Knurling on lathe machine
2. Angular machining on Shaper.
3. Key Way Cutting boring on slotting machine
4. To Grind Lathe Tools (All Angles), Shaper/Planer Tools and drill bit.
5. Spur Gear Cutting on milling machine.

**WELDING SHOP**

1. Practice of Welding pipe joints, Pipes
2. Study of Welding defects.

**FOUNDRY SHOP**

1. Moulding and casting practice
2. Cleaning, inspection and non-destructive testing:
   - Dye penetration test for casting
   - Magnetic flaw detection test/Ultra sound flaw detection test for castings.

**CNC MACHINE TOOLS LAB**

Program feeding, editing, Simulation and execution for different operations.

1. Linear interpolation and circular interpolation on milling machine.
2. Point to point drilling process on milling.
3. Grooving and threading on CNC lathe machine.

**Text Book and/or Reference Material**
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-692</td>
<td>Automobile Lab</td>
<td>Compulsory</td>
<td>Practical</td>
<td>-</td>
</tr>
</tbody>
</table>

### Course Assessment Method
1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

### Topics Covered
**Practical Exercises on the following**
1. Electrical System of a Patrol Car
2. Synchromesh Gear Box
3. Carburetor
4. Differential Gear Box
5. Ignition system of Petrol Engine
6. Fuel system of Diesel Engine
7. Mechanical Fuel Pump
8. Chassis of Diesel Engine
9. Chassis of Petrol Car Engine
10. Hydraulics Brake System & Disc Brake System

### Text Book and/or Reference Material
### Department

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-693</td>
<td>Hydraulics &amp; Pneumatics Lab</td>
<td>Compulsory</td>
<td>Practical</td>
<td>-</td>
</tr>
</tbody>
</table>

#### Course Assessment Method

1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

#### Topics Covered

**Practical Exercises on the following**

1. Bernoulli’s Theorem
2. Orifice Meter / Venturi Meter.
4. Coefficient friction of Pipe Line.
5. Reynolds Experiments.
6. Mouth piece.
7. Easy & Sharp bend.
8. Rectangular / Triangular Notch.
11. Francis Turbine.
13. Reciprocating Pump.
15. Pneumatic Bench.

#### Text Book and/or Reference Material

7. Hydraulic & Hydraulic Machines by Bansal.
8. A text book of Hydraulics by Bawa
Diploma in Mechanical Engineering
Special BOS 28-3-2019
Annexure III- B

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-694</td>
<td>Project</td>
<td>Compulsory</td>
<td>Practical</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

**Topics Covered**

1. Students shall complete the project work as they have allotted in V semester.
2. The project shall be completed and submitted at least one month before the last teaching day of the VI semester, date of which shall be notified in the academic calendar.
3. The assessment of performance of students should be made in VI semester and shall be of 80 marks. The student shall present the final project live as also using overheads project or power point presentation on LCD to the internal examiners as also the external examiner.
4. The evaluation committee shall consist of faculty members constituted by the college, which would comprise of at-least three members, the student’s guide, one internal examiner & one external examiner passed by Board of studies. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately to the controller of examinations in a sealed envelope.

**Text Book and/or Reference Material**
### Diploma in Mechanical Engineering (Production)

#### Course Title: Industrial Engineering

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-501</td>
<td>Industrial Engineering</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

#### UNIT Topics Covered Marks

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>INDUSTRIAL MANAGEMENT: Introduction to industrial management, Management of men material and machines, Scientific management and its principles, Functions of management, Structure of industrial organization, Types and applications. INDUSTRIAL OWNERSHIP: Introduction to Ownership and its types: Partnership organization, Joint Stock Company, Private Limited Companies, Public Limited Companies, Private sector and Public sector organization, Concept of the heavy, medium, small scale, cottage and village industries.</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td>FINANCIAL MANAGEMENT: Sources of finance, Elements of costs, Prime cost, Factory cost, Other overheads, Total cost, selling price and problems on them Depreciation, Classification and methods of providing depreciation, Problems. WAGES AND INCENTIVES: Job evaluation and merit ratings, Definition and objectives, Ranking and point rating methods, Introduction to wages, Types of wages, Introduction to incentives, Types of incentives, Problems based on Halsey and Rowan systems.</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td>HUMAN RESOURCE MANAGEMENT: Objectives of HRM, Staff development, Training strategies and methods. LABOUR AND INDUSTRIAL LAWS: Importance and necessity, Types of Labour laws and disputes, Brief description of the Acts such as Factories Act 1948, Workmen’s Compensation Act 1923, Minimum wage Act 1948, Employee’s provident fund Act 1952. ACCIDENTS: Introduction, Classification, Causes and Effects of accidents, Types of industrial hazards.</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td>ENTREPRENUERSHIP DEVELOPMENT: Concept of entrepreneurship, Characteristics of entrepreneur, Role of Entrepreneur, Role of entrepreneurs in Economic Development; Entrepreneurship in India, Entrepreneurship – its Barriers, Preparation of project report, Steps of planning a small to medium enterprises. (SMEs). MOTIVATION AND LEADERSHIP: Definition of motivation, Methods for improving motivation, Definition of leadership, Functions of leadership, Manager as a leader.</td>
<td>20</td>
</tr>
</tbody>
</table>

#### Text Book and/or Reference Material

1. Industrial Engineering and Production Management by Mart and Telsang (S. Chand Pub.)
2. Industrial Engineering and Management by D. Ravi Shankar (Galgotia Pub.)
3. Industrial Engineering and Production Management by M. Mahajan (Dhanpat Rai Pub.)
4. Industrial Engineering by N.J. Manek (Laxmi Pub.)
5. Industrial Engineering and Management by O.P. Khanna (Dhanpat Rai Pub.)
## Diploma in Mechanical Engineering (Production)

### Special BOS 28-3-2019

**Annexure III- B**

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-502</td>
<td>Hydraulics &amp; Pneumatics</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4 - -</td>
</tr>
</tbody>
</table>

### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Introduction: Fluid, types of fluids, Difference between fluid mechanics and hydraulics. Properties of Fluid: Mass density, weight density (specific weight), specific volume, specific gravity, viscosity, kinematic &amp; dynamic viscosity, surface tension, and their units. Intensity of pressure, pressure bead, center of pressure, total pressure on horizontal &amp; vertical flat surfaces (without proof) and simple problems on them. Pressure Measurement: Pressure (Atmospheric, Gauge, Absolute, Vacuum), Pascal’s law and its paradox. Pressure Measuring Devices: Piezometric tube, simple manometer, differential manometer, inverted differential manometer, simple problems on them.</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td>Flow of fluids: Types of fluid flow, steady &amp; unsteady, uniform &amp; non-uniform, laminar &amp; turbulent flows, rate of flow &amp; its units, continuity equation for I-D steady flow, Reynolds no &amp; its significance, Energy of liquid in motion total energy, velocity head, pressure head, potential head, Bernoulli’s theorem (Statement &amp; proof), its applications &amp; assumptions, discharge measurement with the help of venturimeter, problem on the same.</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td>Flow through Orifices: Types of orifices, hydraulic coefficients, relationship between Cc, Cv &amp; Cd, Vena-contracts. Flow through Pipes: Minor &amp; major losses, loss of head in pipes due to sudden enlargement, sudden contraction, obstruction in flow path and pipe fitting (without proof), problems, water hammering in pipes &amp; surge tanks.</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td>Hydraulic Machines: Concept of hydraulic pumps, construction and working of centrifugal pumps and reciprocating pumps. Selection of pumps. Concept of hydraulic Turbines- Classification, construction &amp; description of main components of Pelton, Francis &amp; Kaplan Turbines. Description and application of hydraulic ram, hydraulic accumulator and hydraulic press. Pneumatic System: Basic elements of pneumatic system and their functions such as- Air Compressor (Types &amp; selection), generation of compressed air, Air-filters, Pressure regulators and Lubricators, their necessity in pneumatic circuits, Application of Pneumatics, Characteristic / features of pneumatic system. Pneumatic valves, pneumatic actuators (Brief idea only), pneumatic system safety, cleanliness and preventive maintenance.</td>
<td>20</td>
</tr>
</tbody>
</table>

### Text Book and/or Reference Material

7. Hydraulic & Hydraulic Machines by Bansal.
### Course Description

#### Department
MES, University Polytechnic

#### Course Details

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPE-501</td>
<td>Automation &amp; CAM</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

#### UNIT Topics Covered

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>AUTOMATION&lt;br&gt;Introduction to Automation; Reasons for Automating; Automation Principles and strategies; Automation Migration Strategy; Levels of Automation; Types of Automated Manufacturing Systems.</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td>NUMERICAL CONTROL&lt;br&gt;Introduction to Numerical control of Machines; Computerized Numerical Control (CNC) and Direct Numerical Control (DNC); Advantages and Disadvantages of CNC Machines; Parts suitable for CNC Machines; Basic Components of Numerical Control System; Classification of Numerical Control Machines.</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td>NUMERICAL CONTROL PART PROGRAMMING&lt;br&gt;Manual Part Programming and Computer Aided Part Programming; Advantages of Computer Aided Part Programming over Manual Part Programming.&lt;br&gt;CNC MACHINES&lt;br&gt;Construction details of CNC Machines; Tooling for CNC Machines; Maintenance of CNC Machines.</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td>CAM and FMS: Concept of CAD, CAM, FMS, CIM, Computer Aided Process Planning (CAPP), JIT and Group Technology (GT), and their advantages.&lt;br&gt;ROBOTICS: Definition; Different Types of configuration; Basic robot motions; Degrees of freedom; Main parts of robot; Applications of Robots in different manufacturing processes, Advantages of robots.</td>
<td>20</td>
</tr>
</tbody>
</table>

#### Text Book and/or Reference Material

1. CNC Machines by M. Adithan.
2. Production Automation and CIM by Groover.
Department | Course No. | Course Title | Course Designation | Course Type | Contact Hours
--- | --- | --- | --- | --- | ---
MES, University Polytechnic | BPE-502 | Tool Design | Compulsory | Theory | 4

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>BASICS OF JIGS AND FIXTURES</strong>&lt;br&gt;Importance of jigs &amp; fixtures, principles of location, locating devices, v-location, conical location, principle of 6 point location &amp; cylindrical location, support pins and jack pins, locating pins, diamond pin locators, bush locators, purpose of clamping, types of clamps i.e. lever clamp, bridge clamp, edge clamp, screw clamp, latch clamp, hinged clamp, quick acting clamp, and clamping methods, devices.</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td><strong>DESIGN OF JIGS AND FIXTURES</strong>&lt;br&gt;Fundamentals principles or general consideration in the design of drill jig &amp; fixture, location and clamping devices, clip control, bushes, types of drill jig i.e., template, plate type, swinging leaf, box, channel, index, parts/main elements of drill jig, types of bushes, different types of fixtures i.e. turning, milling, boring, grinding, welding etc.</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td><strong>INTRODUCTION OF POWER PRESS TOOLS</strong>&lt;br&gt;Introduction to press cutting operations, cutting action in punch and die operations, die clearance, angular clearance, cutting force, bending force, drawing force, blank development, elements of press tool, die sets, introduction of different types of press tools i.e., blanking, piercing, compound, progressive, combination, drawing, inverted etc., different types of operations.&lt;br&gt;&lt;br&gt;<strong>DESIGNING OF POWER PRESS TOOLS</strong>&lt;br&gt;Requirement of press tool design, die &amp; punch clearance for different materials, designing of different types of punch, pilots, stripper plate, pressure pads, punch and die mountings, dowel pins, die block &amp; punch, strip layout, methods of reducing cutting force, calculation of blank development, blanking force, bending force, bending methods, bending tools, spring back, bend allowance, forming and drawing force.</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td><strong>MOULDING (PLASTIC DIES)</strong>&lt;br&gt;Types of moulds for processing the thermosetting and thermoplastic materials, criteria for selection of processing methods, materials of mould parts, elementary ideas of construction of different types of moulds used for plastic components, layout of product, development of core, cavity, parting line, runner, sprue, gate, cooling of mould, ejector pin system of product.&lt;br&gt;&lt;br&gt;<strong>DIE CASTING</strong>&lt;br&gt;Know how about die casting, elements of die casting tools and their description, material for die casting tools, designing of parting line, draft, fillet and corner radii shrinkage allowance, die wear allowance, cavities, flash, die inserts, cooling system in tool, ejection system of product.</td>
<td>20</td>
</tr>
</tbody>
</table>

**Text Book and/or Reference Material**

2. Tool Design: by Cyril Donaldson
3. Jigs & Fixture: by P.H. Joshi
### Department
MES, University Polytechnic

### Course
BME-505

### Course Title
Production Technology-III

### Course Designation
Compulsory

### Course Type
Theory

<table>
<thead>
<tr>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

### Course Assessment Method
1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

### UNIT

#### I
**GRINDING MACHINES**
Introduction; Classification of Abrasives; Basic concept of Bond, Grit, Structure and Grade of Abrasives; Selection of grinding wheel; Trueing and Dressing of Grinding wheel; Specification of grinding wheels; Grinding Machines: Brief description of Cylindrical grinder, Centre-less grinder; Surface grinder, Tool and Cutter grinder.

#### II
**JIGS AND FIXTURES:** Introduction; Difference between a jig and a fixture; Important considerations in jig and fixture design; Main elements of jigs and fixtures. Clamping & locating devices types of jigs. Brief idea of milling & grinding fixture

**CAPSTAN AND TURRET LATHES**
Introduction; Principal Parts of Capstan and Turret lathes; Differences between a Turret and a Capstan Lathe; Tool layout.

**BROACHING AND BROACHING MACHINES**
Introduction; Classification of Broaches; Principle of Broaching; Methods of Broaching; Classification of Broaching machines; Broaching versus other machining operations; Applications of Broaching.

#### III
**NUMERICAL CONTROL MACHINE TOOLS:**
Introduction; Elements of NC machine tool system; Brief description and classification of NC systems; Basic concept of manual and computer assisted part-programming.

**ROBOTS:** Introduction; Main components of a robot; Applications of robot.

#### IV
**UNCONVENTIONAL METHODS OF MACHINING**
Introduction; Classification of unconventional machining methods; Common unconventional machining methods; Brief description of Electro-Discharge machining (EDM) and Electro-Chemical machining.

**POWDER METALLURGY:** Brief description; Applications, advantages and disadvantages of powder metallurgy

### Text Book and/or Reference Material
3. Mfg. Engg & Technology: By Kalpakjian
5. CNC machines: By M. Adithan
Department | Course No. | Course Title | Course Designation | Course Type | Contact Hours |
--- | --- | --- | --- | --- | ---
MES, University Polytechnic | BME-591 | Workshop Practice-V | Compulsory | Practical | - - 6 |

Course Assessment Method
1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

Topics Covered

**MACHINE SHOP**
Demonstration and study of lathe and shaper.
1. Step turning, parallel Turning, Taper turning and Grooving.

**WELDING SHOP**
1. Study of various Gas cutting and welding equipment: -Welding transformer, Generator/rectifier, Gas cylinder, Gas cutting machines, Cutting torches etc., various electrodes and filler metals and fluxes.
2. TIG Welding practice of Non-Ferrous metals, like Copper, Brass and Aluminium.
3. Practice of Gas cutting manually.
4. Practice of MIG welding
5. Practice of stud welding
6. Practice of gas welding.
7. Practice of Arc cutting.
Note: Any three jobs to be completed

**FOUNDRY SHOP**
1. Making sands moulds of different forms with different types of pattern using- (i) Floor Moulding. (ii)Three Box (or more) Moulding.
2. Making and setting of cores of different types.
3. Casting practice of Nonferrous metals.

**CNC MACHINE TOOLS LAB**
1. Study and sketch of CNC lathe and milling machine.
2. Study of G codes and M codes.
3. Part programming, for different operations.
Programme editing & simulation on CNC lathe and milling machine.

Text Book and/or Reference Material
3. CNC machines: By M. Adithan
### Course Assessment Method

1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

### Topics Covered

Practical Exercises on the following.

**List of Experiments**

1. To verify that when random samples are taken from a universe with a certain percentage of defectives, the same percentage of defectives tend to appear in the random samples (by using a lot of glass balls having certain percentage of defectives).
2. To construct - R chart for the given data of variables & conclude your results.
3. To construct p-chart for attribute for constant sample size & state your conclusion.
4. To construct c-chart for attributes for a given data & conclude your results.
5. To construct left hand & right hand process chart for an assembly of Nut & Bolt with two washers.
6. To draw flow process Chart for an activity of your own choice & hence, draw the flow diagram using suitable scale.
7. To carry out time study (T-S) for a simple job on a lathe machine for at least 10 cycles & compute the standard time.
8. To draw “Frequency Distribution/Normal Distribution Curve” for a mass production item & to compare the area with standard data (using Normal Distribution Curve).

Case–I: To draw a chart of man working on a single machine for an activity of your choice.

Case-II: To draw a chart of man working on two machines simultaneously for an activity of your choice.

Note: Number of Experiments depend upon the availability of equipment and time

**Text Book and/or Reference Material**
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-594</td>
<td>Project</td>
<td>Compulsory</td>
<td>Practical</td>
<td>-  -  3</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

**Topics Covered**

GUIDELINES

i. Project will have to be done by a group comprising of maximum ten students only in their area of interest.

ii. Each group has to select a contemporary topic that will use the technical knowledge of their program of specialization.

iii. Allocation of the guides preferably in accordance with the expertise of the faculty.

iv. The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the IV semester.

v. The number of projects that a faculty can guide would be limited to two groups.

vi. The project can be carried out on-campus or in an industry or an organization with prior approval from the Principal through Section Incharge.

vii. The project shall be finalized by the students before the start of the V semester and shall be completed and submitted at least one month before the last teaching day of the VI semester, date of which shall be notified in the academic calendar.

viii. The assessment of performance of students should be made at least twice in each semester i.e. V and VI and each internal assessment shall be for 80 marks. The student shall present the final project live as also using overheads project or power point presentation on LCD to the internal examiners as also the external examiner.

ix. The evaluation committee shall consist of faculty members constituted by the college which would comprise of at-least three members comprising of the student’s guide, one internal examiner & one external examiner passed by Board of studies. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately to the controller of examinations in a sealed envelope.

**Text Book and/or Reference Material**
### Department Course No. Course Title Course Designation Course Type Contact Hours
---
MES, University Polytechnic BME-595 Hydraulics Lab Compulsory Practical - - 2

### Course Assessment Method
1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

### Topics Covered
Practical Exercises on the following
1. Bernoulli’s Theorem
2. Orifice Meter / Venturi Meter.
4. Coefficient friction of Pipe Line.
5. Reynolds Experiments.
6. Mouth piece.
7. Easy & Sharp bend.
8. Rectangular / Triangular Notch.
11. Francis Turbine.
13. Reciprocating Pump.
15. Pneumatic Bench.

Note:
1. Number of Experiments depend upon the availability of equipment and time.
2. Any eight experiments to be completed in Production/ R.A.C / Plastic Tech

### Text Book and/or Reference Material
6. Hydraulic & Hydraulic Machines by Bansal.
7. A text book of Hydraulics by Bawa
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-601</td>
<td>Industrial Management &amp; Entrepreneur Development</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4 - -</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks  
2. Mid Semester Exam: 15 Marks, 01 Hour  
3. End Semester Exam: 75 Marks, 02 Hour

**UNIT** | **Topics Covered**                                                                 | **Marks** |
--- | --- | --- |
I     | **Introduction to Industrial Engg.** Definition, Application and Industry Classification. **Production and Productivity:** Definition, Production system, its characteristics, Product Life Cycle, Factors influencing productivity and measurement of productivity. **Plant Location:** Introduction, Factors affecting plant location. **Plant Layout:** Definition, Types of layouts, advantages and disadvantages of different layouts. **Material Handling:** Introduction, Material handling equipment, their types, functions and selection. | 15 |
II    | **Work Study**  
**Method Study:** Definition, objectives and need of method study, Role of method study in improving productivity, Procedure of conducting method study, Process charts and diagrams, Process chart symbols, (Flow process chart, Multi-activity chart, Right and Left-hand chart and flow diagram), Examples. Introduction to Therbligs.  
**Time Study:** Definition, Objectives and procedure of conducting time study, System of performance rating, various allowances, Calculation of standard time.  
**Ergonomics:** Definition, objectives and applications, Design of workplace layout, Man-Machine system, Role of work environment on human performance. | 20 |
III   | **Planning and Control:** An introduction to production, planning and control, its need and objectives, comparison between production planning and production control, Concept of Scheduling, Routing, Dispatching and Expediting, Techniques/methods of PPC like CPM and PERT, terminology related with CPM and PERT, Simple problems on them.  
**Break Even Analysis:** Introduction, Break-even chart, Break-even point, Margin of safety, Simple problems on them. | 20 |
IV    | **Forecasting:** Introduction to sales forecasting, definition, types, applications, need and limitations.  
**Inventory Control:** Introduction, types, objectives, need, terminology used in inventory control, Economic Order Quantity (EOQ), Lot size of production for minimum cost, simple problems on EOQ. | 20 |

**Text Book and/or Reference Material**

0. Industrial Engineering and Management by D. Ravi Shankar (Galgotia Pub.)  
1. Industrial Engineering and Production Management by M. Mahajan (Dhanpat Rai Pub.)  
2. Industrial Engineering and Management by O.P. Khanna (Dhanpat Rai Pub.).  
3. Industrial Management by H.S. Bawa  
4. Industrial Management by Mittal
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, Polytechnic</td>
<td>BME-602</td>
<td>Machine Design</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>INTRODUCTION</strong>&lt;br&gt;Design: Definition, type of designs, necessary of design&lt;br&gt;Design procedure.&lt;br&gt;Practical Examples related with design procedure.&lt;br&gt;Characteristics of a good designer.&lt;br&gt;Design terminology: Stress, strain, factor of safety, factors affecting factor of safety, stress concentration, methods to reduce stress concentration, fatigue, endurance limit.&lt;br&gt;General design considerations, codes and standards. Selection of materials</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td><strong>DESIGN OF SHAFT</strong>&lt;br&gt;Design of shaft: Types of shaft materials, types of loading, effect of keyway on shaft strength, design of shaft under various types of loading.&lt;br&gt;<strong>DESIGN OF KEYS AND COUPLINGS</strong>&lt;br&gt;Design of keys: Types, Materials, function and design of keys.&lt;br&gt;Necessity, advantages and types of couplings, design of Oldham and flanged couplings (Protected and unprotected)</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td><strong>DESIGN OF JOINTS</strong>&lt;br&gt;Types of joints, Temporary and permanent, utility of joints, design of simple cotter and Knuckle joint.&lt;br&gt;Welded Joints: Types of welded joints, strength of parallel and transverse fillet welds, strength of combined parallel and transverse welds under axial loading.&lt;br&gt;Riveted Joints: Leak proofing of riveted joints caulking and fullering&lt;br&gt;Different modes of failure of riveted joint.&lt;br&gt;Design of riveted joints: lap and butt joints.&lt;br&gt;Design of boiler joints i.e circumferential and longitudinal joints</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td><strong>SPRINGS</strong>&lt;br&gt;Introduction, Types of spring, Material for helical spring, standard size of spring wire, Terms used in compression spring, end connection for compression helical springs, end connection for tension helical springs, stresses in helical springs of circular wire, energy stored in helical string of circular wire, stress &amp; deflection in helical spring of non-circular wire, construction of leaf spring, equalved stresses in spring levers (Nipping) length of leaf spring leaves, simple problems</td>
<td>20</td>
</tr>
</tbody>
</table>

**Text Book and/or Reference Material**

1. Machine Design by S.K. Bhandari
### Diploma in Mechanical Engineering (Production)  
Special BOS 28-3-2019  
Annexure III- B

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BPE-601</td>
<td>Manufacturing Technology</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4 - -</td>
</tr>
</tbody>
</table>

#### Course Assessment Method
1. Course Work: 10 Marks  
2. Mid Semester Exam: 15 Marks, 01 Hour  
3. End Semester Exam: 75 Marks, 02 Hour

#### UNIT

<table>
<thead>
<tr>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Introduction: Metal working as a metal shaping method-its advantage and scope, Recrystallization process (Brief idea) Rolling: Elementary theory of Rolling: - Flat rolling, roll force and power requirement (without derivation), Materials for rolling and rolls. Characteristics of Rolling: Draught and reduction, contact area, contact angle (without derivation) hot rolling and cold rolling, Pack rolling, defects in roll plates and sheets rolling Mills: Types of rolling mills, lubricants in rolling, thread rolling: flow chart of rolled stock production. Drawing: Wire drawing process, wire drawing dies, die materials, rod drawing, tube drawing lubricants, defects and remedies in drawing process.</td>
<td>15</td>
</tr>
<tr>
<td>II Extrusion: Introduction, types of extrusion: direct, Indirect, hydrostatic &amp; tube extrusion (only brief idea) extrusion forces (without derivation), hot and cold extrusion, impact extrusion, die design (without derivation) die materials and lubrication, Principle, merits and demerits of hydrostatic extrusion defects, Extrusion equipment: - Presses die. Forging: Introduction, types of forging: open die forging, closed die forging, precision forging, coining, forging force (without derivation). Related forging operations: Heading Piercing hobbling forging die design and geometry (without derivation) die materials and lubrication, forging defects.</td>
<td>20</td>
</tr>
</tbody>
</table>

#### Text Book and/or Reference Material
1. Materials and Manufacturing Technology. by Kalpakjian  
2. Workshop and Technology Vol-I: by S.K Hajara
## Diploma in Mechanical Engineering (Production)

**Course Title:** Machine Tools & Maintenance  
**Course No.:** BME-604

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I MILLING MACHINE</td>
<td>Introduction, classification and specifications. Description of main parts of column &amp; Knee type, Horizontal and vertical spindle milling machines. Milling cutters: types and specifications. Operations performed on milling machines.</td>
<td>15</td>
</tr>
<tr>
<td>III INSTALLATION AND TESTING OF MACHINES</td>
<td>Introduction, reading of information manual, Location, Foundation for machine tools, Different types of machine foundations, Factors affecting the type and size of foundation, Foundation plan (Erection drawing), Preparing the foundation, Damping and isolation of vibration, Erection and transportation, Levelling and aligning. Introduction, Sites for testing, Measuring instruments used for alignment test, Alignment test on lathe machine, drilling machine and milling machine.</td>
<td>20</td>
</tr>
<tr>
<td>IV RELIABILITY ENGINEERING</td>
<td>Basic concept and importance of reliability, failure rate, mean time to failure (MTTF), mean time between failures (MTBF), System reliability, Reliability analysis, Reliability improvement, availability and maintainability of mechanical system; Types and causes of failure. Failure analysis MAINTENANCE</td>
<td>20</td>
</tr>
<tr>
<td>IV MAINTENANCE</td>
<td>Maintenance objectives and types, Role of maintenance engineer, Maintenance procedure, need of planned maintenance, recent developments in maintenance engineering, maintenance of various machine parts (belt drive, chain drive, gear drive and shaft coupling). Maintenance stages of Pipes and pipe joints, pumps and lathe machine, Maintenance records, Computerization of maintenance. Reasons of equipment replacement, group replacement, replacement in anticipation of failure. Guidelines in replacement studies and methods of replacement studies.</td>
<td>20</td>
</tr>
</tbody>
</table>

### Text Book and/or Reference Material

### Diploma in Mechanical Engineering (Production)

#### Special BOS 28-3-2019

#### Annexure III-B

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BCE-605</td>
<td>Environmental Science and management</td>
<td>Elective</td>
<td>Theory</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

#### Text Book and/or Reference Material
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-605 (B)</td>
<td>Non-Conventional Energy Source</td>
<td>Elective</td>
<td>Theory</td>
<td>4 - -</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
</table>
| I    | **Energy and its Sources**  
Introduction to the Energy and present energy crises. Conventional Energy Sources and limitations of using these sources. The need of Non-Conventional Energy Sources (NCES). Introduction to various non-conventional i.e. renewable energy sources. Comparison of NCES with the conventional source. Advancements made in recent time. | 15    |
| II   | **Nuclear Power Reactors and MHD Systems**  
| III  | **Solar Energy and Geothermal Energy**  
| IV   | **Geothermal Energy and MHD Systems**  

**Text Book and/or Reference Material**

1. “Non-conventional energy sources”, G. D. RAI, Khanna Publisher, New Delhi.
2. “Non-conventional resources of energy”, G. S. SAWHNEY, PHI Learning Pvt. Ltd.
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-602 (C)</td>
<td>Total quality management</td>
<td>Elective</td>
<td>Theory</td>
<td>3 - -</td>
</tr>
</tbody>
</table>

### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

Text Book and/or Reference Material
Diploma in Mechanical Engineering(Production)  
Special BOS 28-3-2019  
Annexure III- B

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-691</td>
<td>Workshop Practice-VI</td>
<td>Compulsory</td>
<td>Practical</td>
<td>-  -  6</td>
</tr>
</tbody>
</table>

Course Assessment Method
1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

Topics Covered

MACHINE SHOP
1. Threading, Drilling & Knurling on lathe machine
2. Angular machining on Shaper.
3. Key Way Cutting boring on slotting machine
4. To Grind Lathe Tools (All Angles), Shaper/Planer Tools and drill bit.
5. Spur Gear Cutting on milling machine.

WELDING SHOP
1. Practice of Welding pipe joints, Pipes
2. Study of Welding defects.

FOUNDRY SHOP
1. Moulding and casting practice
2. Cleaning, inspection and non-destructive testing:
   • Dye penetration test for casting
   • Magnetic flaw detection test/ Ultra sound flaw detection test for castings.

CNC MACHINE TOOLS LAB
Program feeding, editing, Simulation and execution for different operations.
1. Linear interpolation and circular interpolation on milling machine.
2. Point to point drilling process on milling.
3. Grooving and threading on CNC lathe machine.

Text Book and/or Reference Material
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BPE-691</td>
<td>Tool Engg. Lab</td>
<td>Compulsory</td>
<td>Practical</td>
<td>-</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

**Topics Covered**

Practical Exercises on production of the following:

1. Drill Jigs.
2. Welding Fixture.

Note: Type of Jigs and Fixtures will be decided by the teachers as per availability of materials in the workshop.

**Text Book and/or Reference Material**
## Diploma in Mechanical Engineering (Production)  
Special BOS 28-3-2019  
Annexure III-B

### Department
- MES, University Polytechnic

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME-694</td>
<td>Project</td>
<td>Compulsory</td>
<td>Practical</td>
<td>-</td>
</tr>
</tbody>
</table>

### Course Assessment Method
1. Course Work: 80 Marks  
2. End Semester Exam: 40 Marks, 02 Hour

### Topics Covered
1. Students shall complete the project work as they have allotted in V semester.  
2. The project shall be completed and submitted at least one month before the last teaching day of the VI semester, date of which shall be notified in the academic calendar.  
3. The assessment of performance of students should be made in VI semester and shall be of 80 marks. The student shall present the final project live as also using overheads project or power point presentation on LCD to the internal examiners as also the external examiner.  
4. The evaluation committee shall consist of faculty members constituted by the college, which would comprise of at-least three members, the student’s guide, one internal examiner & one external examiner passed by Board of studies. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately to the controller of examinations in a sealed envelope.

### Text Book and/or Reference Material
### Course Assessment Method

1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

### UNIT

<table>
<thead>
<tr>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>This course is aiming to provide hands on training in AutoCAD/CREO/Solid Edge/NX(Solid Edge/NX-Combined or Optionally Available)</td>
<td></td>
</tr>
</tbody>
</table>

### Text Book and/or Reference Material
## Diploma in Mechanical Engineering (Refrigeration & A/C)

### Special BOS 28-3-2019

**Annexure III- B**

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-501</td>
<td>Industrial Engineering</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4 - -</td>
</tr>
</tbody>
</table>

### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

### UNIT Topics Covered

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>INDUSTRIAL MANAGEMENT: Introduction to industrial management, Management of men material and machines, Scientific management and its principles, Functions of management, Structure of industrial organization, Types and applications.</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td>FINANCIAL MANAGEMENT: Sources of finance, Elements of costs, Prime cost, Factory cost, Other overheads, Total cost, selling price and problems on them Depreciation, Classification and methods of providing depreciation, Problems.</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>WAGES AND INCENTIVES: Job evaluation and merit ratings, Definition and objectives, Ranking and point rating methods, Introduction to wages, Types of wages, Introduction to incentives, Types of incentives, Problems based on Halsey and Rowan systems.</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>HUMAN RESOURCE MANAGEMENT: Objectives of HRM, Staff development, Training strategies and methods.</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>ACCIDENTS: Introduction, Classification, Causes and Effects of accidents, Types of industrial hazards.</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>ENTREPRENEURSHIP DEVELOPMENT: Concept of entrepreneurship, Characteristics of entrepreneur, Role of Entrepreneur, Role of entrepreneurs in Economic Development; Entrepreneurship in India, Entrepreneurship – its Barriers, Preparation of project report, Steps of planning a small to medium enterprises. (SMEs).</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>MOTIVATION AND LEADERSHIP: Definition of motivation, Methods for improving motivation, Definition of leadership, Functions of leadership, Manager as a leader.</td>
<td></td>
</tr>
</tbody>
</table>

### Text Book and/or Reference Material

1. Industrial Engineering and Production Management by Mart and Telsang (S. Chand Pub.)
2. Industrial Engineering and Management by D. Ravi Shankar (Galgotia Pub.)
3. Industrial Engineering and Production Management by M. Mahajan (Dhanpat Rai Pub.)
4. Industrial Engineering by N.J. Manek (Laxmi Pub.)
5. Industrial Engineering and Management by O.P. Khanna (Dhanpat Rai Pub.)
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-502</td>
<td>Hydraulics &amp; Pneumatics</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4</td>
</tr>
</tbody>
</table>

Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

UNIT | Topics Covered | Marks |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Introduction: Fluid, types of fluids, Difference between fluid mechanics and hydraulics. Properties of Fluid: Mass density, weight density (specific weight), specific volume, specific gravity, viscosity, kinematic &amp; dynamic viscosity, surface tension, and their units. Intensity of pressure, pressure bead, center of pressure, total pressure on horizontal &amp; vertical flat surfaces (without proof) and simple problems on them. Pressure Measurement: Pressure (Atmospheric, Gauge, Absolute, Vacuum), Pascal’s law and its paradox. Pressure Measuring Devices: Piezometric tube, simple manometer, differential manometer, inverted differential manometer, simple problems on them.</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td>Flow of fluids: Types of fluid flow, steady &amp; unsteady, uniform &amp; non-uniform, laminar &amp; turbulent flows, rate of flow &amp; its units, continuity equation for I-D steady flow, Reynolds no &amp; its significance, Energy of liquid in motion total energy, velocity head, pressure head, potential head, Bernoulli’s theorem (Statement &amp; proof), its applications &amp; assumptions, discharge measurement with the help of venturimeter, problem on the same.</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td>Flow through Orifices: Types of orifices, hydraulic coefficients, relationship between Cc, Cv&amp; Cd, Vena-contracts. Flow through Pipes: Minor &amp; major losses, loss of head in pipes due to sudden enlargement, sudden contraction, obstruction in flow path and pipe fitting (without proof), problems, water hammering in pipes &amp; surge tanks.</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td>Hydraulic Machines: Concept of hydraulic pumps, construction and working of centrifugal pumps and reciprocating pumps, Selection of pumps. Concept of hydraulic Turbines- Classification, construction &amp; description of main components of Pelton, Francis &amp; Kaplan Turbines. Description and application of hydraulic ram, hydraulic accumulator and hydraulic press. Pneumatic System: Basic elements of pneumatic system and their functions such as- Air Compressor (Types &amp; selection), generation of compressed air, Air-filters, Pressure regulators and Lubricators, their necessity in pneumatic circuits, Application of Pneumatics, Characteristic / features of pneumatic system. Pneumatic valves, pneumatic actuators (Brief idea only), pneumatic system safety, cleanliness and preventive maintenance.</td>
<td>20</td>
</tr>
</tbody>
</table>

Text Book and/or Reference Material

7. Hydraulic & Hydraulic Machines by Bansal.
# Course: Applied Thermodynamics

**Department**: MES, University Polytechnic  
**Course No.**: BME-503  
**Course Title**: Applied Thermodynamics  
**Course Designation**: Compulsory  
**Course Type**: Theory  
**Contact Hours**: 4  

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
</table>
| I    | Gas Power and Vapour Power Cycles  
Vapour power cycles: Carnot cycle and Rankine cycle. Comparison of Rankine cycle with Carnot cycle. Use of Mollier diagram, Problems. | 15 |
| II   | Steam Nozzles, Turbines and Condensers  
**Steam nozzles**: Introduction. Types of nozzles, velocity of steam at exit of the nozzle, mass of steam discharge through nozzle, condition of maximum discharge through a nozzle, maximum discharge through a nozzle. Problems  
**Steam turbines**: Principal of operation of impulse and reaction turbines. Pressure, Velocity and Pressure-velocity compounding, their advantages. Steam condensers: Functions of condenser in a steam power plant. Types of condenser. Comparison of jet and surface condenser. Quantity of cooling water required. Effects of air leakage in condenser. Problems. | 20 |
| III  | Air Compressors  
| IV   | I.C. Engine and Gas Turbine  

**Text Book and/or Reference Material**

### Course Assessment Method

1. Course Work: 10 Marks  
2. Mid Semester Exam: 15 Marks, 01 Hour  
3. End Semester Exam: 75 Marks, 02 Hour

### UNIT Topics Covered Marks

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>Refrigeration Cycles</strong>: Principles of refrigeration, unit of refrigeration, various methods of refrigeration. Air refrigeration systems – Reversed Carnot and Bell Coleman cycles. Vapour compression refrigeration system and analysis of its cycle. Effects of sub cooling and superheating. Vapour absorption refrigeration system.</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td><strong>Refrigeration Components and Refrigerants</strong>: Refrigeration components and controls such as Compressor, Condenser, Evaporator and Throttling valve and Thermostat. Introduction to refrigerants and their desirable properties, primary and secondary refrigerants. Nomenclature of refrigerants. Important properties of some common refrigerants such as R-11, R-22, R-502, R-134a and NH3.</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td><strong>Psychometric</strong>: Psychometric properties of air, psychrometric processes and their representation on psychrometric chart. Bypass factor, Mixing of air streams. Brief idea of metabolism 20 in human body. Introduction to human comfort and comfort air conditioning.</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td><strong>Load Calculations, HVAC and Air-distribution Systems</strong>: Air conditioning load calculations; Cooling and heating load calculations. Description of various types of loads – sensible and latent heat loads, sensible heat factor, Apparatus dew point. HVAC classification of air conditioning systems. Air distribution systems; Simple description of filters, dampers, fans, blowers, air resisters (Grilles).</td>
<td>20</td>
</tr>
</tbody>
</table>

### Text Book and/or Reference Material

### Course Title: Production Technology-III

**Course Designation:** Compulsory  
**Course Type:** Theory  
**Contact Hours:** 4 - -

### Course Assessment Method
1. Course Work: 10 Marks  
2. Mid Semester Exam: 15 Marks, 01 Hour  
3. End Semester Exam: 75 Marks, 02 Hour

### UNIT Topics Covered Marks

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
</table>
| I    | **GRINDING MACHINES**  
Introduction; Classification of Abrasives; Basic concept of Bond, Grit, Structure and Grade of Abrasives; Selection of grinding wheel; Trueing and Dressing of Grinding wheel;  
Specification of grinding wheels; Grinding Machines: Brief description of Cylindrical grinder, Centre-less grinder; Surface grinder, Tool and Cutter grinder. | 15    |
| II   | **JIGS AND FIXTURES:** Introduction; Difference between a jig and a fixture; Important considerations in jig and fixture design; Main elements of jigs and fixtures.  
Clamping & locating devices types of jigs. Brief idea of milling & grinding fixture  
**CAPSTAN AND TURRET LATHES**  
Introduction; Principal Parts of Capstan and Turret lathes; Differences between a Turret and a Capstan Lathe; Tool layout.  
**BROACHING AND BROACHING MACHINES**  
Introduction; Classification of Broaches; Principle of Broaching; Methods of Broaching; Classification of Broaching machines; Broaching versus other machining operations; Applications of Broaching. | 20    |
| III  | **NUMERICAL CONTROL MACHINE TOOLS:**  
Introduction; Elements of NC machine tool system; Brief description and classification of NC systems; Basic concept of manual and computer assisted part-programming.  
**ROBOTS:**  
Introduction; Main components of a robot; Applications of robot. | 20    |
| IV   | **UNCONVENTIONAL METHODS OF MACHINING**  
Introduction; Classification of unconventional machining methods; Common unconventional machining methods; Brief description of Electro-Discharge machining (EDM) and Electro-Chemical machining.  
**POWDER METALLURGY:** Brief description; Applications, advantages and disadvantages of powder metallurgy | 20    |

### Text Book and/or Reference Material
3. Mfg. Engg & Technology: By Kalpakjian  
5. CNC machines: By M. Adithan  
### Course Assessment Method

1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

### Topics Covered

#### MACHINE SHOP
Demonstration and study of lathe and shaper.

1. Step turning, parallel Turning, Taper turning and Grooving.

#### WELDING SHOP

1. Study of various Gas cutting and welding equipment: -Welding transformer, Generator/rectifier, Gas cylinder, Gas cutting machines, Cutting torches etc., various electrodes and filler metals and fluxes.
2. TIG Welding practice of Non-Ferrous metals, like Copper, Brass and Aluminium.
3. Practice of Gas cutting manually.
4. Practice of MIG welding
5. Practice of stud welding
6. Practice of gas welding.
7. Practice of Arc cutting.
   Note: Any three jobs to be completed

#### FOUNDRY SHOP

1. Making sands moulds of different forms with different types of pattern using- (i) Floor Moulding.
   (ii) Three Box (or more) Moulding.
2. Making and setting of cores of different types.
3. Casting practice of Nonferrous metals.

#### CNC MACHINE TOOLS LAB

1. Study and sketch of CNC lathe and milling machine.
2. Study of G codes and M codes.
3. Part programming, for different operations.

Programme editing & simulation on CNC lathe and milling machine.

### Text Book and/or Reference Material

3. CNC machines: By M. Adithan
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BRA-591</td>
<td>Refrigeration &amp; Air Conditioning Lab-I</td>
<td>Compulsory</td>
<td>Practical</td>
<td>-</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

**Topics Covered**

Practical Exercises on the following

1. Refrigeration Cycle Demonstrator.
2. Window Air Conditioning Trainer.
3. Domestic Refrigeration Trainer.
5. Refrigeration Control Display Board.
6. Refrigeration & Air Conditioning Tools such as.
   - Gus Charging Unit
   - Capillary Tube Cutter
   - Pipe Cutter
   - Tubing tool kit (flaring tools and tools for expending tube).
   - Pinch Off Plier.
   - Curving Pliers.
   - Pipe Bender Set.
   - Flexible Gas charging Line.
   - Pressure Gauge.
   - Vacuum Gauge.
   - Tong Tester.
   - Gas Wilding Kit.

Note: Number of Experiments depends upon the availability of equipment and time.

**Text Book and/or Reference Material**
### Course Assessment Method

1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

### Topics Covered

**GUIDELINES**

i. Project will have to be done by a group comprising of maximum ten students only in their area of interest.

ii. Each group has to select a contemporary topic that will use the technical knowledge of their program of specialization.

iii. Allocation of the guides preferably in accordance with the expertise of the faculty.

iv. The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the IV semester.

v. The number of projects that a faculty can guide would be limited to two groups.

vi. The project can be carried out on-campus or in an industry or an organization with prior approval from the Principal through Section Incharge.

vii. The project shall be finalized by the students before the start of the V semester and shall be completed and submitted at least one month before the last teaching day of the VI semester, date of which shall be notified in the academic calendar.

viii. The assessment of performance of students should be made at least twice in each semester i.e. V and VI and each internal assessment shall be for 80 marks. The student shall present the final project live as also using overheads project or power point presentation on LCD to the internal examiners as also the external examiner.

ix. The evaluation committee shall consist of faculty members constituted by the college which would comprise of at-least three members comprising of the student’s guide, one internal examiner & one external examiner passed by Board of studies. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately to the controller of examinations in a sealed envelope.

### Text Book and/or Reference Material
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-595</td>
<td>Hydraulics Lab</td>
<td>Compulsory</td>
<td>Practical</td>
<td>-</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

**Topics Covered**

Practical Exercises on the following
1. Bernoulli’s Theorem
2. Orifice Meter / Venturi Meter.
4. Coefficient friction of Pipe Line.
5. Reynolds Experiments.
6. Mouth piece.
7. Easy & Sharp bend.
8. Rectangular / Triangular Notch.
11. Francis Turbine.
13. Reciprocating Pump.
15. Pneumatic Bench.

Note:
1. Number of Experiments depend upon the availability of equipment and time.
2. Any eight experiments to be completed in Production/ R.A.C / Plastic Tech

**Text Book and/or Reference Material**
## Diploma in Mechanical Engineering (Refrigeration & A/C)

### Special BOS 28-3-2019

Annexure III- B

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-601</td>
<td>Industrial Management &amp; Entrepreneur Development</td>
<td>Compulsory</td>
<td>Theory</td>
<td>L</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

### UNIT

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>Introduction to Industrial Engg.</strong>: Definition, Application and Industry Classification. <strong>Production and Productivity</strong>: Definition, Production system, its characteristics, Product Life Cycle, Factors influencing productivity and measurement of productivity. <strong>Plant Location</strong>: Introduction, Factors affecting plant location. <strong>Plant Layout</strong>: Definition, Types of layouts, advantages and disadvantages of different layouts. <strong>Material Handling</strong>: Introduction, Material handling equipment, their types, functions and selection.</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td><strong>Work Study</strong>&lt;br&gt;<strong>Method Study</strong>: Definition, objectives and need of method study, Role of method study in improving productivity, Procedure of conducting method study, Process charts and diagrams, Process chart symbols, (Flow process chart, Multi-activity chart, Right and Left-hand chart and flow diagram), Examples. Introduction to Therbligs. <strong>Time Study</strong>: Definition, Objectives and procedure of conducting time study, System of performance rating, various allowances, Calculation of standard time. <strong>Ergonomics</strong>: Definition, objectives and applications, Design of workplace layout, Man-Machine system, Role of work environment on human performance.</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td><strong>Planning and Control</strong>: An introduction to production, planning and control, its need and objectives, comparison between production planning and production control, Concept of Scheduling, Routing, Dispatching and Expediting, Techniques/methods of PPC like CPM and PERT, terminology related with CPM and PERT, Simple problems on them. <strong>Break Even Analysis</strong>: Introduction, Break-even chart, Break-even point, Margin of safety, Simple problems on them.</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td><strong>Forecasting</strong>: Introduction to sales forecasting, definition, types, applications, need and limitations. <strong>Inventory Control</strong>: Introduction, types, objectives, need, terminology used in inventory control, Economic Order Quantity (EOQ), Lot size of production for minimum cost, simple problems on EOQ.</td>
<td>20</td>
</tr>
</tbody>
</table>

### Text Book and/or Reference Material

1. Industrial Engineering and Management by D. Ravi Shankar (Galgotia Pub.)
2. Industrial Engineering and Production Management by M. Mahajan (Dhanpat Rai Pub.)
3. Industrial Engineering and Management by O.P. Khanna (Dhanpat Rai Pub.).
4. Industrial Management by H.S. Bawa
5. Industrial Management by Mittal
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-602</td>
<td>Machine Design</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>INTRODUCTION</strong>&lt;br&gt;Design: Definition, type of designs, necessary of design&lt;br&gt;Design procedure.&lt;br&gt;Practical Examples related with design procedure.&lt;br&gt;Characteristics of a good designer.&lt;br&gt;Design terminology: Stress, strain, factor of safety, factors affecting factor of safety, stress concentration, methods to reduce stress concentration, fatigue, endurance limit.&lt;br&gt;General design considerations, codes and standards. Selection of materials</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td><strong>DESIGN OF SHAFT</strong>&lt;br&gt;Design of shaft: Types of shaft materials, types of loading, effect of keyway on shaft strength, design of shaft under various types of loading.</td>
<td>20</td>
</tr>
<tr>
<td>II</td>
<td><strong>DESIGN OF KEYS AND COUPLINGS</strong>&lt;br&gt;Design of keys: Types, Materials, function and design of keys.&lt;br&gt;Necessity, advantages and types of couplings, design of Oldham and flanged couplings (Protected and unprotected)</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td><strong>DESIGN OF JOINTS</strong>&lt;br&gt;Types of joints, Temporary and permanent, utility of joints, design of simple cotter and Knuckle joint.&lt;br&gt;Welded Joints: Types of welded joints, strength of parallel and transverse fillet welds, strength of combined parallel and transverse welds under axial loading.&lt;br&gt;Riveted Joints: Leak proofing of riveted joints caulking and fullering&lt;br&gt;Different modes of failure of riveted joint.&lt;br&gt;Design of riveted joints: lap and butt joints.&lt;br&gt;Design of boiler joints .i.e circumferential and longitudinal joints</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td><strong>SPRINGS</strong>&lt;br&gt;Introduction, Types of spring, Material for helical spring, standard size of spring wire, Terms used in compression spring, end connection for compression helical springs, end connection for tension helical springs, stresses in helical springs of circular wire, energy stored in helical string of circular wire, stress &amp; deflection in helical spring of non-circular wire, construction of leaf spring, equavalent stresses in spring levers (Nipping) length of leaf spring leaves, simple problems</td>
<td>20</td>
</tr>
</tbody>
</table>

**Text Book and/or Reference Material**

1. Machine Design by S.K. Bhandari
### Diploma in Mechanical Engineering (Refrigeration & A/C)

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BRA-601</td>
<td>Refrigeration air-conditioning-II</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks  
2. Mid Semester Exam: 15 Marks, 01 Hour  
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>COMPRESSIONERS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RECIRCULATING COMPRESSIONERS: Construction and arrangement of cylinders, types and contraction of piston, suction and discharge value (types and construction), poppet plate valves, ring plate valves, flexing valves, valve location, bore and stroke relation of a compressor. Construction of cranks, connecting rod, crank shaft seal and gaskets, lubricants, their properties, Lubrication recommendations, (Small systems, industrial refrigeration, miscellaneous equipment) methods of lubrication, Liquid refrigerant in compressor crank case. Method of reducing oil foaming at the compressor start.</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>ROTARY COMPRESSIONERS: Construction and working, cylinder construction and fitting rotor construction, blade construction, crank shaft construction, valve construction, crank shaft seal and gaskets. Lubrication of rotary compressors.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CENTRIFUGAL COMPRESSIONERS: Construction and working of compressor, sealed unit ruffles and their advantages hermetic rotary compressor, regulation of compressor capacity, starting of compressor, Shutting down of a compressor.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>COMPRESSOR DRIVES: Reciprocating compressor drives, open and hermetic compressor drives, compressor drive. Compressor performance.</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>CONDENSERS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Definition, type of condensers, air cooled water cooled and evaporator type.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Air cooled condensers- Natural convection, mechanically cooled finned tube, Plate type, Wire mesh, induced and forced type, Chassis mounted and remote type, air quantity and velocity for an air cooled condenser and rating and selection of air cooled condensers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EVAPORATIVE CONDENSERS: Induced and forced type rating and selection of evaporative condenser. By pass and its advantages, water regulating valves, condenser controls, winter starts, condenser and tower maintenance.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>REFRIGERANT FLOW CONTROLS: Type of expansion valves, hand expansion valve, automatic expansion valves, pressure limiting valve gas charge expansion valve multi-outlet valves and distributors, multi distributor, pressure drop type.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EVAPORATORS AND COOLERS: Definition, design, over all heat transfer co-efficient, L.M.T.D., Evaporator T.D., Effect of evaporator selection. Types space humidity, other factor of construction, Bare tube, plate surface and finned natural convection evaporators. Rating and selection of natural convection evaporator evaporators. Forced convection evaporators rating and selection of unit coolers, liquid chilling evaporators (chillers), double pipe coolers, advantage, disadvantage, application.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AIR CONDITIONING SYSTEM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Unit air conditioning system (window air conditioning system), remote and split air conditioning.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Package air conditioning system.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>i. Package A.C. with water cooled condenser.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii. Package A.C. with air cooled condenser.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Central Air Conditioning System</td>
<td></td>
</tr>
<tr>
<td></td>
<td>i. D.X system with air handling unit.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii. Chilled and hot water system with fan coil unit.</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>FLUID FLOW, DUCT DESIGN AND AIR DISTRIBUTION SYSTEM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pressure drop through duct, conversion from circular section to rectangular section duct design –Equal friction loss (pressure drop) method, the static regain method, velocity reduction method, Advantages and Disadvantages of the above methods.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AIR DISTRIBUTION SYSTEM: Duct system the perimeter system, perimeter loops system and radial perimeter system.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AIR CONDITIONING EQUIPMENTS: Air contaminants, purpose and methods of air cleaning, Different types of air filters and humidifiers, Fans and Blowers, grills and registers.</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>HEAT RECOVERY SYSTEM AND HEAT PUMP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Hot gas heat reclaim with de-superheter.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Heat recovery with parallel condensers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Heat well, basic principle of heat pump, heat source and sink, Handling of peak heating loads. Application of heat pump, co-efficient of performance of heat.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AIR FILTERS: Dry filter, viscous filter, wet filters, centrifugal dust collector, electric filter.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HUMIDIFIERS: Steam humidifier, Atomization, type humidifiers, forced Evaporation humidifier, air washer humidifier capillary type humidifier.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FAN AND BLOWERS: Axil flow Radial flow fan, fan laws, selection of fan.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EVAPORATIVE COOLING: Evaporative cooling –Thermodynamic of evaporative cooling, types of evaporative collars- Spray type, Pad type, Rotating type, Efficiency of evaporative cooling, Limitation of evaporative cooling, Indirect or, Modified evaporative cooling system.</td>
<td></td>
</tr>
</tbody>
</table>

**Text Book and/or Reference Material**

1. Refrigeration & Air Conditioning by S.C. Arora.  
2. Basic Refrigeration & Air Conditioning By P.N. Ananthanarayan.  
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BRA-602</td>
<td>Erection, servicing and maintenance</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4 - - -</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

**UNIT** | **Topics Covered** | **Marks**
--- | --- | ---
I | Layout and Erection of Refrigeration Plant: Need based layout of the plant, installation of different components, Estimation & costing of the need based of refrigerant & water piping, pipe fittings & valves, observation of safety codes of refrigeration & air-conditioning plants (ISI). | 15
II | Servicing and Maintenance of the Refrigeration Plant: Dehydrating, charging , pump down, Simple gas and electric welding, soldering, brazing etc., servicing , overhauling and testing of compressors ( open and sealed type) maintenance of condenser, receiver, servicing of expansion and solenoid valves, servicing & overhauling of refrigerators, installation care & maintenance of ice cream making plant & milk cooling plant. Maintenance of Equipments: Maintenance, objectives and types (Routine and preventive maintenance) maintenance of centrifugal pump & accessories, repair & maintenance of cooling tower, refrigerated trucks, fluid chillers, blast freezers, multiple plate freezers, contact freezers, Window and split air-conditioners. | 20
IV | Commissioning & Performance of an Air-conditioning plant: General building construction, occupancy and other loads, check room temperature, proper cooling outside temperature conditions, air noise level, foundation of Refrigeration plant vibrations, primary & secondary chilled water circuits, Testing of air-conditioning plant. Balancing of Air & waterside systems, balancing of grills, Adjustment of dampers, check return air to unit, performance evaluation, actual capital cost, operation and maintenance cost. | 20

**Text Book and/or Reference Material**

1. Refrigeration & Air Conditioning by S.C Arora.
4. Refrigeration & Air Conditioning by C.P.Arora.
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BCE-605 (a)</td>
<td>Environmental Science and Management</td>
<td>Elective</td>
<td>Theory</td>
<td>3</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

**Text Book and/or Reference Material**
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-605(b)</td>
<td>Non-Conventional Energy Sources</td>
<td>Elective</td>
<td>Theory</td>
<td>3</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

**UNIT Topics Covered**

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Conventional and Non-conventional energy Sources&lt;br&gt;The need of Non-Conventional Energy Sources. Introduction to various renewable energy sources. Comparison of NCES with the conventional sources – their merits and demerits. Advancements made in recent time.</td>
<td>15</td>
</tr>
<tr>
<td>III</td>
<td>Wind and Tidal Energy&lt;br&gt;Introduction and basic principles of wind energy conversion. Wind data and energy estimation. Wind energy conversion systems. Site selection considerations. Application of wind energy&lt;br&gt;Basics principles of tidal energy, components of tidal power plants, site requirements, Advantages and limitations of tidal power generation.</td>
<td>20</td>
</tr>
</tbody>
</table>

**Text Book and/or Reference Material**

1. “Non-conventional energy sources”, G. D. RAI, Khanna Publisher, New Delhi.
2. “Non-conventional resources of energy”, G. S. SAWHNEY, PHI Learning Pvt. Ltd.
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-605 (c)</td>
<td>Total Quality Management</td>
<td>Elective</td>
<td>Theory</td>
<td>3 - -</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

**Text Book and/or Reference Material**
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BRA-691</td>
<td>Refrigeration &amp; Air Conditioning Lab-II</td>
<td>Compulsory</td>
<td>Practical</td>
<td>-</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

**Topics Covered**

Practical Exercises on the following.

1. General Cycle Refrigeration Trainer (medium temp. application)
2. Industrial Refrigeration Trainer Bench.
3. Windows Air Conditioning Trainer.
4. Air Conditioning Trainer Recalculating type.
5. Centralized Air Conditioning Trainer.
6. Ice Plant Absorption Refrigeration Trainer.
7. Water Cooler Trainer.
10. Air Expansion Refrigeration Trainer.
11. Cascade Refrigeration Trainer
12. Desert Cooler Trainer.
15. Steam Jet Refrigeration Test Rig.

Note: Number of Experiments depend upon the availability of equipment and time.

**Text Book and/or Reference Material**
### Diploma in Mechanical Engineering (Refrigeration & A/C)

**Special BOS 28-3-2019**  
**Annexure III- B**

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BRA-692</td>
<td>Erection, Servicing &amp; Maintenance Lab</td>
<td>Compulsory</td>
<td>Practical</td>
<td>- - 3</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 80 Marks  
2. End Semester Exam: 40 Marks, 02 Hour

**Topics Covered**

Erection /Installation of the following.
1. Centralize Air Conditioner.  
2. Window Air Conditioner.  
3. Cascade Air Conditioner.  
4. Industrial Refrigeration System.  
5. Variable Refrigerant Flow Air Conditioner  
6. Split Air Conditioner.  

Servicing and Maintenance of the following.
1. All of above.  
2. Water Cooling systems.  
3. Chiller Plant.

Note: Number of Experiments depend upon the availability of equipment and time

**Text Book and/or Reference Material**
Department | Course No. | Course Title | Course Designation | Course Type | Contact Hours |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-694</td>
<td>Project</td>
<td>Compulsory</td>
<td>Practical</td>
<td>- - 3</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

**Topics Covered**

1. Students shall complete the project work as they have allotted in V semester.
2. The project shall be completed and submitted at least one month before the last teaching day of the VI semester, date of which shall be notified in the academic calendar.
3. The assessment of performance of students should be made in VI semester and shall be of 80 marks. The student shall present the final project live as also using overheads project or power point presentation on LCD to the internal examiners as also the external examiner.
4. The evaluation committee shall consist of faculty members constituted by the college, which would comprise of at-least three members, the student’s guide, one internal examiner & one external examiner passed by Board of studies. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately to the controller of examinations in a sealed envelope.

**Text Book and/or Reference Material**
### Course Description

**Department**: MES, University Polytechnic  
**Course No.**: BME-695  
**Course Title**: CAD LAB-II  
**Course Designation**: Compulsory  
**Course Type**: Practical  
**Contact Hours**: - - 3

#### Course Assessment Method
1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

#### Topics Covered
This course is aiming to provide hands on training in AutoCAD/CREO/Solid Edge/NX (Solid Edge/NX-Combined or Optionally Available)  
AutoCAD: 2D Drawing, Isometric and 3D Drawing.  
CREO: Sketcher, Part and Surface Modeling, Assembly and Sheet Metal Design, Drafting and Detailing.  
Solid Edge: Sketcher, Part Modeling, Surface Modeling, Sheet Metal Design, Assembly, Drafting and Detailing.  
NX: Sketcher, Part Modeling, Surface Modeling, Sheet Metal Design, Assembly, Drafting and Detailing.

#### Text Book and/or Reference Material
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BKE-501</td>
<td>Basic Chemical Engg.</td>
<td>Compulsory</td>
<td>Theory</td>
<td>3</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

**Text Book and/or Reference Material**

I. Introduction – Classification of Unit Operations, Examples and applications of key unit operations in the plastic industry.

II. Mechanical size reduction - Description of equipment for size reduction such as Jaw crusher, gyratory crusher, roller crusher and hammer mill. Law of Conservation of Mass - fundamentals of material balance, material balance in batch and continuous process without chemical reactions.


IV. Screening and standard screen series. Drying - Description of natural draft tray dryer, forced draft tray dryer, fluidized bed and rotary dryer.
### Diploma in Engineering (Plastic Technology)

#### Special BOS 28-3-2019

#### Annexure III- B

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BPT-501</td>
<td>Polymer Processing-II</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

#### Department Course No. Course Title Course Designation Course Type Contact Hours

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BPT-501</td>
<td>Polymer Processing-II</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

#### Course Title

**I**
Extrusion: Introduction and principle of extrusion, types of extruders-screw extruder, ram extruder, screw less extruder, Components of screw extruder such as screw, barrel, feed system, heating systems, cooling systems, screen packs, breaker plate, die-adapter etc.

**II**
Screw Design: Screw and its design, L/D ratio and its significance, compression ratio and its significance Selection of screw for different materials, Manufacturing processes for pipe, sheets, blown film, cable and wire covering and monofilaments by extrusion.

**III**
Calendering: Introduction to Calendering, basic principle, materials for Calendering, application of calendaring process, Calender rolls, Calender Designs, Roll heating and cooling systems, Production process with brief description, merits and limitations.

**IV**
Rotational Molding: Basic process and materials, types of rotational molding machine i.e. batch type machine, carousel type machine, straight line machine, jacketed-mould type machine, Application of rotational molding, Material selection for rotational moulding.

#### Text Book and/or Reference Material

---

**Mechanical Engineering Section**, University Polytechnic, AMU Aligarh, India 131
### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BPT-502</td>
<td>Advance Polymer Processing</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4 - -</td>
</tr>
</tbody>
</table>

#### Text Book and/or Reference Material

- Introduction to control system: Importance of control system in polymer processing, Various control devices used in moulding machines, thermocouple, limit switches, reed switches, pressure measuring devices- strain gauge, bourdon tube etc. tachometer, brief introduction to microprocessor control system.

- Introduction to advanced injection moulding techniques: hot-runner injection moulding process, Gas assisted injection moulding process and its application, Multi-colour injection moulding process, Reaction injection moulding process and its applications. Injection molding defects and remedies. Introduction to advanced extrusion techniques: Mechanism of twin screw extrusion and its advantages, counter rotating and co-rotating screws, intermeshing and non-intermeshing screws, advantage of twin screw extrusion, Co-extrusion process, Types of co-extrusion, applications of co-extrusion.

- Introduction to advanced blow-moulding techniques: Blow moulding with multi-parison system, injection stretch blow moulding process, extrusion stretch blow moulding process, advantage and applications of stretch blow moulded products, Defects and remedies of blow moulding.

Department | Course No. | Course Title | Course Designation | Course Type | Contact Hours |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-502</td>
<td>Hydraulics &amp; Pneumatics</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4 - -</td>
</tr>
</tbody>
</table>

### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

### UNIT Topics Covered Marks

**I**
Introduction: Fluid, types of fluids, Difference between fluid mechanics and hydraulics. Properties of Fluid: Mass density, weight density (specific weight), specific volume, specific gravity, viscosity, kinematic & dynamic viscosity, surface tension, and their units. Intensity of pressure, pressure bead, center of pressure, total pressure on horizontal & vertical flat surfaces (without proof) and simple problems on them. Pressure Measurement: Pressure (Atmospheric, Gauge, Absolute, Vacuum), Pascal’s law and its paradox. Pressure Measuring Devices: Piezometric tube, simple manometer, differential manometer, inverted differential manometer, simple problems on them. 15

**II**
Flow of fluids: Types of fluid flow, steady & unsteady, uniform & non-uniform, laminar & turbulent flows, rate of flow & its units, continuity equation for 1-D steady flow. Reynolds no & its significance, Energy of liquid in motion total energy, velocity head, pressure head, potential head, Bernoulli’s theorem (Statement & proof), its applications & assumptions, discharge measurement with the help of venturimeter, problem on the same. 20

**III**
Flow through Orifices: Types of orifices, hydraulic coefficients, relationship between $C_c$, $C_v$ & $C_d$, Vena-contracts. Flow through Pipes: Minor & major losses, loss of head in pipes due to sudden enlargement, sudden contraction, obstruction in flow path and pipe fitting (without proof), problems, water hammering in pipes & surge tanks. 20

**IV**
Hydraulic Machines: Concept of hydraulic pumps, construction and working of centrifugal pumps and reciprocating pumps. Selection of pumps. Concept of hydraulic Turbines- Classification, construction & description of main components of Pelton, Francis & Kaplan Turbines. Description and application of hydraulic ram, hydraulic accumulator and hydraulic press. Pneumatic System: Basic elements of pneumatic system and their functions such as- Air Compressor (Types & selection), generation of compressed air. Air-filters, Pressure regulators and Lubricators, their necessity in pneumatic circuits, Application of Pneumatics, Characteristic / features of pneumatic system. Pneumatic valves, pneumatic actuators (Brief idea only), pneumatic system safety, cleanliness and preventive maintenance. 20

### Text Book and/or Reference Material

7. Hydraulic & Hydraulic Machines by Bansal.
8. A text book of Hydraulics by Bawa
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-505</td>
<td>Production Technology-III</td>
<td>Compulsory</td>
<td>Theory</td>
<td></td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>GRINDING MACHINES</strong>&lt;br&gt;Introduction; Classification of Abrasives; Basic concept of Bond, Grit, Structure and Grade of Abrasives; Selection of grinding wheel; Trueing and Dressing of Grinding wheel; Specification of grinding wheels; Grinding Machines: Brief description of Cylindrical grinder, Centre-less grinder; Surface grinder, Tool and Cutter grinder.</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td><strong>JIGS AND FIXTURES:</strong> Introduction; Difference between a jig and a fixture; Important considerations in jig and fixture design; Main elements of jigs and fixtures; Clamping &amp; locating devices types of jigs. Brief idea of milling &amp; grinding fixture <strong>CAPSTAN AND TURRET LATHES</strong>&lt;br&gt;Introduction; Principal Parts of Capstan and Turret lathes; Differences between a Turret and a Capstan Lathe; Tool layout. <strong>BROACHING AND BROACHING MACHINES</strong>&lt;br&gt;Introduction; Classification of Broaches; Principle of Broaching; Methods of Broaching; Classification of Broaching machines; Broaching versus other machining operations; Applications of Broaching.</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td><strong>NUMERICAL CONTROL MACHINE TOOLS:</strong> Introduction; Elements of NC machine tool system; Brief description and classification of NC systems; Basic concept of manual and computer assisted part-programming. <strong>ROBOTS:</strong> Introduction; Main components of a robot; Applications of robot.</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td><strong>UNCONVENTIONAL METHODS OF MACHINING</strong>&lt;br&gt;Introduction; Classification of unconventional machining methods; Common unconventional machining methods; Brief description of Electro-Discharge machining (EDM) and Electro-Chemical machining. <strong>POWDER METALLURGY:</strong> Brief description; Applications, advantages and disadvantages of powder metallurgy</td>
<td>20</td>
</tr>
</tbody>
</table>

**Text Book and/or Reference Material**

3. Mfg. Engg & Technology: By Kalpakjian
5. CNC machines: By M. Adithan
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BKE-591</td>
<td>Basic Chemical Engg Lab</td>
<td>Compulsory</td>
<td>Practical</td>
<td>2</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

**Topics Covered**

**LIST OF EXPERIMENTS**

1. Analysis of various sizes of given material by sieve analysis
2. Drying of solids in a tray dryer under natural draft conditions
3. Drying of solids in a tray dryer under forced draft conditions
4. Study of fluidized bed dryer
5. Study of continuous flow rotary dryer
6. Determination of overall heat transfer co-efficient in double pipe heat exchanger-parallel flow
7. Determination of overall heat transfer co-efficient in double pipe heat exchanger-counter flow

Note: No of experiments depend upon availability of equipment in the Lab.

**Text Book and/or Reference Material**

4.
Diploma in Engineering (Plastic Technology)

Special BOS 28-3-2019
Annexure III- B

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BPT-591</td>
<td>Polymer Processing Lab-II</td>
<td>Compulsory</td>
<td>Practical</td>
<td>- - 3</td>
</tr>
</tbody>
</table>

**Course Assessment Method**
1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

**Topics Covered**

Practical Exercises on the following

1. To make a bag, identity card, file cover of different polymeric sheet by heat sealing method and prepare a quality control chart.
2. To study and operate of the plastic granulator.
3. To calculate the energy consumed in grinding the given plastic material and to draw the graph energy versus time.
4. Repair and maintenance of scrap grinding machine.
5. To study and operate the single screw extruder.
6. To make a plastic strip of 5 metre length from the given material.
7. To study the effect of screw rpm over output rate of the given single screw extruder (Barrel dia: 19.0 mm).
8. To change the die in a single screw extruder.
9. To assemble the blown-film die and film take-off unit with the extruder.
10. To make a blown-film of 5 metre length from the given material.
11. To study the effect on quality of polyethylene blow film by the variation in speed of screw, barrel temperature, cooling at the die and speed of take off device.
12. Maintenance of single screw extruder.
13. To study and operate vacuum forming machine.
14. To make 20 numbers of plastic cup from the given sheet by the vacuum forming machine.

Note: Number of Experiments depend upon the availability of equipment and time.

**Text Book and/or Reference Material**
### Course Assessment Method

1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

### Topics Covered

**GUIDELINES**

i. Project will have to be done by a group comprising of maximum ten students only in their area of interest.

ii. Each group has to select a contemporary topic that will use the technical knowledge of their program of specialization.

iii. Allocation of the guides preferably in accordance with the expertise of the faculty.

iv. The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the IV semester.

v. The number of projects that a faculty can guide would be limited to two groups.

vi. The project can be carried out on-campus or in an industry or an organization with prior approval from the Principal through Section Incharge.

vii. The project shall be finalized by the students before the start of the V semester and shall be completed and submitted at least one month before the last teaching day of the VI semester, date of which shall be notified in the academic calendar.

viii. The assessment of performance of students should be made at least twice in each semester i.e. V and VI and each internal assessment shall be for 80 marks. The student shall present the final project live as also using overheads project or power point presentation on LCD to the internal examiners as also the external examiner.

ix. The evaluation committee shall consist of faculty members constituted by the college which would comprise of at-least three members comprising of the student’s guide, one internal examiner & one external examiner passed by Board of studies. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately to the controller of examinations in a sealed envelope.

Projects related to designing new dies, moulds jigs and fixtures.

Project related to increasing productivity.

Project related to quality assurance.

Project connected with repair and maintenance of plant and equipment.

Project related to recycling of raw material thereby reducing the wastage.

Project related to suggesting substitutes of the polymer being used.

Any other related problems of interested of host industry.

**Assessment criteria will be as under:-**

<table>
<thead>
<tr>
<th>Attendance and Punctuality</th>
<th>15% weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiative in problem solving</td>
<td>30% weightage</td>
</tr>
<tr>
<td>Relationship with people</td>
<td>10% weightage</td>
</tr>
<tr>
<td>Report Writing</td>
<td>45% weightage</td>
</tr>
</tbody>
</table>

**Text Book and/or Reference Material**
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-595</td>
<td>Hydraulics Lab</td>
<td>Compulsory</td>
<td>Practical</td>
<td>-</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

**Topics Covered**

- Practical Exercises on the following
  1. Bernoulli’s Theorem
  2. Orifice Meter /Venturi Meter.
  4. Coefficient friction of Pipe Line.
  5. Reynolds Experiments.
  6. Mouth piece.
  7. Easy & Sharp bend.
  8. Pelton Turbine.
  11. Reciprocating Pump.
  12. Pneumatic Bench.

Note: Number of Experiments depend upon the availability of equipment and time.

**Text Book and/or Reference Material**
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-601</td>
<td>Industrial Management &amp; Entrepreneur Development</td>
<td>Compulsory</td>
<td>Theory</td>
<td>4 - -</td>
</tr>
</tbody>
</table>

### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>Planning and Control: An introduction to production, planning and control, its need and objectives, comparison between production planning and production control, Concept of Scheduling, Routing, Dispatching and Expediting, Techniques/methods of PPC like CPM and PERT, terminology related with CPM and PERT, Simple problems on them. Break Even Analysis: Introduction, Break-even chart, Break-even point, Margin of safety, Simple problems on them.</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td>Forecasting: Introduction to sales forecasting, definition, types, applications, need and limitations. Inventory Control: Introduction, types, objectives, need, terminology used in inventory control, Economic Order Quantity (EOQ), Lot size of production for minimum cost, simple problems on EOQ.</td>
<td>20</td>
</tr>
</tbody>
</table>

### Text Book and/or Reference Material

1. Industrial Engineering and Management by D. Ravi Shankar (Galgotia Pub.)
2. Industrial Engineering and Production Management by M. Mahajan (Dhanpat Rai Pub.)
3. Industrial Engineering and Management by O.P. Khanna (Dhanpat Rai Pub.).
4. Industrial Management by H.S. Bawa
5. Industrial Management by Mittal
## Diploma in Engineering (Plastic Technology)

**Course Code:** Special BOS 28-3-2019  
**Annexure III-B**

### Department Course Title  
MES, University Polytechnic BPT-601 Mould Design

### Course Designation  
Compulsory

### Course Type  
Theory

### Contact Hours  
<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Course Assessment Method

1. Course Work: 10 Marks  
2. Mid Semester Exam: 15 Marks, 01 Hour  
3. End Semester Exam: 75 Marks, 02 Hour

### UNIT  
**Topics Covered**  
**Marks**

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
</table>
| I | POLYMER PRODUCT DESIGN  
Brief idea of polymer product design, Product design features such as surface finish, texturing, positioning of holes, ribs and bosses, radii and fillets, taper and draft, wall thickness, moulded threads, inserts, external and internal undercuts, mould selection for a particular product. | 15 |
| II | EXTRUSION DIES  
Introduction to extrusion dies and its features. Die design for rods, pipes, wire coating and sheets. Types of dies- hollow die, offset dies and co-axial dies. Die land, die swell, die head mandrel, breaker plate.  
INJECTION MOULD  
Introduction, parting line. Feed system- sprue, gate, types of sprue and gate, runner, types of runners. Runner balancing. Product ejection system, mould cooling system. Types of moulds: two plates mould, three plates mould, split mould and hot runner mould | 20 |
| III | BLOW MOULD & COMPRESSION MOULD  
Compression Mould: Introduction to compression moulds. Technical requirement, construction of compression moulds. Types of compression moulds: Positive type, semi positive type, flash type and landed positive type compression mould. | 20 |
| IV | THERMOFORMING MOULDS:  
Introduction, Moulds for thermoforming, female mould, split female mould, male mould, clamping frame, plugs, multi-cavity mould, vacuum channels | 20 |

### Text Book and/or Reference Material

1. Injection mould design engineering: By David Kazmer  
2. The Mould Design Guide: By Peter Jones  
**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Rheology:- Introduction to polymer rheology, types of deformation and flow, elastic deformation, plastic deformation and Viscous flow – Newtonian and non-Newtonian flow, Time dependent and time independent fluids, Pseudo plastics and dilatants behavior, Thixotropic fluid and Rheopectic fluids.</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td>Testing of Plastics: - Scope of polymer testing, Basic concept of plastic testing, specification and standards, Brief introduction to various testing organizations, testing method for measuring mechanical. Mechanical Properties: Tensile Strength, Elongation, Hardness, Impact test like Izod impact test, Charpy impact test and falling-dart method.</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td>Thermal Properties– Melt flow index (MFI), Heat deflection temperature (HDT), Vicat softening point (VSP)</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td>Testing methods for measuring properties such as Specific gravity and density, Water absorption, Optical properties such as transmittance &amp; haze secular gloss.</td>
<td>20</td>
</tr>
<tr>
<td>Department</td>
<td>Course No.</td>
<td>Course Title</td>
</tr>
<tr>
<td>----------------------------</td>
<td>------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-604</td>
<td>Machine Tools &amp; Maintenance</td>
</tr>
</tbody>
</table>

### Course Assessment Method

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

### UNIT Topics Covered

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>MILLING MACHINE Introduction, classification and specifications. Description of main parts of column &amp; Knee type, Horizontal and vertical spindle milling machines. Milling cutters: types and specifications. Operations performed on milling machines.</td>
<td>15</td>
</tr>
<tr>
<td>III</td>
<td>INSTALLATION AND TESTING OF MACHINES Introduction, reading of information manual, Location, Foundation for machine tools, Different types of machine foundations, Factors affecting the type and size of foundation, Foundation plan (Erection drawing), Preparing the foundation, Damping and isolation of vibration, Erection and transportation, Levelling and aligning. Introduction, Sites for testing, Measuring instruments used for alignment test, Alignment test on lathe machine, drilling machine and milling machine.</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td>RELIABILITY ENGINEERING Basic concept and importance of reliability, failure rate, mean time to failure (MTTF), mean time between failures (MTBF), System reliability, Reliability analysis, Reliability improvement, availability and maintainability of mechanical system; Types and causes of failure. Failure analysis MAINTENANCE Maintenance objectives and types, Role of maintenance engineer, Maintenance procedure, need of planned maintenance, recent developments in maintenance engineering, maintenance of various machine parts (belt drive, chain drive, gear drive and shaft coupling). Maintenance stages of Pipes and pipe joints, pumps and lathe machine, Maintenance records, Computerization of maintenance. Reasons of equipment replacement, group replacement, replacement in anticipation of failure. Guidelines in replacement studies and methods of replacement studies.</td>
<td>20</td>
</tr>
</tbody>
</table>

### Text Book and/or Reference Material

### Course Details

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BCE-605 (A)</td>
<td>Industrial pollution &amp; control</td>
<td>Elective</td>
<td>Theory</td>
<td>3 - -</td>
</tr>
</tbody>
</table>

#### Course Assessment Method

1. Course Work: 10 Marks  
2. Mid Semester Exam: 15 Marks, 01 Hour  
3. End Semester Exam: 75 Marks, 02 Hour

#### UNIT Topics Covered

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

#### Text Book and/or Reference Material

### Diploma in Engineering (Plastic Technology)

**Department:** MES, University Polytechnic  
**Course No.:** BPT-603 (B)  
**Course Title:** Rubber technology  
**Course Designation:** Elective  
**Course Type:** Theory  
**Contact Hours:** 3

### Course Assessment Method
1. Course Work: 10 Marks  
2. Mid Semester Exam: 15 Marks, 01 Hour  
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Sources and history of natural and synthetic rubber, Advantages and disadvantages of natural rubber, Differences in natural rubber versus Synthetic rubber. Ageing of rubber.</td>
<td>15</td>
</tr>
</tbody>
</table>
| II   | (a) Preparation of pale crape and smoke sheet rubber from latex.  
     (b) Mastication of rubber – Mastication, Machine used for Mastication, Chemistry of Mastication.                                                                                      | 20    |
|      | (a) Compounds of rubber – Different compounding ingredients such as plasticizers, fillers, accelerators, anti-oxidants and curing agents.  
     (b) Vulcanization – Sulpher and non-sulpher vulcanization.                                                                                                                                 |       |
| III  | (a) Manufacturing process of synthetic rubber such as SER, Nitrile rubber, Neoprene rubber, Butyl rubber and their properties and application.  
     (b) Elementary knowledge of other synthetic rubber such as Thiokal or polysulphide rubber, Hypalone rubber, polyurethane and silicon rubber. | 20    |
| IV   | (a) Reclaiming of rubber – Manufacturing process properties and limitation.  
     (b) Industrial fabrication of rubber products such as conveyer belt, Hose pipe, cycle tubes.                                                                                       | 20    |

### Text Book and/or Reference Material

---

Mechanical Engineering Section, University Polytechnic, AMU Aligarh, India
### Diploma in Engineering (Plastic Technology)

#### Special BOS 28-3-2019

**Annexure III- B**

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BPT-603</td>
<td>Polymer composite</td>
<td>Elective</td>
<td>Theory</td>
<td>4 - - -</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Introduction:- Basic concepts of polymer composites, Types of polymer composites, fiber reinforced plastic, history &amp; development of Fiber Reinforced Plastics. Comparison of Reinforced Plastic and metals.</td>
<td>15</td>
</tr>
</tbody>
</table>
| II      | Materials of reinforced Plastics:-  
(a) Resin – preparation, properties and application of  
(i) Unsaturated Polyester Resin  
(ii) Epoxy Resin  
(iii) Polypropylene  
(iv) ABS (Acrylonitrile butadiene Styrene).  
(b) Reinforcing materials – Glass fibre, carbon, asbestos, nylon, graphite and aramid Fibre.  
(a) Miscellaneous additives for reinforced plastic such as catalyst, Accelerator, Fillers, pigment monomer, moulds release agents and its functions in moulding.  
(b) Design and Fabrication of moulds for Reinforced plastic, Types of moulds | 20    |
| III     | Moulding Technique of Reinforced Plastics:-  
(a) Hand lay – up  
(b) Spray Lay – up  
(c) Vacuum bag  
(d) Pressure bag  
(e) Autoclave  
(f) Filament winding  
(g) Pultrusion | 20    |
| IV      | Commercial applications of composite in various fields such as chemical industry, automotive industry, games and recreational items, marine ship, and aero space. | 20    |

**Text Book and/or Reference Material**
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BPT-603 (D)</td>
<td>Foams and adhesives</td>
<td>Elective</td>
<td>Theory</td>
<td>3 - -</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 10 Marks
2. Mid Semester Exam: 15 Marks, 01 Hour
3. End Semester Exam: 75 Marks, 02 Hour

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Topics Covered</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Foam- Introduction to foam, meaning, applications, types of foams, flexible and rigid foams, chemistry and physics of foam formation, foaming ingredients such as blowing agents etc. and their effects on foam morphology and physical properties of cellular foam.</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td>Formation, manufacturing processes and properties of thermoplastic foam such as expanded polystyrene, polyethylene foams, LDPE &amp; HD, Introduction to adhesives, mechanism of adhesion, types of adhesives, natural and synthetic, pressure sensitive adhesives, contact adhesives, hot melt adhesives, drying adhesives. PE, PVC foams.</td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td>Thermoplastic and thermosetting adhesives properties, structure, chemistry and method of manufacture adhesives based on: Poly vinyl chloride (PVC), Polyurethane (PU), Ethylene vinyl Acetate (EVA), Melamine Formaldehyde, Epoxy</td>
<td>20</td>
</tr>
<tr>
<td>IV</td>
<td>Natural Rubber solution, its composition, chemical structure, properties and method of production. Polychloroprene (Neoprene), composition, chemical structure, properties and method of production. Hot melt Adhesives, Polyester &amp; Polyamide its composition, chemical structure, properties and method of production.</td>
<td>20</td>
</tr>
</tbody>
</table>

**Text Book and/or Reference Material**
### Department
**Course No.** BPT-691
**Course Title** Mould Construction Lab
**Course Designation** Compulsory
**Course Type** Practical

### Contact Hours
<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

### Course Assessment Method
1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

### Topics Covered
Practical exercises on manufacture of polymer processing moulds for:

1. Injection Moulding.
2. Compression Moulding.
3. Extrusion Moulding.
4. Thermo Forming.

**Note:**
1. At least two moulds should be prepared.
2. If the mould is complicated then, one mould will be sufficient.
3. Students have to use the facilities in CNC and Machine Shop (and other workshop facilities if needed) for production of moulds.

### Text Book and/or Reference Material
### Course Assessment Method

1. Course Work: 50 Marks
2. End Semester Exam: 30 Marks, 02 Hour

### Topics Covered

#### Practical Exercises on the following

1. To study about the testing codes used for characterization of plastic materials by ASTM.
2. To calculate the melt flow index (MFI) of the given polystyrene sample.
3. To calculate the melt flow index (MFI) of the given polyethylene sample.
4. To study and operate of the universal testing machine.
5. To perform tensile test over the given tensile specimen and to draw the graph applied load versus elongation.
6. To calculate the modulus, yield stress, break stress and % elongation at break of the given tensile specimen.
7. To evaluate the engineering properties of plastics materials by stress-strain diagram.
8. To verify the stress relaxation phenomenon in polymeric materials using tensile testing machine.
9. To determine vicat softening point of the given plastic material by using vicat softening apparatus and to draw the graph penetration versus temperature.
10. To determine the heat deflection temperature of the given polymer sample by HDT apparatus and to draw the graph penetration versus temperature.
11. To calculate the coefficient of friction of the given polymer film by friction tester.
12. To determine the impact failure weight of the given polymer film with the help of falling dart impact tester.

Note: Number of Experiments depend upon the availability of equipment and time.

### Text Book and/or Reference Material

3. Outlines Polymer Technology by R. Sinha
5. Brydson, J.A “Plastics Material”
### Diploma in Engineering (Plastic Technology)

**Special BOS 28-3-2019**

**Annexure III- B**

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BPT-693</td>
<td>Project</td>
<td>Compulsory</td>
<td>Practical</td>
<td>- - 3</td>
</tr>
</tbody>
</table>

#### Course Assessment Method

1. Course Work: 80 Marks
2. End Semester Exam: 40 Marks, 02 Hour

#### Topics Covered

1. Students shall complete the project work as they have allotted in V semester.
2. The project shall be completed and submitted at least one month before the last teaching day of the VI semester, date of which shall be notified in the academic calendar.
3. The assessment of performance of students should be made in VI semester and shall be of 80 marks. The student shall present the final project live as also using overheads project or power point presentation on LCD to the internal examiners as also the external examiner.
4. The evaluation committee shall consist of faculty members constituted by the college, which would comprise of at-least three members, the student’s guide, one internal examiner & one external examiner passed by Board of studies. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately to the controller of examinations in a sealed envelope.

Some of the project activities are given below:-

Projects related to designing new dies, moulds jigs and fixtures.
- Project related to increasing productivity.
- Project related to quality assurance.
- Project related to estimation and economics.
- Project connected with repair and maintenance of plant and equipment.
- Project related to recycling of raw material thereby reducing the wastage.
- Project related to suggesting substitutes of the polymer being used.
- Any other related problems of interested of host industry.

Assessment criteria will be as under: -

- Attendance and Punctuality 15% weightage
- Initiative in problem solving 30% weightage
- Relationship with people 10% weightage
- Report Writing 45% weightage

#### Text Book and/or Reference Material
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Course Type</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES, University Polytechnic</td>
<td>BME-695</td>
<td>CAD Lab-II</td>
<td>Compulsory</td>
<td>Theory</td>
<td>- - 2</td>
</tr>
</tbody>
</table>

**Course Assessment Method**

1. Course Work: 30 Marks
2. End Semester Exam: 50 Marks, 02 Hour

**Topics Covered**

This course is aiming to provide hands on training in AutoCAD/CREO/Solid Edge/NX (Solid Edge/NX - Combined or Optionally Available)

- AUTOCAD: 2D Drawing, Isometric and 3D Drawing.
- CREO: Sketcher, Part and Surface Modeling, Assembly and Sheet Metal Design, Drafting and Detailing.
- SOLID EDGE: Sketcher, Part Modeling, Surface Modeling, Sheet Metal Design, Assembly, Drafting and Detailing.
- NX: Sketcher, Part Modeling, Surface Modeling, Sheet Metal Design, Assembly, Drafting and Detailing.

**Text Book and/or Reference Material**
STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME UNIVERSITY POLYTECHNIC, A.M.U., ALIGARH

Mechanical Engineering section teaching courses in the following branches:

- Electrical Engineering
- Instrumentation & Control
- Architectural Assistantship
- Interior Design
- Civil
- Computers
- Electronics

THEORY COURSES:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Branch</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Study Scheme Pds./wk.</th>
<th>Evaluation Scheme Duration of end wk. exam</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>P</td>
</tr>
<tr>
<td>I Semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Elect./Inst.</td>
<td>BME 103</td>
<td>Engg. Drawing I</td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Elect./Inst.</td>
<td>BME 104</td>
<td>Mech. Engg.</td>
<td></td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>II Semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Elect./Inst.</td>
<td>BME 203</td>
<td>Engg. Drawing I</td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>LFT</td>
<td>BPT 201</td>
<td>Polymer Chemistry</td>
<td></td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>III Semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Civil</td>
<td>BME 305</td>
<td>Mech. Engg.</td>
<td></td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>LFT</td>
<td>BME 307</td>
<td>Gen. Mech. Engg.</td>
<td></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>V Semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Computer &amp; Electronics</td>
<td>BME 506</td>
<td>Engg. Economy Management</td>
<td></td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>VI Semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Elect./Inst.</td>
<td>BME 606</td>
<td>Engg. Economy Management</td>
<td></td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

PRACTICAL COURSES:

| I Semester |               |            |                       |                       |     |     |      |             |              |            |         |
| 1          | Elect./Inst.   | BME-192    | Workshop Practice-I   |                       | 0   | 4   | 2    | 80          | --           | 40          | 120      |
| 2          | Civil          | BME-193    | Workshop Practice-I   |                       | 0   | 4   | 2    | 60          | --           | 40          | 100      |
| 3          | Arch/Int./LFT  | BME-193    | Workshop Practice-I   |                       | 0   | 4   | 2    | 80          | --           | 40          | 120      |