Syllabus

Diploma in Mechanical Engineering (Machine Tool Maintenance and Repairs) (Sandwich)

Course Code: 2022

2015 -16
M – SCHEME

DIRECTORATE OF TECHNICAL EDUCATION
GOVERNMENT OF TAMILNADU
STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
M SCHEME
(Implemented from the Academic year 2015 - 2016 onwards)

Chairperson
Tmt. S.MADHUMATHI, I.A.S.,
Director
Directorate of Technical Education
Guindy, Chennai.

Dr. K.SUNDARAMOORTHY, M.E., Phd.,
Additional Director of Technical Education (Polytechnics)
Directorate of Technical Education
Guindy, Chennai.

Co-ordinator
Dr. M.Isakkimuthu, Phd.,
Principal
Bharathiar Centenary Memorial Girls Government College
Ettayapuram-628902
Members

Convener
Dr. R.R.Rajkumar B.Sc, M.E, PhD
Head of the Department (MTMR)
AMK Technological Polytechnic College
Sembarambakam,Chennai -600 123

Members:

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>College/Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr. S.N.Sundar, M.E</td>
<td>Lecturer (Selection Grade)</td>
<td>AMK Technological Polytechnic College</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sembarambakam,Chennai -600 123</td>
</tr>
<tr>
<td>Dr. C.Thiagarajan, M.E, PhD</td>
<td>Professor, Department of Mechanical Engineering, Savitha School of Engineering, Savitha University</td>
<td></td>
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<tr>
<td>Mr. S. Murali, M.E</td>
<td>Lecturer (Senior Grade)</td>
<td>AMK Technological Polytechnic College</td>
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<td>Sembarambakam,Chennai -600 123</td>
</tr>
<tr>
<td>Mr. V. Kumar,</td>
<td>Manager (Maintenance)</td>
<td>M/S BRAKES INDIA Ltd, Padi, Chennai – 600 050</td>
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<tr>
<td>Mr. N. Ramu, M.E</td>
<td>Lecturer (Senior Grade)</td>
<td>AMK Technological Polytechnic College</td>
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<td>Sembarambakam,Chennai -600 123</td>
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<tr>
<td>Mr. N. Dhakshnamoorthy,</td>
<td>Manager (Maintenance)</td>
<td>M/S TAFE (Tractors and Form Equipment Ltd) Chennai</td>
</tr>
<tr>
<td>Mr. K. Hema Prasad,</td>
<td>Head of the Department (Mechatronics)</td>
<td>T.S.Srinivasan Centre for Polytechnic College and Advanced Training (CPAT – TVS)</td>
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</table>
DIPLOMA COURSES IN ENGINEERING/TECHNOLOGY

(SEMESTER SYSTEM)

(Implemented from 2015-2016)

M – SCHEME

REGULATIONS*

* Applicable to the Diploma Courses other than Diploma in Hotel Management & Catering Technology and the Diploma Courses offered through MGR Film Institute, Chennai.

1. Description of the Course:

a. Full Time (3 years)

The Course for the full Time Diploma in Engineering shall extend over a period of three academic years, consisting of 6 semesters* and the First Year is common to all Engineering Branches.

b. Sandwich (3½ years)

The Course for the Diploma in Engineering (sandwich) shall extend over a period of three and half academic years, consisting of 7 semesters* and the First Year is common to all Engineering Branches. The subjects of three years full time diploma course being regrouped for academic convenience.

During 4th and/or during 7th semester the students undergo industrial training for six months/one year. Industrial training examination will be conducted after completion of every 6 months of industrial training.

c. Part Time (4 years)

The course for the diploma in Engineering shall extend over a period of 4 academic years containing of 8 semesters*, the subjects of 3 year full time diploma courses being regrouped for academic convenience.

* Each Semester will have 15 weeks duration of study with 35 hrs./Week for Regular Diploma Programme and 18hrs/week (21 hrs. / Week I year) for Part-Time Diploma Programmes.

The Curriculum for all the 6 Semesters of Diploma courses (Engineering & Special Diploma Courses viz. Textile Technology, Leather Technology, Printing Technology, Chemical Technology etc.) have been revised and revised curriculum is applicable for the candidates admitted from 2015 – 2016 academic year onwards.
2. Condition for Admission:

Condition for admission to the diploma courses shall be required to have passed in
The S.S.L.C Examination of the Board of Secondary Education, TamilNadu.

(Or)
The Anglo Indian High School Examination with eligibility for Higher Secondary Course in TamilNadu.

(Or)
The Matriculation Examination of Tamil Nadu.

(Or)
Any other Examination recognized as equivalent to the above by the Board of Secondary Education, TamilNadu.

Note: In addition, at the time of admission the candidate will have to satisfy certain minimum requirements, which may be prescribed from time to time.

3. Admission to Second year (Lateral Entry):

A pass in HSC ( Academic ) or ( Vocational ) courses mentioned in the Higher Secondary Schools in TamilNadu affiliated to the TamilNadu Higher Secondary Board with eligibility for university Courses of study or equivalent examination, & Should have studied the following subjects.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Courses</th>
<th>H.Sc Academic Subjects Studied</th>
<th>H.Sc Vocational Subjects Studied</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>All the Regular and Sandwich Diploma Courses</td>
<td>Maths, Physics &amp; Chemistry</td>
<td>Maths / Physics / Chemistry</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Related Vocational Subjects Theory &amp; Practical</td>
</tr>
<tr>
<td>2.</td>
<td>Diploma course in Modern Office Practice</td>
<td>English &amp; Accountancy</td>
<td>English &amp; Accountancy,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>English &amp; Elements of Economics</td>
<td>English &amp; Elements of Economics,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>English &amp; Elements of Commerce</td>
<td>English &amp; Management Principles &amp; Techniques,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>English &amp; Typewriting</td>
</tr>
</tbody>
</table>
• For the diploma Courses related with Engineering/Technology, the related / equivalent subjects prescribed along with Practical may also be taken for arriving the eligibility.

• Branch will be allotted according to merit through counseling by the respective Principal as per communal reservation.

• For admission to the Textile Technology, Leather Technology, Printing Technology, Chemical Technology and Modern Office Practice Diploma courses the candidates studied the related subjects will be given first preference.

• Candidates who have studied Commerce Subjects are not eligible for Engineering Diploma Courses.

4. Age Limit:  
   No Age limit.

5. Medium of Instruction: English

6. Eligibility for the Award of Diploma:

   No candidate shall be eligible for the Diploma unless he/she has undergone the prescribed course of study for a period of not less than 3 academic years in any institution affiliated to the State Board of Technical Education and Training, TamilNadu, when joined in First Year and two years if joined under Lateral Entry scheme in the second year and passed the prescribed examination.

   The minimum and maximum period for completion of Diploma Courses are as given below:

<table>
<thead>
<tr>
<th>Diploma Course</th>
<th>Minimum Period</th>
<th>Maximum Period</th>
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</thead>
<tbody>
<tr>
<td>Full Time</td>
<td>3 Years</td>
<td>6 Years</td>
</tr>
<tr>
<td>Full Time(Lateral Entry)</td>
<td>2 Years</td>
<td>5 Years</td>
</tr>
<tr>
<td>Sandwich</td>
<td>3½ Years</td>
<td>6½ Years</td>
</tr>
<tr>
<td>Part Time</td>
<td>4 Years</td>
<td>7 Years</td>
</tr>
</tbody>
</table>

7. Subjects of Study and Curriculum outline:

   The subjects of study shall be in accordance with the syllabus prescribed from time to time, both in theory and practical. The curriculum outline is given in Annexure - I

8. Examinations:

   Board Examinations in all subjects of all the semesters under the scheme of examinations will be conducted at the end of each semester.
The Internal assessment marks for all the subjects will be awarded on the basis of continuous internal assessment earned during the semester concerned. For each subject 25 marks are allotted for internal assessment and 75 marks are allotted for Board Examination.

9. **Continuous Internal Assessment:**

   **A. For Theory Subjects:**
   The Internal Assessment marks for a total of 25 marks, which are to be distributed as follows:

   **i. Subject Attendance**  
   (Award of marks for subject attendance to each subject theory/practical will as per the range given below)

<table>
<thead>
<tr>
<th>Percentage Range</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>80% - 83%</td>
<td>1</td>
</tr>
<tr>
<td>84% - 87%</td>
<td>2</td>
</tr>
<tr>
<td>88% - 91%</td>
<td>3</td>
</tr>
<tr>
<td>92% - 95%</td>
<td>4</td>
</tr>
<tr>
<td>96% - 100%</td>
<td>5</td>
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</table>

   **ii) Test #**

   2 Tests each of 2 hours duration for a total of 50 marks are to be conducted. Out of which the best one will be taken and the marks to be reduced to:

   The Test – III is to be the Model test covering all the five units and the marks so obtained will be reduced to:

<table>
<thead>
<tr>
<th>TEST</th>
<th>UNITS</th>
<th>WHEN TO CONDUCT</th>
<th>MARKS</th>
<th>DURATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test I</td>
<td>Unit – I &amp; II</td>
<td>End of 6th week</td>
<td>50</td>
<td>2 Hrs</td>
</tr>
<tr>
<td>Test II</td>
<td>Unit – III &amp; IV</td>
<td>End of 12th week</td>
<td>50</td>
<td>2 Hrs</td>
</tr>
<tr>
<td>Test III</td>
<td>Model Examination - Compulsory</td>
<td>End of 15th week</td>
<td>75</td>
<td>3 Hrs</td>
</tr>
<tr>
<td></td>
<td>Covering all the 5 Units.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Board Examination-question paper-pattern).</td>
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<td></td>
</tr>
</tbody>
</table>

# - From the Academic year 2015-2016 onwards.
Question Paper Pattern for the Periodical Test : (Test - I & Test- II)

With no choice:

PART A type questions: 4 Questions X 2 mark … … 8 marks
PART B type questions: 4 Questions X 3 marks … … 12 marks
PART C type questions: 3 Questions X 10 marks … … 30 marks

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Total 50 marks
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iii) Assignment 10 Marks

For each subject Three Assignments are to be given each for 20 marks and the average marks scored should be reduced for 10 marks

All Test Papers and assignment notebooks after getting the signature with date from the students must be kept in the safe custody in the Department for verification and audit. It should be preserved for 2 Semesters and produced to the flying squad and the inspection team at the time of inspection/verification.

B. For Practical Subjects:

The internal assessment mark for a total of 25 marks which are to be distributed as follows:-

a) Attendance : 5 Marks
   (Award of marks as same as Theory subjects)
b) Procedure/ observation and tabulation/
   Other Practical related Work : 10 Marks
c) Record writing : 10 Marks

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TOTAL : 25 Marks
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• All the Experiments/exercises indicated in the syllabus should be completed and the same to be given for final board examinations.
• The Record for every completed exercise should be submitted in the subsequent Practical classes and marks should be awarded for 20 for each exercise as per the above allocation.
• At the end of the Semester, the average marks of all the exercises should be calculated for 20 marks and the marks awarded for attendance is to be added to arrive at the internal assessment mark for Practical. (20+5=25 marks)
• The students have to submit the duly signed bonafide record note book/file during the Practical Board Examinations.
• All the marks awarded for assignment, Test and attendance should be entered in the Personal Log Book of the staff, who is handling the subject. This is applicable to both Theory and Practical subjects.

10. Life and Employability Skill Practical:
The Life and Employability Skill Practical with more emphasis is being introduced in IV Semester for Circuit Branches and in V Semester for other branches of Engineering.
Much Stress is given to increase the employability of the students:

Internal assessment Mark

11. Project Work:
The students of all the Diploma Programmes (except Diploma in Modern Office Practice) have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamilnadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. **The Project work must be reviewed twice in the same semester.**

a) Internal assessment mark for Project Work & Viva Voce:

<table>
<thead>
<tr>
<th>Project Review I</th>
<th>10 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Review II</td>
<td>10 marks</td>
</tr>
<tr>
<td>Attendance</td>
<td>05 marks (award of marks same as theory subjects pattern)</td>
</tr>
</tbody>
</table>

Total 25 marks

Proper record to be maintained for the two Project Reviews, and It should be preserved for 2 Semesters and produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Mark for Project Work & Viva Voce in Board Examination:

<table>
<thead>
<tr>
<th>Viva Voce</th>
<th>30 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marks for Report Preparation, Demo</td>
<td>35 marks</td>
</tr>
</tbody>
</table>

Total 65 marks

c) Written Test Mark (from 2 topics for 30 minutes duration):

i) Environment Management 2 questions X 2 ½ marks = 5 marks

ii) Disaster Management 2 questions X 2 ½ marks = 5 marks

10 marks

Selection of Questions should be from Question Bank, by the External Examiner.
No choice need be given to the candidates.

**Project Work & Viva Voce in Board Examination**  --  65 Marks
Written Test Mark (from 2 topics for 30 minutes duration)  --  10 Marks

**TOTAL**  --  **75 Marks**

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual during the Project Work & Viva Voce Board examination.

12. **Scheme of Examinations:**

   The Scheme of examinations for subjects is given in Annexure - II.

13. **Criteria for Pass:**

   1. No candidate shall be eligible for the award of Diploma unless he/she has undergone the prescribed course of study successfully in an institution approved by AICTE and affiliated to the State Board of Technical Education & Training, Tamil Nadu and pass all the subjects prescribed in the curriculum.

   2. A candidate shall be declared to have passed the examination in a subject if he/she secures not less than **40% in theory subjects** and **50% in practical subject** out of the total prescribed maximum marks including both the internal assessment and the Board Examination marks put together, subject to the condition that he/she secures at least a minimum of **30 marks out of 75 marks in the Board's Theory examinations and a minimum of 35 marks out of 75 marks in the Board Practical Examinations.**

14. **Classification of successful candidates:**

   Classification of candidates who will pass out the final examinations from April 2018 onwards (Joined in first year in 2015-2016) will be done as specified below.

   **First Class with Superlative Distinction:**
   A candidate will be declared to have passed in **First Class with Superlative Distinction** if he/she secures not less than 75% of the marks in all the subjects and passes all the semesters in the first appearance itself and passes all subjects within the stipulated period of study 3/ 3½/ 4 years (Full Time/Sandwich/Part Time) without any break in study.

   **First Class with Distinction:**
   A candidate will be declared to have passed in **First Class with Distinction** if he/she secures not less than 75% of the aggregate of marks in all the
semesters put together and passes all the semesters except the I and II semesters in the first appearance itself and passes all the subjects within the stipulated period of study 3/ 3½/ 4 years (Full Time/Sandwich/Part Time) without any break in study.

First Class:
A candidate will be declared to have passed in First Class if he/she secures not less than 60% of the aggregate marks in all semesters put together and passes all the subjects within the stipulated period of study 3/ 3½ / 4 years (Full Time/Sandwich/Part Time) without any break in study.

Second Class:
All other successful candidates will be declared to have passed in Second Class.

The above mentioned classifications are also applicable for the Sandwich / Part-Time students who pass out Final Examination from October 2018 /April 2019 onwards (both joined in First Year in 2015-2016)

15. **Duration of a period in the Class Time Table:**

The duration of each period of instruction is 1 hour and the total period of instruction hours excluding interval and Lunch break in a day should be uniformly maintained as 7 hours corresponding to 7 periods of instruction (Theory & Practical).

16. **Seminar:**

For seminar the total seminar 15 hours(15 weeks x 1hour) should be distributed equally to total theory subject per semester(i.e 15 hours divided by 3/4 subject). A topic from subject or current scenario is given to students. During the seminar hour students have to present the paper and submit seminar material to the respective staff member, who is handling the subject. It should be preserved for 2 Semesters and produced to the flying squad and the inspection team at the time of inspection/verification.

-xXx-
### III SEMESTER – WITH EFFECT FROM OCTOBER 2016

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Subject Code</th>
<th>L-SCHEME</th>
<th>Subject Code</th>
<th>M-SCHEME</th>
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<td>01</td>
<td>22031</td>
<td>Strength of Materials</td>
<td>39231</td>
<td>Solid Mechanics and Fluid Power</td>
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<tr>
<td>02</td>
<td>29232</td>
<td>Industrial Hydraulics And Pneumatics</td>
<td>39231</td>
<td>Solid Mechanics and Fluid Power</td>
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<tr>
<td>03</td>
<td>22033</td>
<td>Renewable Energy Sources**</td>
<td>39252</td>
<td>Thermal and Renewable Energy</td>
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<tr>
<td>04</td>
<td>22034</td>
<td>Machine Drawing**</td>
<td>32033</td>
<td>Machine Drawing**</td>
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<tr>
<td>05</td>
<td>22035</td>
<td>Mechanical Testing &amp; Quality Control Practical **</td>
<td>32045</td>
<td>Strength of Materials and Fluid Mechanics Practical</td>
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<tr>
<td>06</td>
<td>22036</td>
<td>Fluid Power Practical **</td>
<td>32045</td>
<td>Strength of Materials and Fluid Mechanics Practical</td>
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<tr>
<td>07</td>
<td>20001</td>
<td>Computer Applications Practical</td>
<td>32034</td>
<td>Computer Applications and CAD Practical</td>
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### IV SEMESTER WITH EFFECT FROM APRIL 2017

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<th>Subject Code</th>
<th>L-SCHEME</th>
<th>Subject Code</th>
<th>M-SCHEME</th>
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<tr>
<td>01</td>
<td>22041</td>
<td>Manufacturing Technology – I**</td>
<td>39232</td>
<td>Industrial Production Technology – I</td>
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<tr>
<td>02</td>
<td>22045</td>
<td>Manufacturing Technology - I Practical**</td>
<td>32036</td>
<td>Lathe and Drilling Practical</td>
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<td>03</td>
<td>29291</td>
<td>Industrial Training – I (Report Writing &amp; Viva Voce)</td>
<td>39291</td>
<td>Industrial Training – I (Report Writing &amp; Viva Voce)</td>
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# V SEMESTER – WITH EFFECT FROM OCTOBER 2017

<table>
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<th>Subject Code</th>
<th>M-SCHME</th>
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<tbody>
<tr>
<td>01</td>
<td>29251</td>
<td>Thermal Equipments And Energy Conservation</td>
<td>39252</td>
<td>Thermal and Renewable Energy</td>
</tr>
<tr>
<td>02</td>
<td>22043</td>
<td>Electrical Drives &amp; Control**</td>
<td>32044</td>
<td>Electrical Drives &amp; Control**</td>
</tr>
<tr>
<td>03</td>
<td>29253</td>
<td>Metrology and Instrumentation</td>
<td>39253</td>
<td>Engineering Metrology</td>
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<tr>
<td>04</td>
<td>29254</td>
<td>Industrial Equipment Maintenance</td>
<td>39254</td>
<td>Maintenance of Machine Drive Elements</td>
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<tr>
<td>05</td>
<td>22044</td>
<td>Computer Aided Machine Drawing Practical **</td>
<td>32034</td>
<td>Computer Applications and CAD Practical</td>
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<tr>
<td>06</td>
<td>29256</td>
<td>Thermal Equipments Performance Practical</td>
<td>39258</td>
<td>Thermal Equipments Performance Practical</td>
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<tr>
<td>07</td>
<td>29257</td>
<td>Metrology and Instrumentation Practical</td>
<td>32037</td>
<td>Metrology and Metallography Practical *</td>
</tr>
<tr>
<td>08</td>
<td>22047</td>
<td>Electrical Drives and control practical**</td>
<td>32047</td>
<td>Electrical Drives &amp; Control Practical</td>
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# VI SEMESTER – WITH EFFECT FROM APRIL 2018

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<th>Subject Code</th>
<th>M-SCHME</th>
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<tbody>
<tr>
<td>01</td>
<td>22052</td>
<td>Manufacturing Technology - II**</td>
<td>39251</td>
<td>Industrial Production Technology - II</td>
</tr>
<tr>
<td>02</td>
<td>29262</td>
<td>Machine Tool Reconditioning &amp; Overhauling</td>
<td>39264</td>
<td>Machine Tool Reconditioning and Overhauling</td>
</tr>
<tr>
<td>03</td>
<td>22061</td>
<td>Industrial Engineering and Management**</td>
<td>39265</td>
<td>Engineering Management</td>
</tr>
<tr>
<td>04</td>
<td>22062</td>
<td>Computer Integrated Manufacturing **</td>
<td>32062</td>
<td>Computer Aided Design and Manufacturing</td>
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<tr>
<td>05</td>
<td>29265</td>
<td>Total Productive Maintenance</td>
<td>39263</td>
<td>Total Quality Management and Total Productive Maintenance</td>
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<tr>
<td>06</td>
<td>22056</td>
<td>Manufacturing Technology – II Practical**</td>
<td>32046</td>
<td>Special Machines Practical</td>
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<tr>
<td>07</td>
<td>22064</td>
<td>Computer Integrated Manufacturing Practical **</td>
<td>32064</td>
<td>Computer Aided Design and Manufacturing Practical</td>
</tr>
<tr>
<td>08</td>
<td>20002</td>
<td>Communication &amp; Life Skills Practical *</td>
<td>30002</td>
<td>Life and Employability skill Practical**</td>
</tr>
<tr>
<td>Sl No</td>
<td>Subject Code</td>
<td>L-SCHEME</td>
<td>Subject Code</td>
<td>M-SCHEME</td>
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<tr>
<td>01</td>
<td>29271</td>
<td>Machine Tool Reconditioning &amp; Overhauling Practical</td>
<td>39271</td>
<td>Maintenance Lab - II</td>
</tr>
<tr>
<td>02</td>
<td>22065</td>
<td>Process Automation Practical**</td>
<td>32055</td>
<td>Process Automation Practical</td>
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<td>03</td>
<td>29273</td>
<td>Project Work</td>
<td>39273</td>
<td>Project Work</td>
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<tr>
<td>04</td>
<td>29292</td>
<td>Industrial Training – II (Report Writing &amp; Viva Voce)</td>
<td>39292</td>
<td>Industrial Training – II (Report Writing &amp; Viva Voce)</td>
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</table>
### M SCHEME

*Implemented from 2015 - 2016*

#### CURRICULUM OUTLINE

**2022: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs (sandwich))**

### III SEMESTER

<table>
<thead>
<tr>
<th>Subject code</th>
<th>Subject</th>
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* Common with DME.

* Common with all branches.
## M SCHEME

**Implemented from 2015 - 2016**

**2022: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs (sandwich)) Scheme of Examination**

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* Common with DME.

* Common with all branches.
Board Examination - Question paper pattern

Common for all theory subjects except Machine Drawing and Design of Machine Elements

**PART A** - (1 to 8) 5 Questions are to be answered out of 8 questions for 2 marks each. (Question No. 8 will be the compulsory question and can be asked from any one of the units) (From each unit maximum of two 2 marks questions alone can be asked)

**PART B** - (9 to 16) 5 Questions are to be answered out of 8 questions for 3 marks each. (Question No. 16 will be the compulsory question and can be asked from any one of the units) (From each unit maximum of two 3 marks questions alone can be asked)

**PART C** - (17 to 21) Five Questions will be in the Either OR Pattern. Students have to answer these five questions. Each question carries 10 marks. (Based on the discretion of the question setter, he/she can ask two five mark questions (with sub division A & sub division B) instead of one ten marks question if required)

Any tables required should be mentioned in the question paper. Steam table, Design Data Book, Mollier chart, Psychometric Chart etc..
DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (MACHINE TOOL MAINTENANCE AND REPAIRS) (SANDWICH)

II YEAR

M – SCHEME

III SEMESTER
2015 -2016 onwards

39231 SOLID MECHANICS AND FLUID POWER

CURRICULUM DEVELOPMENT CENTRE
M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs)

Course Code: 2022

Subject Code: 39231

Semester: III

Subject Title: SOLID MECHANICS & FLUID POWER

No. of Weeks per Semester: 15 weeks

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<td>Properties of Fluids, Elements of Hydraulic Systems, Pumps And Valves</td>
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Rational:
Hydraulics plays an important role in the automatic machine circuit. Further the student should have knowledge about deformation of metals with the application of force. Hence this paper is introduced.

Objective:

- To know about Deformation of Metals
- To know about Torsion And Springs
- To know Properties of Fluids, Elements of Hydraulic Systems, Pumps And Valves
- To know about Hydraulic Cylinders, Intensifiers, Hydraulic Motors, Accumulators And Hydraulic System Design
- To know about Pneumatic Power Unit, Cylinders And Motors, Pneumatic Valves, Basic Pneumatic Circuits

**SOLID MECHANICS & FLUID POWER**

**Detailed Syllabus**

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<td>Types of springs – Laminated and coiled springs and applications – Types of coiled springs – Difference between open and closely coiled helical springs – closely coiled helical spring subjected to an axial load – problems to determine shear stress, deflection, stiffness and resilience of closed coiled helical springs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject</th>
<th>PROPERTIES OF FLUIDS, ELEMENTS OF HYDRAULIC SYSTEMS, PUMPS AND VALVES</th>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction - Definition of fluid - Classification of Fluids - ideal and real fluids -Properties of a fluid – definition and units - Pressure-units of Pressure - Pressure head-atmospheric, gauge and absolute pressure.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### IV 
**HYDRAULIC CYLINDERS, INTENSIFIERS, HYDRAULIC MOTORS, ACCUMULATORS AND HYDRAULIC SYSTEM DESIGN**

**Hydraulic cylinders:** Non-rotating type – single acting, double acting – rotating type – description - applications.

**Intensifiers:** Type – single acting – double acting – purpose – construction and its uses.

**Accumulators:** Types – dead weight, spring loaded, air or gas operated – purpose construction and its uses.


**Hydraulic system design:** Hydraulic circuits applications – automatic systems – machine tools – shaping machine, milling machine, grinding machine – trouble shooting and maintenance and safety.

### V 
**PNEUMATIC POWER UNIT, CYLINDERS AND MOTORS, PNEUMATIC VALVES, BASIC PNEUMATIC CIRCUITS**

**Pneumatic power unit:** Construction and principles of operation of the compressor – reciprocating, rotary, centrifugal and axial flow – air tank construction pressure switch control – FRL unit.

**Pneumatic cylinders:** Types of air cylinders – single acting, double acting – construction – cushion assembly – piston and piston seals – applications.

**Air motor:** Vane types – construction – application.


**Basic pneumatic circuits:** Symbols – basic pneumatic circuits.
Text Books:

Reference Books:
4. Introduction to Pneumatics – Text Book by Festo Company - 1983
DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (MACHINE TOOL MAINTENANCE AND REPAIRS) (SANDWICH)

II YEAR

M – SCHEME

III SEMESTER
2015 -2016 onwards

39232 INDUSTRIAL PRODUCTION TECHNOLOGY – I

CURRICULUM DEVELOPMENT CENTRE
M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs)

Course Code: 2022

Subject Code: 39232

Semester: III

Subject Title: INDUSTRIAL PRODUCTION TECHNOLOGY – I

No. of Weeks per Semester: 15 weeks

<table>
<thead>
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<th>Subject</th>
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<td>Hours/Semester</td>
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<tr>
<td>Industrial Production Technology – I</td>
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Topics and Allocation of Hours:

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<tr>
<th>S.No</th>
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<tbody>
<tr>
<td>1</td>
<td>Foundry and Welding</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>Forging and Press Working</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>Powder Metallurgy And Heat Treatment</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>Lathe and Work Holding Devices</td>
<td>14</td>
</tr>
<tr>
<td>5</td>
<td>Semi-Automatic Lathes And Automatic Lathes</td>
<td>14</td>
</tr>
<tr>
<td>6</td>
<td>Test and Revision</td>
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Rational:
The students studying maintenance course should have a fundamental knowledge manufacturing process like forging, welding, foundry and machines like lathe. Further they should have knowledge about heat treatment process.

Objectives:
- To know about Foundry and Welding
• To know Forging and Press Working
• To know Powder Metallurgy And Heat Treatment
• To know Lathe and Work Holding Devices
• To know Semi-Automatic Lathes And Automatic Lathes

**Industrial Production Technology – I**

**Detailed Syllabus**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Name of the Topic</th>
<th>Hours</th>
</tr>
</thead>
</table>
| I    | **FOUNDRY and WELDING**  
| II   | **FORGING AND PRESS WORKING**  
Forging: Hot working, advantages of hot working – hot working operations – rolling – forging – hammer or smith forging, drop forging, upset forging, press forging – roll forging  
| III  | **POWDER METALLURGY AND HEAT TREATMENT**  
POWDER METALLURGY: Methods of manufacturing metal | 14 |
powders – atomization, reduction and electrolysis deposition – compacting – sintering – sizing – infiltration – mechanical properties of parts made by powder metallurgy – design rule for the powder metallurgy process


IV LATHE AND WORK HOLDING DEVICES


WORK HOLDING DEVICES: Face plate – three jaw chuck – four jaw chuck – catch plate and carrier – types of centre’s.

V SEMI AUTOMATIC LATHES AND AUTOMATIC LATHES

SEMI AUTOMATIC LATHES: Types of semi automatic lathes – capstan and turret lathes – difference between turret and capstan – tool and work holding devices – self opening die head – collapsible taps

Text Books:


Reference Books:


6) Manufacturing Engineering & Technology - Kalpakjian,
DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (MACHINE TOOL MAINTENANCE AND REPAIRS) (SANDWICH)

II YEAR
M – SCHEME

III SEMESTER
2015-2016 onwards

39233 - LUBRICATION TECHNOLOGY

CURRICULUM DEVELOPMENT CENTRE
Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs)

Course Code: 2022

Subject Code: 39233

Semester: III

Subject Title: LUBRICATION TECHNOLOGY

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Topics and Allocation of Hours:

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<th>Topic</th>
<th>Hours</th>
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<tbody>
<tr>
<td>1</td>
<td>Lubrication Principles &amp; Practice</td>
<td>14</td>
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<tr>
<td>2</td>
<td>Lubrication Performance Evaluation</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>Organization of Lubrication process</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>Failure Analysis And Case Studies</td>
<td>14</td>
</tr>
<tr>
<td>5</td>
<td>Industrial Lubrication</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Test and revision</td>
<td>5</td>
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Rational:
The people who are in the maintenance field should a thorough knowledge about Lubrication Principles, Lubricants Performance and failure analysis of machine component.
Objectives:

- To know the Lubrication Principles & Practice
- To know the Lubrication Performance Evaluation
- To know the Organization of Lubrication process
- To know the Failure Analysis And Case Studies
- To know the Industrial Lubrication

**Lubrication Technology**

**Detailed Syllabus**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Name of the Topic</th>
<th>Hours</th>
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<tbody>
<tr>
<td>I</td>
<td><strong>LUBRICATION PRINCIPLES &amp; PRACTICE</strong></td>
<td>14</td>
</tr>
<tr>
<td></td>
<td><strong>Friction and wear:</strong></td>
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<tr>
<td></td>
<td>Wear – effects of wear, wear and damage – types of wear.</td>
<td></td>
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<tr>
<td></td>
<td>a) Lubrication principle:</td>
<td></td>
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<tr>
<td></td>
<td>b) General Lubrication practice:</td>
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<tr>
<td></td>
<td>Lubrication sources and composition – additives – detergents – purpose – selecting the lubricant under various conditions – lubricant in metal working seals and packing</td>
<td></td>
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<tr>
<td>II</td>
<td><strong>LUBRICATION PERFORMANCE EVALUATION:</strong></td>
<td>14</td>
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</tbody>
</table>

### III ORGANISATION OF LUBRICATION PROCESS


### IV FAILURE ANALYSIS AND CASE STUDIES:


Chain – types of chain – roller chain – effect of failure of lubricants in chain- Lubrication of wire ropes for material handling.

### V INDUSTRIAL LUBRICATION:


**Text Book:**

1. Industrial Maintenance by H. P. Garg.

**Reference books:**

2. Fundamentals of Mechanical maintenance By Mukund K. Nimbarate
DIRECTORATE OF TECHNICAL EDUCATION
DIPLOMA IN MECHANICAL ENGINEERING

[MTMR]
M SCHEME
2015 -2016 onwards

II YEAR
III SEMESTER

32033 – MACHINE DRAWING

CURRICULUM DEVELOPMENT CENTRE
M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [MTMR]
Course Code : 2022
Subject Code : 32033
Semester : III
Subject Title : MACHINE DRAWING

TEACHING AND SCHEME OF EXAMINATIONS:
No. of Weeks per Semester: 15 Weeks

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<th>Examination</th>
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<td>Hours/Semester</td>
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<td>Machine Drawing</td>
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Topics and Allocation of Hours:

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<td>I</td>
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<td>II</td>
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<td>III</td>
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<td>IV</td>
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<td>V</td>
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<table>
<thead>
<tr>
<th>Topics</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Sectional Views</td>
<td>5</td>
</tr>
<tr>
<td>Limits, Fits and Tolerances</td>
<td>5</td>
</tr>
<tr>
<td>Surface Texture</td>
<td>5</td>
</tr>
<tr>
<td>Keys, Screw threads and Threaded fasteners</td>
<td>5</td>
</tr>
<tr>
<td>Assemble drawing</td>
<td>33</td>
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<tr>
<td>TEST AND REVISION</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
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</tbody>
</table>

RATIONALE:
Manufacturing of various parts start from the basic drawing of components. The assembly of components is also carried out from the drawing. So drawing is an important subject to be studied by the students to carry and complete the production and assembly process successfully.
**OBJECTIVES:**

- Appreciate the need for sectional view and types of sections.
- Draw sectional views using different types of sections.
- Explain the use of threaded fasteners and the types of threads.
- Compare hole basis system with shaft basis system.
- Select different types of fits and tolerance for various types of mating parts.
- Appreciate the importance of fits and tolerance.

---

**MACHINE DRAWING**
**DETAILED SYLLABUS**

**Contents: Theory**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Name of the Topic</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>I</td>
<td>SECTIONAL VIEWS</td>
<td>5</td>
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<tr>
<td></td>
<td>Review of sectioning – Conventions showing the section – symbolic representation of cutting plane- types of section – full section, half section, offset section, revolved section, broken section, removed section – section lining.</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>LIMITS, FITS AND TOLERANCES</td>
<td>5</td>
</tr>
<tr>
<td>III</td>
<td>SURFACE TEXTURE</td>
<td>5</td>
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<tr>
<td></td>
<td>Surface texture – importance – controlled and uncontrolled surfaces – Roughness – Waviness – lay – Machining symbols</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>KEYS, SCREW THREADS AND THREADED FASTENERS</td>
<td>5</td>
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</tbody>
</table>
V MANUAL DRAWING PRACTICE

Detailed drawings of following machine parts are given to students to assemble and draw the Elevations / Sectional elevations / Plan / and Side views with dimensioning and bill of materials

1. Sleeve & Cotter joint
2. Knuckle joint
3. Screw Jack
4. Foot step bearing
5. Plummer Block
6. Universal Coupling
7. Simple Eccentric
8. Machine Vice
9. Protected type flanged coupling
10. Swivel bearing.

Books:

3) Mechanical Draughtsmanship, G.L. Tamta, Dhanpat Rai & Sons, Delhi
5) Engineering Drawing, D.N. Ghose, Dhanpat Rai & Sons, Delhi

BOARD EXAMINATIONS

Question Pattern

Time: 3 Hrs                          Max Marks : 75
Note: All the questions will be answered in drawing sheet only

PART A: (7 x 5 = 35)

Theory questions: (1 TO 8)
Two questions from each unit (I to IV) will be asked.
Answer any seven questions from the given eight questions.

PART B: 40 Marks (Either A or B.)

Answer any one question by selecting either A or B.

9. A. Assemble and Draw any two views and bill of materials.
   (OR)
   B. Assemble and Draw any two views and bill of material
DIRECTORATE OF TECHNICAL EDUCATION
DIPLOMA IN MECHANICAL ENGINEERING

[MTMR]

M SCHEME
2015 - 2016 onwards

II YEAR
III SEMESTER

32034 – COMPUTER APPLICATIONS AND
CAD PRACTICAL

CURRICULUM DEVELOPMENT CENTRE
M-SCHME
(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [MTMR]
Course Code : 2022
Subject Code : 32034
Semester : III
Subject Title : COMPUTER APPLICATIONS AND CAD PRACTICAL

TEACHING AND SCHEME OF EXAMINATIONS:
No. of weeks per semester: 15 Weeks

<table>
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<th>Subject</th>
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<th>Duration</th>
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<tr>
<td>Computer Applications and CAD</td>
<td>Hours / Week 6</td>
<td>Internal Assessment 25</td>
<td>3 Hrs</td>
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<td>practical</td>
<td>Hours / Semester 90</td>
<td>Board Examination 75</td>
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OBJECTIVES:
On completion of the exercises, the students must be able to
- Use the different facilities available in the word processor
- Analyze the data sheet
- Create and manipulate the database
- Prepare PowerPoint presentation
- Practice on CADD commands in making 2D Drawings.
- Draw assembled drawings using CADD.
- Draw sectional views using different types of sections.

PART – A: COMPUTER APPLICATIONS (30 Hrs)
WORD PROCESSING
Exercises
1. Create a news letter of three pages with two columns text. The first page contains some formatting bullets and numbers. Set the document background colour and add ‘confidential’ as the watermark. Give the document a title which should be displayed in the header. The header/ footer of the first page should be different from other two pages. Also, add author name and date/ time in the header. The footer should have the page number.

2. Create the following table using align, border, merging and other attributes.

<table>
<thead>
<tr>
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<tr>
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<td>16304504</td>
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<tr>
<td>16304505</td>
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</table>

SPREADSHEET

Exercises
3. Create a table of records with columns as Name and Donation Amount. Donation amount should be formatted with two decimal places. There should be at least twenty records in the table. Create a conditional format to highlight the highest donation with blue colour and lowest donation with red colour. The table should have a heading.

4. Prepare line, bar and pie chart to illustrate the subject wise performance of the class for any one semester.
DATABASE

Exercises
5. Prepare a payroll for employee database of an organization with the following details: Employee Id, Employee name, Date of Birth, Department and Designation, Date of appointment, Basic pay, Dearness Allowance, House Rent Allowance and other deductions if any. Perform simple queries for different categories.

6. Design a pay slip for a particular employee from the above database.

PRESENTATION

Exercises
7. Make a presentation with atleast 10 slides. Use different customized animation effects on pictures and clip art on any four of the ten slides.

PART – B: CAD (60 Hrs)
INTRODUCTION

DRAWING AIDS AND EDITING COMMANDS

**BASIC DIMENSIONING, HATCHING, BLOCKS AND VIEWS**


**CAD EXERCISES**

Detailed drawings of following machine parts are to be given to students. Draw the assembled views (two views only) and bill of materials.

The elevation / sectional elevation / plan / sectional plan / side view with dimensioning.

1. Sleeve & Cotter joint
2. Screw jack
3. Plummer Block
4. Simple Eccentric
5. Machine Vice
6. Protected type flanged coupling

**Reference Books:**

1) *Inside AutoCAD* - D. Raker and H. Rice - BPB Publications, NewDelhi
3) *AutoCAD with Applications* - Sham Tickoo - Tata Mcgraw Hill.
Board of Examination

**Note:** All the exercises have to be completed. Two exercises will be given for examination by selecting one exercise in each PART.
All the exercises should be given in the question paper and students are allowed to select by a lot.
Record note book should be submitted during examination.

**ALLOCATION OF MARKS**

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<th>25 marks</th>
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<td>Formatting</td>
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<th>PART - B</th>
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<td>Assembly</td>
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<td>Dimensioning</td>
<td>-</td>
<td>10</td>
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<tr>
<td>Printout</td>
<td>-</td>
<td>5</td>
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</table>

Viva-voce : 05 marks

Total : 75 marks

**LIST OF EQUIPMENT**

1. Personal computer – 30 Nos.
2. Printer – 1 No.
3. Required Softwares : Office Package, CAD Package – Sufficient to the strength.
DIRECTORATE OF TECHNICAL EDUCATION
DIPLOMA IN MECHANICAL ENGINEERING
[MTMR]
M SCHEME
2015 -2016 onwards

II YEAR
III SEMESTER

32036 – LATHE AND DRILLING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE
M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [MTMR]
Course Code : 2022
Subject Code : 32036
Semester : III
Subject Title : Lathe and Drilling Practical

TEACHING AND SCHEME OF EXAMINATIONS:
No. of weeks per semester: 15 Weeks

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<th>Subject</th>
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<td>Lathe and Drilling Practical</td>
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<td>Duration 3 Hrs</td>
</tr>
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</table>

OBJECTIVES:
- Identify the parts of a lathe.
- Identify the work holding devices.
- Set the tools for various operations.
- Operate the lathe and machine a component using lathe.
- Identify the parts of drilling machine.
- Perform the various drilling operations.
- Identify the various tools and its holding devices.
- Identify the work holding devices.
- Prepare the record of work for the exercises.

Lathe section:
1. Introduction of safety in operating machines.
2. Study of lathe and its parts.
3. Types of tools used in lathe work.
4. Study of work holding devices and tool holding devices.
5. Setting of work and tools.
7. Practice on a lathe.
8. Types of measuring instruments and their uses.

Exercises:

Make the following jobs in the lathe. Raw material 32 mm M.S. Rod

1. Facing, Step turning & Chamfering

2. Step turning & Groove cutting

3. Step turning & Taper turning

4. Step turning & Knurling
5. Step turning & Thread cutting (L.H.)

6. Step turning & Thread cutting (R.H)

7. Bush: Turning & Drilling

8. Eccentric turning
Drilling section:
1. Introduction of safety in operating machines.
2. Study of drilling machines and its parts.
3. Study the types of tools used.
4. Study of work holding devices and tool holding devices.
5. Setting of work and tools.
6. Operation and practice.
7. Types of measuring instruments and their uses.

Exercises:
Make the following jobs in the drilling machine.
Raw material 50mm X 50mm X 20 mm thick M.S. Flat

1. Drilling & Tapping

2. Drilling & Counter boring

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<th>Sl.No</th>
<th>Part Name</th>
<th>Actual</th>
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<th>Part Name</th>
<th>Actual</th>
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3. Drilling & Counter sinking

![Diagram of Drilling & Counter sinking]

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</tr>
</tbody>
</table>

4. Drilling and Reaming – Radial drilling machine

![Diagram of Drilling and Reaming – Radial drilling machine]

<table>
<thead>
<tr>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sl.No</td>
</tr>
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</tbody>
</table>

**BOARD EXAMINATION**

**Note:** All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise in each section. All the exercises should be given in the question paper and students are allowed to select by a lot. Record note book should be submitted during examination.

**Lathe:** 45 marks (2 hours)
- Procedure / Preparation: 10
- Machining / Dimensions: 25
- Surface Finishing: 10

**Drilling:** 25 marks (1 hour)
- Procedure / Marking: 10
- Dimensions: 10
- Surface Finishing: 5

**Viva-voce:** 05 marks

**Total:** 75 marks
# LIST OF EQUIPMENT

## Lathe Section
1. Lathe (Minimum 4 ½') - 13 Nos.
2. All geared lathe - 2 Nos.
3. 4 Jaw / 3 Jaw Chucks - Required Numbers
4. Chuck key - Required Numbers
5. Spanner - Sufficient quantity
6. Cutting Tools - Sufficient quantity
7. Pitch gauge - 5 Nos.
8. Thread gauge - 5 Nos.
10. Snap gauges - Sufficient quantity
11. Steel Rule (0-150) - Sufficient quantity
12. Calipers (Inside / Outside / Jenny) - Sufficient quantity
13. Dial Gauge with Magnetic Stand - Sufficient quantity
14. Marking Gauge - Sufficient quantity

## Drilling Section
1. Upright drilling machine - 2 Nos.
2. Radial drilling machine - 1 No.
3. Drill bit & Tap set - Sufficient quantity
4. Reaming bit - Sufficient quantity
5. Counter sinking bit - Sufficient quantity
6. Counter boring bit - Sufficient quantity
7. Plug gauges - Sufficient quantity
8. Vernier Height Gauge - 1 No.
DIRECTORATE OF TECHNICAL EDUCATION
DIPLOMA IN MECHANICAL ENGINEERING
[MTMR]

M SCHEME
2015 -2016 onwards

II YEAR
III SEMESTER

32045 – STRENGTH OF MATERIALS AND
FLUID MECHANICS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE
M-SCHME
(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [MTMR]
Course Code : 2022
Subject Code : 32045
Semester : III
Subject Title : STRENGTH OF MATERIALS AND FLUID MECHANICS PRACTICAL

TEACHING AND SCHEME OF EXAMINATIONS:
No. of Weeks per Semester: 15 Weeks

<table>
<thead>
<tr>
<th>Subject</th>
<th>Instructions</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength of Materials and Fluid</td>
<td>Hours/Week</td>
<td>Hours/Semester</td>
</tr>
<tr>
<td>Mechanics Practical</td>
<td>4</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OBJECTIVES:
- Acquire skills on different types of testing methods of metals.
- Conduct material testing on elasticity, hardness, shear strength
- Determine modulus of rigidity of open spring and closed coil springs.
- Determine the co-efficient of discharge of venturimeter, orifice meter, mouth piece and orifice.
- Determine the co-efficient of friction in pipes.
- Conduct performance test on centrifugal and reciprocating pumps.
- Conduct performance test on impulse and reaction turbines.
Strength of Materials Laboratory

Exercises

1. Test on Ductile Materials:
   Finding Young’s Modulus of Elasticity, yield points, percentage elongation and percentage reduction in area, stress strain diagram plotting, tests on mild steel.

2. Hardness Test:
   Determination of Rockwell’s Hardness Number for various materials like mild steel, high carbon steel, brass, copper and aluminium.

3. Torsion test:
   Torsion test on mild steel – relation between torque and angle of twist-determination of shear modulus and shear stress.

4. Impact test:
   Finding the resistance of materials to impact loads by Izod test and Charpy test.

5. Tests on springs of circular section:
   Determination of modulus of rigidity, strain energy, shear stress and stiffness by load deflection method (Open / Closed coil spring)

6. Shear test:
   Single or double shear test on M.S. bar to finding the resistance of material to shear load.

Fluid Mechanics Laboratory

Exercises

1. Verify the Bernoulli’s Theorem.

2. Determination of co-efficient of discharge of a mouth piece / orifice by variable head method.

3. Determination of co-efficient of discharge of a venturimeter / orificemeter.

4. Determination of the friction factor in a pipe.

5. Performance test on reciprocating pump / centrifugal pump and to draw the characteristics curves.

6. Performance test on impulse turbine / reaction turbine and to find out the Efficiency.
BOARD EXAMINATION

Note: All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise in each section. All the exercises should be given in the question paper and students are allowed to select by a lot. Record note book should be submitted during examination.

**Detailed allocation**

**Strength of material lab**

<table>
<thead>
<tr>
<th>Part A</th>
<th>35 marks</th>
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<tbody>
<tr>
<td>Observation</td>
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</tr>
<tr>
<td>Tabulation / Calculation</td>
<td>-</td>
</tr>
<tr>
<td>Result / Graph</td>
<td>-</td>
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**Fluid mechanics lab**

<table>
<thead>
<tr>
<th>Part B</th>
<th>35 marks</th>
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<tbody>
<tr>
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<td>Tabulation / Calculation</td>
<td>-</td>
</tr>
<tr>
<td>Result / Graph</td>
<td>-</td>
</tr>
<tr>
<td>Viva-voce</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
</tr>
</tbody>
</table>
LIST OF EQUIPMENTS

1. UTM 01
2. Rockwell’s Hardness Testing Machine 01
3. Torsion testing machine 01
4. Impact testing machine 01
5. Spring testing arrangements 01
6. Shear testing machine 01
7. Vernier calliper 02
8. The Bernoulli’s Apparatus 01
9. An Open tank fitted with a small orifice / an external mouth piece and a collecting tank with Piezometer 01
10. A Centrifugal pump having the discharge line with venturimeter / orifice meter arrangement 01
11. An arrangement to find friction factor of pipe 01
12. A reciprocating pump with an arrangement for collecting data to find out the efficiency and plot the characteristics curves. 01
13. A centrifugal pump with an arrangement for collecting tank to find out the efficiency and plot the characteristics curves. 01
14. A impulse turbine with an arrangement for calculating data to find out the efficiency 01
15. A reaction turbine with an arrangement for collecting data to find out the efficiency 01
DIRECTORATE OF TECHNICAL EDUCATION
DIPLOMA IN MECHANICAL ENGINEERING

[MTMR]
M SCHEME
2015 -2016 onwards

II YEAR
IV SEMESTER

32037 – METROLOGY AND METALLOGRAPHY
PRACTICAL

CURRICULUM DEVELOPMENT CENTRE
M-Scheme
( Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [MTMR]
Course Code : 2022
Subject Code : 32037
Semester : IV
Subject Title : METROLOGY & METALLOGRAPHY PRACTICAL

TEACHING AND SCHEME OF EXAMINATIONS:
No. of weeks per semester: 15 Weeks

<table>
<thead>
<tr>
<th>Subject</th>
<th>Instructions</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metrology &amp; Metallography</td>
<td>Hours/Week</td>
<td>Hours/Semester</td>
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<tr>
<td>Practical</td>
<td>4</td>
<td>60</td>
</tr>
<tr>
<td></td>
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</tbody>
</table>

OBJECTIVES:
- Familiarize about measuring techniques of Metrology instruments.
- Select the range of measuring tools.
- Obtain accurate measurements.
- Determine the least count of measuring instruments.
- Study the working principle of Microscope.
- Specimen preparation of ferrous and non-ferrous metals.
- Grinding, polishing and mounting of specimen.
- Non-destructive testing of metals for cracks.
- Crack detection – Visual inspection, Die penetration method
- Prepare the record of work for the exercises.

METROLOGY SECTION:
- Introduction to linear measurement.
- Introduction to angular measurement.
- Introduction to geometric measurements.
• Study of Least Count of measuring instruments.
• Study of accuracy of instruments and calibration of instruments.
• Study of Linear Measuring Instruments: Vernier Caliper, Micrometer, Inside Micrometer, Vernier Height gauge, Depth Gauge and Slip Gauge.
• Study of Angular Measuring Instruments – Universal Bevel Protractor, Sine Bar.
• Study of Geometric measurement - Gear tooth Vernier, Thread Micrometer.

Exercises:
1. Measure the dimensions of ground MS flat / cylindrical bush using Vernier Caliper compare with Digital / Dial Vernier Caliper.
2. Measure the diameter of a wire using micrometer and compare the result with digital micrometer
3. Measure the thickness of ground MS plates using slip gauges
5. Measure the angle of the machined surface using sine bar with slip gauges.
6. Measure the geometrical dimensions of V-Thread using thread Vernier gauge.
7. Measure the geometrical dimensions of spur gear.

METALLOGRAPHY SECTION:
• To study the micro structure of the metals using Metallurgical Microscope.
• Determine the micro structure of the ferrous and nonferrous metals.
• Prepare the specimen to study the microstructure.
• Conduct the liquid penetration test to find the crack.
• Conduct magnetic particle test to find cracks.

Exercises:
1. Find the grain structure of the given specimen using the Metallurgical Microscope.
2. Prepare a specimen to examine the micro structure of the Ferrous and Non-ferrous metal.
3. Detect the cracks in the specimen using Visual Inspection and ring test.
5. Detect the cracks in specimen using Magnetic particle test.
BOARD EXAMINATION

Note: All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise in each section. All the exercises should be given in the question paper and students are allowed to select by a lot.

Record note book should be submitted during examination.

Detailed allocation

<table>
<thead>
<tr>
<th>Metrology Section</th>
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<tr>
<td>Procedure / Least Count</td>
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<tr>
<td>Reading / Calculation</td>
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<td>Result</td>
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<table>
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<th>Metallography Section</th>
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<tr>
<td>Procedure</td>
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<tr>
<td>Preparation and observation</td>
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<tr>
<td>Result</td>
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Viva voce 5

Total 75
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<th>No.</th>
<th>Equipment</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>1</td>
<td>Vernier Caliper</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>2</td>
<td>Digital Vernier Caliper</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>3</td>
<td>Dial Vernier Caliper</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>4</td>
<td>Micrometer</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>5</td>
<td>Digital Micrometer</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>6</td>
<td>Slip gauges</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>7</td>
<td>Universal bevel protractor</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>8</td>
<td>Sine bar</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>9</td>
<td>Thread micrometer</td>
<td>2 Nos.</td>
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<tr>
<td>10</td>
<td>Surface plate</td>
<td>2 Nos.</td>
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<tr>
<td>11</td>
<td>Vernier height gauge</td>
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<tr>
<td>12</td>
<td>Metallurgical Microscope</td>
<td>2 Nos.</td>
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<tr>
<td>13</td>
<td>Die penetration</td>
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<td>14</td>
<td>Magnetic particle test</td>
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<tr>
<td>15</td>
<td>Abrasive belt grinder</td>
<td>1 No.</td>
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<tr>
<td>16</td>
<td>Polishing machine</td>
<td>1 No.</td>
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<tr>
<td>17</td>
<td>Mounting machine</td>
<td>1 No.</td>
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<tr>
<td>18</td>
<td>Specimen</td>
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<td></td>
<td>(Ferrous / Non-ferrous metals)</td>
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<tr>
<td>19</td>
<td>Consumable</td>
<td>Sufficient quantity</td>
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DIRECTORATE OF TECHNICAL EDUCATION
DIPLOMA IN MECHANICAL ENGINEERING

[MTMR]
M SCHEME
2015 -2016 onwards

II YEAR
IV SEMESTER

32035 – FOUNDRY AND WELDING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE
M-SCHME
(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [MTMR]
Course Code  : 2022
Subject Code : 32035
Semester     : IV
Subject Title: FOUNDRY AND WELDING PRACTICAL

TEACHING AND SCHEME OF EXAMINATIONS:
No. of weeks per semester: 15 Weeks

<table>
<thead>
<tr>
<th>Subject</th>
<th>Instructions</th>
<th>Examination</th>
<th>Duration</th>
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<tr>
<td>Foundry and Welding</td>
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<td>Practical</td>
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<td>Hours/Semester</td>
<td>Marks</td>
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<td>Board Examination</td>
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<td>75</td>
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<td>100</td>
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</tbody>
</table>

OBJECTIVES:
- Identify the tools used in foundry.
- Identify the tools and equipment used in welding
- Prepare sand moulds for different patterns.
- Perform welding operation to make different types of joints.
- Identify the different welding defects.
- Appreciate the safety practices used in welding.
- Prepare a record of work for all the exercises.

Foundry Section
1. Introduction of tools and equipment
2. Types of patterns
3. Types of sand
4. Preparation of sand moulds
5. Core sands, preparation of cores
Exercises:
Prepare the green sand mould using the following patterns.

Solid pattern
1. Stepped pulley

Split pattern
2. Bent Pipe with core print
3. T-pipes with core print
4. Tumbles

Loose Piece Pattern
5. Dovetail

Core preparation
6. Core preparation for Bent pipe / T-pipe

Welding Section
1. Introduction of Safety in welding shop
2. Introduction to hand tools and equipment
3. Arc and gas welding equipment
4. Types of joints

Exercises:
Make the following welding joint / cutting.

Arc welding (Raw Material: 25 mm x 6mm MS flat)
1. Lap joint
2. Butt joint
3. T- joint

Gas Welding (Raw Material: 25mm x 3mm Ms flat)
4. Lap joint

Gas cutting: (GI/MS Sheet - 3mm thickness)
5. Profile cutting – circular profile

Spot welding: (GI/MS Sheet)
6. Lap joint
BOARD EXAMINATION

Note: All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise in each section. All the exercises should be given in the question paper and students are allowed to select by a lot. Record note book should be submitted during examination.

Detailed allocation

**Foundry**: 35 marks
- Preparation of sand - 10
- Ramming and vent holes - 15
- Gate cutting / Finish - 10

**Welding**: 35 marks
- Edge preparation - 10
- Welding / Cutting - 15
- Joint strength / Finish - 10

**Viva-voce**: 05 marks

**Total**: 75 marks
LIST OF EQUIPMENT

Welding:

1. Arc welding booth - 2 No’s with welding transformer
2. Gas welding unit - 1 Set
   (Oxygen and acetylene cylinder)
3. Flux - Sufficient quantity
4. Electrode - Sufficient quantity
5. Welding rod - Sufficient quantity
7. Gas welding goggles - 5 Nos.
8. Leather Glows 18” - 10 Sets.
9. Chipping hammer - 10 Nos.
10. Spot welding machine - 1 No.
11. Personal protective equipment - Sufficient quantity
12. Fire safety equipment - Sufficient quantity

Foundry:

1. Moulding board - 15 Nos.
2. Cope box - 15 Nos.
3. Drag box - 15 Nos.
4. Core box - 10 Nos.
5. Shovel - 5 Nos.
7. Slick - 15 Nos.
9. Riddle - 5 Nos.
11. Lifter - 15 Nos.
15. Gate cutter - 15 Nos.
16. Runner & riser - 15 Nos. each
17. Patterns - Sufficient quantity
39291 - Industrial Training – I (Report Writing & Viva Voce)
DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (MACHINE TOOL MAINTENANCE AND REPAIRS) (SANDWICH)

III YEAR
M – SCHEME

V SEMESTER
2015 -2016 onwards

39251 INDUSTRIAL PRODUCTION TECHNOLOGY – II

CURRICULUM DEVELOPMENT CENTRE
M-SCHÉME

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs)

Course Code: 2022

Subject Code: 39251

Semester: V

Subject Title: INDUSTRIAL PRODUCTION TECHNOLOGY – II

<table>
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<th>Subject</th>
<th>Instructions</th>
<th>Examination</th>
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<tbody>
<tr>
<td></td>
<td>Hour(s) / Week</td>
<td>Hours /Semester</td>
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<tr>
<td>INDUSTRIAL PRODUCTION TECHNOLOGY – II</td>
<td>4</td>
<td>60</td>
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<tr>
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<td>Board Examination 75</td>
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Topics and Allocation of Hours:

<table>
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<tr>
<th>S.No</th>
<th>Topic</th>
<th>Hours</th>
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<tbody>
<tr>
<td>1</td>
<td>Theory of Metal cutting, Drilling machines and Boring Machines</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>Reciprocating Machines</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>Milling machines and gear generating processes</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>Abrasive Process and Broaching</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>Jigs &amp; Fixtures &amp; Non-Conventional Machining</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>Test and Revision</td>
<td>5</td>
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<td></td>
<td><strong>Total</strong></td>
<td><strong>60</strong></td>
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</tbody>
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Rational:
It is pertinent that those involved in the process of manufacturing should possess adequate and through knowledge about the working of conventional as well as non conventional machines to see that the process of manufacturing goes on without any hindrance. This will
help the individuals to hasten and also troubleshoot the hiccups that may crop up in the process of manufacturing.

Objectives:

- To know the Theory of Metal cutting, Drilling machines and Boring Machines
- To know about Reciprocating Machines
- To know about Milling machines and gear generating processes
- To know about Abrasive Process and Broaching
- To know about Jigs & Fixtures & Non-Conventional Machining

### INDUSTRIAL PRODUCTION TECHNOLOGY – II

#### Detailed Syllabus

<table>
<thead>
<tr>
<th>Unit</th>
<th>Name of the Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>THEORY OF METAL CUTTING, DRILLING MACHINES AND BORING MACHINES</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td><strong>Theory of Metal Cutting:</strong> Cutting tool material-High carbon Steel-High Speed Steel-Stellites-Cemented carbides-ceramics-Composition and applications for the above.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Boring Machines:</strong> Boring machines-horizontal and vertical types-fine boring machines-boring tools</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>RECIPROCATING MACHINES</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td><strong>Planer:</strong> Types of planers-description of double housing planer specifications- principles of operation-drives-quick return mechanism-feed mechanism- work holding devices and special fixtures-types of tools various operation.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Shaper:</strong> Types of shapers-specifications-standard-plain-</td>
<td></td>
</tr>
</tbody>
</table>
universal principles of operations-drives-quick return mechanism-crank and slotted link-feed mechanism-work holding devices-Special fixture-various operations.

**Slotter:** Types of slotters-specifications-method of operation-Whitworth quick return Mechanism-feed mechanism-work holding devices-types of tools.

### III MILLING MACHINES AND GEAR GENERATING PROCESSES


**Generating Process:** gear shaper - gear hobbing - principle of operation only - gear finishing processes-burnishing-shaving-grinding and lapping gear materials - cast iron, steel, alloy steels, brass, bronze, aluminum and nylon.

### IV ABRASIVE PROCESS AND BROACHING

**Abrasive Process:** Types and classification-specifications-rough grinding – pedestal grinders- portable grinders- belt grinders-precision grinding cylindrical grinder- center less grinders – surface grinder- tool and cutter grinder - planetary grinders-principles of operations-grinding wheels abrasives-natural and artificial diamond wheels -mounting of grinding wheels-Dressing and Truing of wheels-Balancing of grinding wheels.

**Broaching:** Types of broaching machine - horizontal, vertical and continuous broaching - principles of operation - types of broaches classification - broach tool nomenclature - broaching
<table>
<thead>
<tr>
<th>V</th>
<th>JIGS &amp; FIXTURES &amp; NON-CONVENTIONAL MACHINING</th>
</tr>
</thead>
</table>
| **Jigs And Fixtures:** | Definitions and concept of Jig and fixture.
| | Advantages of jigs and fixtures - elements of jigs and fixtures - locating devices - 'V' locators - fixed stop locators - adjustable stop locators - clamping devices - strap clamp, screw clamp - cam action clamp - types of jigs - box drill jig indexing drill jig - types of fixtures - keyway milling fixture-string milling fixture. |
| **Non-Conventional Machining Processes:** | Construction, working and applications of Ultrasonic machining - chemical machining - electro chemical grinding - electrical discharge machining - plasma arc machining - LASER machining. |

**Text Book** :

**Reference Book** :
DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (MACHINE TOOL MAINTENANCE AND REPAIRS) (SANDWICH)

II YEAR / III YEAR

M – SCHEME

V SEMESTER

2015 -2016 onwards

39252 THERMAL AND RENEWABLE ENERGY

CURRICULUM DEVELOPMENT CENTRE
M-SHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs)

Course Code: 2022

Subject Code: 39252

Semester: V

Subject Title: Thermal and Renewable Energy

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<tbody>
<tr>
<td></td>
<td>Hour s / Week</td>
<td>Hours /Semest er</td>
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<tr>
<td>Thermal and Renewable Energy</td>
<td>4</td>
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</tbody>
</table>

**Topics and Allocation of Hours:**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basics of Thermodynamics and IC Engines</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>Steam Boilers, Boiler Mountings, Boiler Accessories, Thermal Power Plants</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>Refrigeration, Psychrometry, Air Conditioning</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>Fundamentals of Energy, Solar Energy</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>Wind Energy, Bio – Energy</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>Test</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>60</strong></td>
</tr>
</tbody>
</table>

**RATIONALE:** The exponential growth of engineering industries has made a vide scope for maintenance engineering. The student studying maintenance should have a thorough knowledge in various aspects of Thermal Equipment and Energy Conservation.  

**Objectives :**

- To know about Basics of Thermodynamics and IC Engines
- To know about Steam Boilers, Boiler Mountings, Boiler Accessories, Thermal Power Plants
- To know about Refrigeration, Psychrometry, Air Conditioning
- To know about Fundamentals of Energy, Solar Energy
- To know about Wind Energy, Bio – Energy

**Thermal and Renewable Energy**

**Detailed Syllabus**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Name of the Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Basics of Thermodynamics and IC Engines</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Introduction – definition and units of mass, weight, volume, density, specific weight – gravity – pressure – units - atmospheric, gauge, vacuum and absolute pressure - temperature - Celsius and absolute temperature - S.T.P and N.T.P conditions - heat - specific heat capacity at constant volume and at constant pressure - work - power - energy - types - thermodynamic system - types -properties and state of system - intensive and extensive properties -thermodynamic process - cycle - point and path function - law of conservation of energy - equilibrium - thermodynamic - zeroth , first and second law of thermodynamics- Perfect gases - law of perfect gases - Boyle's, Charles’, Joule’s, Regnault's and Avogadro’s law - characteristic gas equation – relation between specific heats and gas constant - universal gas constant . Introduction - classifications -four stroke cycle petrol and diesel engines -merits and demerits - two stroke cycle petrol and diesel engines – comparison constructional details of I.C.engine -components of engines – cylinder block, crankcase, cylinder head, liners, oil pan, piston, piston rings, connecting rod, crank shaft, cam shaft, valve and valve train - material and manufacturing methods - valve timing diagram for four stroke petrol and diesel engines – port timing for four stroke petrol and diesel engines Layout of fuel supply system in petrol engines</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Steam Boilers, Boiler Mountings, Boiler Accessories, Thermal Power Plants</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Introduction – formation of steam – condition of steam – wet,</td>
<td></td>
</tr>
</tbody>
</table>
**III Refrigeration, Psychrometry, Air Conditioning**


**IV FUNDAMENTALS OF ENERGY, SOLAR ENERGY**

Introduction to Energy – Energy consumption and standard of living – classification of energy resources – consumption trend of primary energy resources – importance of renewable energy sources

**SOLAR ENERGY**

heaters-Solar industrial heating system Principles of photovoltaic conversion of solar energy – types of solar cells – solar Photo Voltaic applications

<table>
<thead>
<tr>
<th>V</th>
<th>WIND ENERGY, BIO – ENERGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction – usable forms of bio mass, their composition and fuel properties-Biomass resources– Biogas production from waste Biomass – types of bio gas plants - applications – Biomass energy programmed in India.</td>
<td></td>
</tr>
</tbody>
</table>

**Text Book:**
1. A Textbook Of Thermal Engineering by R.S Kurmi -- S. Chand, 01-2008

**Reference Books**
DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (MACHINE TOOL MAINTENANCE AND REPAIRS) (SANDWICH)

II YEAR / III YEAR

M – SCHEME

V SEMESTER
2015 -2016 onwards

39253 ENGINEERING METROLOGY

CURRICULUM DEVELOPMENT CENTRE
M-Scheme
(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs)

Course Code: 2022

Subject Code: 39253

Semester: V

Subject Title: ENGINEERING METROLOGY

<table>
<thead>
<tr>
<th>Subject Title</th>
<th>Instructions</th>
<th>Examination</th>
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<tr>
<td></td>
<td>Hours / Week</td>
<td>Hours /Semester</td>
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<tr>
<td>Engineering Metrology</td>
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Topics and Allocation of Hours:

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<tr>
<th>S.No</th>
<th>Topic</th>
<th>Hours</th>
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<tbody>
<tr>
<td>1</td>
<td>Limits, Fits And Gauges:</td>
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<tr>
<td>2</td>
<td>Straightness, Flatness, Squareness, Parallelism, Circularity And Rotation</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>Angular Measurement And Surface Finish</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>Comparators And Non Destructive Testing</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>Transducers</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>Test and Revision</td>
<td>6</td>
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<td><strong>Total</strong></td>
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</table>

RATIONALE:
The exponential growth of engineering industries has made a vide scope for maintenance engineering. The student studying maintenance should have a thorough knowledge in various aspects of Metrology.

Objectives:
- To know the Limits, Fits And Gauges:
- To know the Straightness, Flatness, Squareness, Parallelism, Circularity And Rotation
- To know about Angular Measurement And Surface Finish
- To know about Comparators And Non Destructive Testing
- To about Transducers

**Engineering Metrology**
**Detailed Syllabus**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Name of the Topic</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>I</td>
<td>LIMITS, FITS AND GAUGES:</td>
<td>11</td>
</tr>
<tr>
<td>II</td>
<td>STRAIGHTNESS, FLATNESS, SQUARENESS, PARALLELISM, CIRCULARITY AND ROTATION:</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Straightness-definitions - straight edge- tests for straightness by using spirit level - auto collimator - flatness testing- procedure. Parallelism-two axis - two planes- parallel motion between trajectory and plane – trajectory to an axis two trajectories - equidistance-coincidence or alignment. Square ness - axis of rotation with a given plane - perpendicularity of motion- square ness testing - indicator method- correction for square ness error - engineer’s square tester- optical tester for square ness – Optical test for square ness – Circularity – sources of out of roundness – different types of irregularities of a circular part – causes of out of roundness – roundness and circularity – measurement of roundness by using V block – Test for checking rotation – run out</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>ANGULAR MEASUREMENT AND SURFACE FINISH:</td>
<td>11</td>
</tr>
</tbody>
</table>
Instruments for angular measurement - venire and optical level protractor - universal bevel protractors optical dividing head - angle gauges - use of angle gauges - manufacture of angle gauges - spirit level clinometers - auto collimator - photo electric micro tic auto collimator - automatic position sensing auto collimator - angle Decker - uses of angle Decker in combination with angle gauges.


IV Comparators And Non Destructive Testing
Introduction – Need for comparator – Principal of operation – Characteristics of good comparator – Classification – Mechanical Comparator – optical comparator – Electronic comparator – Pneumatic comparator

V TRANSUCERS:
|------------------|----------------------------|---------------|-----------------------------------------------------|------------------------|-----------------------------------|-----------|--------------------------|--------------------------|-------------------------|------------------|-------------------------|----------------|--------------------------------|-----------------------------|-----------------------------|--------------------------|----------------|----------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|---------------------------|

**Text Book:**


**Reference Books:**

2. A Textbook of Engineering Metrology (English) 7th Edition by Gupta,
DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (MACHINE TOOL MAINTENANCE AND REPAIRS) (SANDWICH)

III YEAR
M – SCHEME

V SEMESTER
2015 -2016 onwards

39254 MAINTENANCE OF MACHINE DRIVE ELEMENTS

CURRICULUM DEVELOPMENT CENTRE
M-SCHME
(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs)

Course Code: 2022

Subject Code: 39254

Semester: V

Subject Title: Maintenance of Machine Drive Elements

<table>
<thead>
<tr>
<th>Subject</th>
<th>Instructions</th>
<th>Examination</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours / Week</td>
<td>Hours /Semester</td>
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<tr>
<td>Maintenance of Machine Drive Elements</td>
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<td>60</td>
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Topics and Allocation of Hours:

<table>
<thead>
<tr>
<th>S.No</th>
<th>Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Friction and antifriction bearings</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>Belt drives and chain drives</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>Belt drives and chain drives</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>Clutches, brakes and couplings</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>Maintenance of mechanisms and safety devices</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>Test and Revision</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>60</td>
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</tbody>
</table>

RATIONALE:
The exponential growth of engineering industries has made a vide scope for maintenance engineering. The student studying maintenance should have a through knowledge in maintenance of Bearings, clutches, Compressors, Transmission systems, I.C engines, R& Ac Equipments and safety in industries.

Objectives:

- To about Friction and antifriction bearings
- To about Belt drives and chain drives
- To about Belt drives and chain drives
To about Clutches, brakes and couplings
To about Maintenance of mechanisms and safety devices

**Maintenance of Machine Drive Elements**  
**Detailed Syllabus**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Name of the Topic</th>
<th>Hours</th>
</tr>
</thead>
</table>
| I    | FRICITION AND ANTIFRICITION BEARINGS,  

a) Bearings: Types of bearings- friction bearings-solid and splited type friction bearings - regulated type and non regulated type- repair of bush bearings- – reconditioning.-pouring stellon compound- casting method- reboring- lubrication of friction bearings.- defects in friction bearings and rectification-

b)Anti friction bearings- ball, roller and taper roller bearings- special types of bearings-Bearing designation-bearing failure analysis-
Care and maintenance – bearing inspection and examination – lubrication of antifriction bearings- grease Vs oil comparison - bearing removal and assembly – tools and equipments used hydraulic press -bearing puller | 11 |
| II   | BELT DRIVES AND CHAINDRIVES;  

a) Bet drives: Types of belt and pulley- flat belt, V belt ,rope belt and timing belt. Flat belt pulley, V pulley and geared tooth pulley.  
b)Care and maintenance of flat leather belt – care and maintenance of rubber V-belts – belt fastening –  
c) Aligning of shaft and pulleys – installation and removal procedure for pulley and belts- straight edge and try square method- straight edge and slip gauge method- belt and pulley trouble shooting – mechanism for belt tensioning.  
d) Chain drives: Types of chain drives-silent chain and roller chain- 
Installation of chain drives – maintenance of precision chain | 11 |
<table>
<thead>
<tr>
<th>III</th>
<th><strong>POWER TRANSMISSION GEAR DRIVE SYSTEMS:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a) Gear drives: types of gears and its uses and application. Simple and compound gear drive-types of gear drives and its importance of drive transmission</td>
</tr>
<tr>
<td></td>
<td>b) Installation and alignment of gear drives</td>
</tr>
<tr>
<td></td>
<td>c) Maintenance and troubleshooting – lubrication of gear drives- gear defects and general repairs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IV</th>
<th><strong>CLUTCHES, BRAKES AND COUPLINGS:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a) Clutches; Types of clutches – clutch installation – care and maintenance of clutches– lubrication of clutches drives- general repairs.</td>
</tr>
<tr>
<td></td>
<td>b) Brakes; Types of brakes – shoe brake, band brake, and disc brake, air and oil brake- electromagnetic multiple disc friction brake-installation – care and maintenance of brakes – general repairs.</td>
</tr>
<tr>
<td></td>
<td>c) Types of couplings – general causes of coupling failure – parallel and angular misalignment of couplings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>V</th>
<th><strong>MAINTENANCE OF MECHANISMS AND SAFETY DEVICES:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a) Mechanical: Lead screw and nut mechanism, cam and follower, crank and connecting rod mechanism, pivots and lever mechanism, quick return mechanism in shaping machine and planning machine, PIV drives using belt, chain and disc drives-mechanical stroke limiter. Care and Replacement of Seals used in hydraulic and pneumatic components and engine head assembly.</td>
</tr>
<tr>
<td></td>
<td>b) Electrical elements; limit switch, push buttons, relays and contactors and proximity sensor both magnetic, inductive and capacitive sensor.</td>
</tr>
<tr>
<td></td>
<td>c) Pneumatic and Hydraulic drives; pressure switch-quick return mechanism in shaping machine.</td>
</tr>
</tbody>
</table>
d) Safety devices; Shear pin, interlocking devices, slipping dog clutch, unidirectional clutch, Dripping relay switch for electrical heaters and motors

TEXT BOOK
1. Maintenance Engineering Hand book by L.C. Morrow
2. Industrial Maintenance by H.P. Garg – chand& Co

REFERENCE BOOKS:
DIRECTORATE OF TECHNICAL EDUCATION
DIPLOMA IN MECHANICAL ENGINEERING

M SCHEME
2015 -2016 onwards

III YEAR
V SEMESTER

32044 – ELECTRICAL DRIVES AND CONTROL

CURRICULUM DEVELOPMENT CENTRE
M-SCHME
(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [MTMR]
Course Code : 2022
Subject Code : 32044
Semester : V
Subject Title : ELECTRICAL DRIVES AND CONTROL

TEACHING AND SCHEME OF EXAMINATIONS:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Instructions</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours/Week</td>
<td>Hours/Semester</td>
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<tr>
<td>Electrical Drives and Control</td>
<td>6</td>
<td>90</td>
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Total 3 Hrs

Topics and Allocation of Hours:

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<tr>
<th>Unit</th>
<th>Topics</th>
<th>Hours</th>
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<tbody>
<tr>
<td>I</td>
<td>DC CIRCUITS AND DC MACHINES</td>
<td>17</td>
</tr>
<tr>
<td>II</td>
<td>AC CIRCUITS AND AC MACHINES</td>
<td>17</td>
</tr>
<tr>
<td>III</td>
<td>STEPPER AND SERVO MOTORS &amp; DRIVES</td>
<td>17</td>
</tr>
<tr>
<td>IV</td>
<td>POWER SUPPLIES AND LOGIC GATES</td>
<td>16</td>
</tr>
<tr>
<td>V</td>
<td>CONTROL ELEMENTS AND PLC</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>TEST AND REVISION</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>90</strong></td>
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</table>

RATIONALE:
The automation is being the order of the day to improve the production with high quality consciousness. Such automation involves electrically operated switches,
sensors controlled through electrically driven motors and actuators. The subject aims in introducing the basic electrical DC and AC circuits and motors and also focuses on the various special control devices like stepper, servo drives and its controlling elements.

**OBJECTIVES:**

- Explore fundamental electric circuit laws.
- Explain the working principle of DC and AC Electrical machines.
- Identify the effective uses of drives of Electrical machines.
- Analyze the various power supply circuits.
- Select the field controlled elements.
- Explain the construction and working of Transformer.
- Compare the different types of Logic gates.
- Appreciate the safety practices followed in Electrical system.
- Compare the use of servo motors and stepper motors in electrical driving system
- Identify PLC Input outputs.
- Identify the use of Control elements.

**ELECTRICAL DRIVES & CONTROL**

**DETAILED SYLLABUS**

**Contents: Theory**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Name of the Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>DC CIRCUITS AND DC MACHINES</td>
<td>17</td>
</tr>
</tbody>
</table>

Definition- Electric current, voltage and resistance -Ohm’s law and Kirchoff’s law. Resistance in series and parallel and series, parallel – simple problems electromagnetism(definitions only ) – magnetic flux, flux density magnetic field intensity, MMF, permeability, reluctance, Faraday’s law of electromagnetic induction, electrical and mechanical units

DC generators – construction, principle of operation, types and application.

DC motors: - construction, principle of operation, types and
application.
Necessity of starters: Three point, four point starters.

II  AC CIRCUITS AND AC MACHINES

Fundamentals of AC voltage, and current – peak, average, RMS value of sine wave, frequency, time period, amplitude, power and power factor (definition only)- star and delta connection relationship between phase, line voltage and current in star and delta connections.
Alternator construction – principle of operation – types and applications.

III  STEPPER AND SERVO MOTORS & DRIVES:

PMDC, Stepper motor- construction and working principle and applications - Servo motor – types: brushless servo motor, permanent magnet servo motor construction and applications.
Industrial drives- types, group drive, individual drive, multi motor drive, block diagram of Variable frequency drive , stepper motor drive: single stepping and half stepping. Servo drives.
Electrical safety: - importance of earthing - electric shock: first aid, precautions - causes of accident and their preventive measures.
Energy conservation

IV  POWER SUPPLIES AND LOGIC GATES

applications.
Display devices – LED, 7 segment LED, LCD
Logic gates: Positive and negative logic, definition, symbol truth table,
Boolean expression for OR, AND, NOT, NOR, NAND, EXOR AND
EXNOR gates – Universal logic Gates: NAND, and NOR.

V CONTROL ELEMENTS AND PLC

Sensors: Photo electric sensor, Inductive proximity sensors,
Temperature sensors.
Switches: Push button switch, selector switch, limit switch, pressure switch,
temperature switch, float switch and reed switch.
Relays – NO, NC – usage- bimetallic thermal overload relays.
Contactors- usage – necessity of contactor- Solenoid type contactor
Circuit breakers – Miniature case Circuit breaker (MCCB) and
Miniature Circuit breaker (MCB), Oil Circuit breakers (OCB), Earth leakage circuit breaker (ELCB)
Features of PLC-PLC Block diagram- PLC scan - Fixed and modular
PLC Ladder logic-NO, NC contacts-Coils-AND, OR.

Text Books:

Reference Books:
2) Electronic Device and Circuits- An introduction – Allen Mottershed - Prentice Hall of India.
DIRECTORATE OF TECHNICAL EDUCATION
DIPLOMA IN MECHANICAL ENGINEERING

M SCHEME
2015 -2016 onwards

III YEAR
V SEMESTER

32046 – SPECIAL MACHINES PRACTICAL

CURRICULUM DEVELOPMENT CENTRE
M-SCHEME  
(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [MTMR]  
Course Code : 2022  
Subject Code : 32046  
Semester : V  
Subject Title : SPECIAL MACHINES PRACTICAL

TEACHING AND SCHEME OF EXAMINATIONS:

No. of weeks per semester: 15 Weeks

<table>
<thead>
<tr>
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<th>Instructions</th>
<th>Examination</th>
<th>Duration</th>
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<tr>
<td>Special Machines</td>
<td>Hours/Week</td>
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<tr>
<td>Practice</td>
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<td>Board Examination</td>
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<td>Total</td>
</tr>
</tbody>
</table>

OBJECTIVES:

- Identify a milling machine and its parts
- Identify a cylindrical grinder, surface grinder and tool and cutter grinder
- Identify shaper, Slotter and its parts
- Identify the tools and instruments used in milling.
- Handle the different types of work holding devices
- Machine a component using different machine tools.
- Calculate the indexing for a work
- Machine a gear using milling machine.
- Machine a cutting tool using Tool and Cutter grinder.
- Machine a plug gauge using Cylindrical grinding machine.
- Machine components by shaping machine
- Machine components by slotting machine
- Prepare a record of work for all the exercises.
EXERCISES:

1. Make ‘V’ Block using shaping machine

2. Make dovetail using shaping machine

3. Make groove cut using slotting machine

4. Make round to square in milling machine.

<table>
<thead>
<tr>
<th>Raw Material: M.S. / C.I</th>
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<tbody>
<tr>
<td><strong>Dimensions</strong></td>
</tr>
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<p>| <strong>Dimensions</strong>          |</p>
<table>
<thead>
<tr>
<th>Sl.No</th>
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</tbody>
</table>

6. Make Helical Gear using milling machine

7. Make slot cut using milling machine.

8. Make Progressive type Plug gauge using Cylindrical Grinding machine
9. Make a turning tool using Tool and Cutter Grinder

10. Make plain surfaces (four surfaces) using surface Grinder
BOARD EXAMINATION

Note: All the exercises should be given in the question paper and students are allowed to select by a lot. Record note book must be submitted for the examination.

ALLOCATION OF MARKS

| Job preparation / Marking | 15 |
| Setting / Operations      | 30 |
| Dimensions / Surface Finish | 25 |
| Viva voce                 | 5  |
| **Total**                 | 75 |

LIST OF EQUIPMENTS

1. Vertical milling machine /
   Vertical attachment - 2 Nos.
5. Tool and Cutter Grinder - 1 No.
7. Slotting Machine - 1 No.
8. Tools and Measuring instruments - Sufficient quantity.
9. Consumables - Sufficient quantity
DIRECTORATE OF TECHNICAL EDUCATION
DIPLOMA IN MECHANICAL ENGINEERING

M SCHEME
2015 -2016 onwards

II YEAR
IV SEMESTER

32047 – ELECTRICAL DRIVES AND CONTROL
PRACTICAL

CURRICULUM DEVELOPMENT CENTRE
M-SHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [MTMR]
Course Code : 2022
Subject Code : 32047
Semester : V
Subject Title : ELECTRICAL DRIVES AND CONTROL PRACTICAL

TEACHING AND SCHEME OF EXAMINATIONS:
No. of Weeks per Semester: 15 Weeks

<table>
<thead>
<tr>
<th>Subject</th>
<th>Instructions</th>
<th>Examination</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours/ Week</td>
<td>Hours/ Semester</td>
</tr>
<tr>
<td>Electrical Drives and Control</td>
<td>4</td>
<td>60</td>
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<tr>
<td>Practical</td>
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Duration: 3 Hrs

OBJECTIVES:

- Identify starters for different motors.
- Study and prepare earthing
- Test the characteristics of DC and AC machines.
- Identify and select controlling elements.
- Explore the performance of ELCB, MCB.
- Design regulated power supplies.
- Identify display devices - LED, 7 segment LED, LCD.
- Identify the drive circuit for special motors.
- Test the speed control circuit of the special motors.
LIST OF EXPERIMENTS:

Part A:
1. Verification of Ohm’s Law
2. Testing of DC starters – 3 point and 4 point starter
3. Load test on DC shunt motor
4. Testing of AC starters - DOL, star - Delta starter
5. Load test on single phase induction motor
6. Load test on three phase squirrel cage motor
7. Testing of relays, contactors, push buttons and limit switch
8. Connection and Testing of MCB, ELCB

Part B
9. Construction and testing of Half wave and Full wave rectifier.
10. Construction and testing of IC voltage regulator using IC 7805.
11. Verification of truth tables for logic gates.
12. Verification of universal gates.
13. Identification and testing of display devices- LED, 7 segment LED, Laser diode.
15. Testing of Servo motor drive.
BOARD EXAMINATION

Note: All the exercises are to be completed. One exercise from Part A and another one from Part B should be given for the Examination.

<table>
<thead>
<tr>
<th>Part A:</th>
<th>35</th>
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</thead>
<tbody>
<tr>
<td>Circuit diagram</td>
<td>05</td>
</tr>
<tr>
<td>Connections &amp; Readings</td>
<td>15</td>
</tr>
<tr>
<td>Calculations &amp; Graph</td>
<td>15</td>
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<table>
<thead>
<tr>
<th>Part B:</th>
<th>35</th>
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</thead>
<tbody>
<tr>
<td>Circuit diagram</td>
<td>05</td>
</tr>
<tr>
<td>Connections &amp; Readings</td>
<td>15</td>
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<tr>
<td>Execution</td>
<td>15</td>
</tr>
<tr>
<td><strong>Viva Voce</strong></td>
<td>5</td>
</tr>
</tbody>
</table>

**Total** 75

LIST OF EQUIPMENTS

**Electrical Lab**

1. DC ammeter 0-5A - 1no
2. DC ammeter 0-25A - 1no
3. DC voltmeter 0-30V - 1no
4. DC voltmeter 0-300V - 1no
5. Rheostat 10.8, 8.5A - 1no
6. AC ammeter 0-5A - 1no
7. AC ammeter 0-10A - 2nos.
8. AC voltmeter 0-50V - 3nos
9. AC wattmeter 5A-10A (0-750W, 0-600V) - 3nos
10. Loading rheostat 5A, 230V - 1no
11. Tachometer 0-1000rpm (Analog type) - 1no
12. Variac 20A, 250V (Auto transformer) - 2nos
13. 3 point starter 20A, 220V - 1no
14. DOL starter 16A, 415V - 1no
15. Star /Delta starter 20A, 600V - 1no
16. Over load relay 1 to 2.5A - 1no
17. Air break contactors 20A, 220V - 4nos
18. Push button 2A, 220V - 2nos
19. Limit switch 20A, 220V - 1no
20. MCB 20A single pole - 1no
21. MCB 20A double pole - 1no
22. ELCB 2pole 20A, 100mA - 1no
23. ELCB 4POLE 20A, 100mA - 1no

**Electronics Lab**

1. Transformer 230 / 9-0-9V, 1A - 4 nos.
2. Resistor 1 KΩ / ½ W - 3 nos.
3. Capacitor 1000 μF/25V - 4 nos.
4. IC 7805 - 1 no.
5. Logic Gates IC
   7400, 7408, 7432, 7404, 7402, 7486- - 1 each
6. Stepper Motor Drive kit - 1no.
7. Servo Motor Drive Kit - 1no
8. Digital Multimeter - 1no.
9. LED, 7Segment LED, Laser Diode - 1 each
DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (MACHINE TOOL MAINTENANCE AND REPAIRS) (SANDWICH)

III YEAR
M – SCHEME
V SEMESTER
2015-2016 onwards

39258 THERMAL EQUIPMENTS PERFORMANCE PRACTICAL

CURRICULUM DEVELOPMENT CENTRE
M-Scheme

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs)

Course Code: 2022

Subject Code: 39258

Semester: V

Subject Title: THERMAL EQUIPMENTS PERFORMANCE PRACTICAL

<table>
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<th>Subject</th>
<th>Instructions</th>
<th>Examination</th>
<th>Hour s / Week</th>
<th>Hours /Semester</th>
<th>Marks</th>
<th>Duration</th>
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<td>4</td>
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<th>Board Examination</th>
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<tr>
<td></td>
<td>25</td>
<td>75</td>
<td>100</td>
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</tbody>
</table>

Rational:

The students studying maintenance should knowledge of lubricants, components of engines, tools which they suppose to handle and fundamentals wiring diagrams

Objectives:

- To know the properties lubricants
- To components of engines
- To know the tools
- To know the wiring diagram
- Flash and fire points oil
- Valve timing diagram and Port timing diagram of petrol engines
- Valve timing diagram and Port timing diagram of diesel engines
- Components like of automobile
- Wiring diagram
Exercises
1. Determining flash and fire points of the given oil using open cup apparatus
2. Determining flash and fire points of the given oil using close cup apparatus.
3. Valve timing diagram and Port timing diagram of petrol engines
4. Valve timing diagram and Port timing diagram of diesel engines
5. Removing, charging and replacing the BATTERY from a car.
6. Identification of various components of Ignition system.
7. Dismantling and Overhauling of a Distributor, Setting Contact Breaker Points
8. Servicing of Spark Plugs.
9. Measurement of voltage, current and resistance by using millimeter (both analog and digital) in all ranges.
10. Study of R&AC tools
11. Wiring diagram of Refrigerator
12. Performance test of evaporator
13. Performance test of condenser
14. Determination of COP of vapour compression system
15. Determination of various air conditioning processes by using air washer
BOARD EXAMINATION

Note: All the exercises in both sections have to be completed.
All the exercises should be given in the question paper and students are allowed to select by a lot.
Record note book should be submitted during examination.

Detailed allocation

<table>
<thead>
<tr>
<th>Procedure</th>
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<tr>
<td>Drawing</td>
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<tr>
<td>Tabulation</td>
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</tr>
<tr>
<td>Observation and Calculation</td>
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<td>25 Marks</td>
</tr>
<tr>
<td>Viva-voce</td>
<td>-</td>
<td>05 marks</td>
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<tr>
<td>Result</td>
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<td>05 Marks</td>
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<tr>
<td>Total</td>
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<td>75 marks</td>
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</table>

List of Equipments

<table>
<thead>
<tr>
<th>S No</th>
<th>Name Of The Equipment / Tools</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Open Cup Apparatus</td>
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</tr>
<tr>
<td>2</td>
<td>Close Cup Apparatus</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Cut Section Petrol Engine</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Cut Section Diesel Engine</td>
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<tr>
<td>5</td>
<td>Evaporator (Window Air Conditioner or Split Air Conditioner)</td>
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</tr>
<tr>
<td>6</td>
<td>Condenser (Window Air Conditioner or Split Air Conditioner)</td>
<td>1</td>
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<tr>
<td>7</td>
<td>Air washer</td>
<td>1</td>
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DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (MACHINE TOOL MAINTENANCE AND REPAIRS) (SANDWICH)

III YEAR

M – SCHEME

VI SEMESTER

2015-2016 onwards

39261 INDUSTRIAL AUTOMATION

CURRICULUM DEVELOPMENT CENTRE
M-Scheme

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs)

Course Code: 2022

Subject Code: 39261

Semester: VI

Subject Title: INDUSTRIAL AUTOMATION

<table>
<thead>
<tr>
<th>Subject Title</th>
<th>Instructions</th>
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<tr>
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<td>Hours / Week</td>
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<thead>
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<th>Topics and Allocation of Hours:</th>
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<tr>
<td>S.No</td>
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RATIONALE:
As per the latest requirements in the Industries this enables to learn the assistance of computer in the field of design and manufacturing areas. It’s able to learn the latest manufacturing concepts of in the shop floors and manufacturing methods like RPT. They are able to know about the working of principles of CNC machines and programming techniques are included. The application of material handling equipments and robots are learnt based on the automation in the industries.

Objectives:

- Introduction To CNC And Types CNC Machines
- Components Of CNC Machine
- Part Programming
- FMS, Integrated Material Handling And Robot
- Maintenance Of CNC Machines

**INDUSTRIAL AUTOMATION**

*Detailed Syllabus*

<table>
<thead>
<tr>
<th>Unit</th>
<th>Name of the Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>INTRODUCTION TO CNC And TYPES CNC MACHINES</strong></td>
<td>14</td>
</tr>
<tr>
<td>II</td>
<td><strong>COMPONENTS OF CNC MACHINE</strong></td>
<td>14</td>
</tr>
<tr>
<td>III</td>
<td><strong>PART PROGRAMMING</strong></td>
<td>14</td>
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<tr>
<td>IV</td>
<td>FMS, INTEGRATED MATERIAL HANDLING AND ROBOT</td>
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<table>
<thead>
<tr>
<th>V</th>
<th>VMAINTENANCE OF CNC MACHINES</th>
</tr>
</thead>
</table>

Text Books:
1) CAD/CAM/CIM, R.RadhaKrishnan, S.Subramanian, New Age International Pvt. Ltd.
2) CAD/CAM, Mikell P.Groover, Emory Zimmers, Jr.Prentice Hall of India Pvt., Ltd.

Reference Books:
DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (MACHINE TOOL MAINTENANCE AND REPAIRS) (SANDWICH)

III YEAR
M – SCHEME

VI SEMESTER
2015 -2016 onwards

39262 AUXILIARY EQUIPMENT MAINTENANCE

CURRICULUM DEVELOPMENT CENTRE
M-SCHMEE
(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs)

Course Code: 2022

Subject Code: 39262

Semester: VI

Subject Title: AUXILIARY EQUIPMENT MAINTENANCE

<table>
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<td>Hours / Week</td>
<td>Hours /Semester</td>
<td>Marks</td>
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<tr>
<td>Auxiliary Equipment Maintenance</td>
<td>5</td>
<td>75</td>
<td>Internal Assessment</td>
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<td>75</td>
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TOPICS AND ALLOCATION OF HOURS:

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<tr>
<th>Unit</th>
<th>Topic</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Maintenance of portable tools, compressors</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>Maintenance of material handling equipments</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>Maintenance of I.C engines</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>Maintenance of hydraulic drive transmission elements</td>
<td>14</td>
</tr>
<tr>
<td>5</td>
<td>Maintenance of industrial housekeeping and safety equipments</td>
<td>14</td>
</tr>
<tr>
<td>6</td>
<td>Test and Revision</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>75</strong></td>
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RATIONALE:
The exponential growth of engineering industries has made a vide scope for maintenance engineering. The student studying maintenance should have a thorough knowledge in maintenance of portable tools, compressors, Transmission systems and maintenance of I.C engines and safety in industries

OBJECTIVES:

- To know the maintenance of portable tools, compressors
- To know the maintenance of material handling equipments
- To know the maintenance of I.C engines
- To know the maintenance of hydraulic drive transmission elements
- To know the maintenance of industrial housekeeping and safety equipments

### Auxiliary Equipment Maintenance

#### Detailed Syllabus

<table>
<thead>
<tr>
<th>Unit</th>
<th>Name of the Topic</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>I</td>
<td>MAINTENANCE OF PORTABLE TOOLS, COMPRESSORS;</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>a) Maintenance of portable electric tools: Bearing, gearing, electric cord, brushes, switches and motor – cordless electric tools – inspection and maintenance of portable drills, screw drivers impact wrenches, sanders, portable grinders, shear, nibblers, circular saws reciprocating saws – routers and hammers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Maintenance of Portable Pneumatic tools: Lubrication - maintenance procedure for precision tools, chipping hammer sealers, rotating tools and portable grinders.</td>
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<tr>
<td></td>
<td>c) Servicing and operation of simple air compressor plant. Air compressor plant – servicing of air compressor plant – daily, weekly periodic maintenance</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>MAINTENANCE OF MATERIAL HANDLING EQUIPMENT:</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>a) Maintenance of material handling equipment: Maintenance or rope – wire rope and fiber rope – chain hoist-types of chain hoists-maintenance of hoisting equipment – wrench</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) E.O.T. crane – inspection of cranes with inspection report-crane maintenance-maintenance of belt and chain conveyors – maintenance of hydraulic and pneumatic conveyors</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>MAINTENANCE OF I.C ENGINES:</td>
<td>14</td>
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<tr>
<td>IV</td>
<td>MAINTENANCE OF HYDRAULIC DRIVE TRANSMISSION ELEMENTS:-</td>
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<tr>
<td></td>
<td>Hydraulic drives</td>
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<tr>
<td></td>
<td>a) Input elements - hydraulic power pack unit, filter, oil tank, pressure gauge, pump and motor unit, safety valve</td>
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<td></td>
<td>b) Control elements - valves - repair of pressure control valves - repair of directional control valves - repair of flow control valves</td>
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<tr>
<td></td>
<td>c) Output elements - repair of hydraulic cylinders and motors - replacement of seals and packing - troubles in the hydraulic drive and their causes - technical conditions for the assembly of hydraulic transmission - pumps and their repairs</td>
<td></td>
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</tbody>
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<table>
<thead>
<tr>
<th>V</th>
<th>MAINTENANCE OF INDUSTRIAL HOUSE KEEPING AND SAFETY EQUIPMENTS:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a) Housekeeping - Requirement of good housekeeping - proper layout and equipment - correct material handling and storage - cleanliness and orderliness - maintenance of housekeeping - house keeping incentive plan - maintenance responsibility for improving housekeeping</td>
</tr>
<tr>
<td></td>
<td>b) Safety equipments - Personnel protective equipments - guarding metal working machines - lathe, milling, grinding, shaping, cold metal forming, punching and shearing machines</td>
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<tr>
<td></td>
<td>C) Firefighting equipments - CO2-soda acid - carbon tetra chloride - dry powder - foam - fire protection from electrical hazard</td>
</tr>
</tbody>
</table>
TEXT BOOK
   1. Maintenance Engineering Hand book by L.C. Morrow

Reference Book
   1. Industrial Maintenance by H.P. Garg – chand& Co
DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (MACHINE TOOL MAINTENANCE AND REPAIRS) (SANDWICH)

III YEAR
M – SCHEME

VI SEMESTER
2015 -2016 onwards

39263 TOTAL QUALITY MANAGEMENT AND TOTAL PRODUCTIVE MAINTENANCE

CURRICULUM DEVELOPMENT CENTRE
M-Scheme
(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs)

Course Code: 2022

Subject Code: 39263

Semester: VI

Subject Title: TOTAL QUALITY MANAGEMENT AND TOTAL PRODUCTIVE MAINTENANCE

<table>
<thead>
<tr>
<th>Subject</th>
<th>Instructions</th>
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<tbody>
<tr>
<td></td>
<td>Hours / Week</td>
<td>Hours / Semester</td>
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<tr>
<td>TOTAL QUALITY MANAGEMENT AND TOTAL PRODUCTIVE MAINTENANCE</td>
<td>4</td>
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Topics and Allocation of Hours:

<table>
<thead>
<tr>
<th>S.No</th>
<th>Topic</th>
<th>Hours</th>
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<tbody>
<tr>
<td>1</td>
<td>Basic Concepts of Total Quality Management</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>Statistical Fundamentals</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>Overview of TPM</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>Aspects of TPM</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>Autonomous Maintenance</td>
<td>11</td>
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</tbody>
</table>

RATIONALE:
Total Productive Maintenance (TPM) is a very popular manufacturing philosophy and well accepted the world over. The TPM aims at creating a system for achieving and maintaining zero breakdown, zero defects, zero accident and zero pollution

Objectives:

- To know the Basic Concepts of Total Quality Management
- To know the Statistical Fundamentals
To have Overview of TPM

To know the Aspects of TPM

To know the Autonomous Maintenance

TOTAL QUALITY MANAGEMENT AND TOTAL PRODUCTIVE MAINTENANCE
Detailed Syllabus

<table>
<thead>
<tr>
<th>Unit</th>
<th>Name of the Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>BASIC CONCEPTS OF TOTAL QUALITY MANAGEMENT</td>
<td>11</td>
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</tbody>
</table>

- Quality-Definitions
- Dimensions of quality-Brainstorming and its objectives

| II   | STATISTICAL FUNDAMENTALS | 11    |

- Types of Data – Collection of Data – Classification of Data – Tabular presentation of Data – Graphical representation of a frequency distribution – Comparison of Frequency distribution – Mean – Median – Mode –
- Comparison of measures of central tendency – Introduction to measures of dispersion – Sample – sampling - Normal curve – Sigma – Concept of six sigma – Principles – Process

| III  | Overview of TPM | 11    |

institutionalizing – Stage B- initial implementation stage- starting TPM or- kick off -Stage C- full implementation or full development stage – establishing system for improving production efficiency - – Individual Improvement – Autonomous Maintenance – Planned Maintenance – operation and maintenance skill upgradation training - Establishing initial control system for new products and equipments- establishing quality maintenance – organization (HinshitsuHozen )- Establishing systems to improve efficiency of administration - Establishing system to control safety and working environment – Maturity stage – getting the PM award.

### IV Aspects of TPM

Equipment effectiveness and types of losses – suspension loss- plant maintenance loss – production adjustment loss -  Downtime loss – equipment failure loss- process failure loss – Speed loss-regular production loss-irregular production loss- 
Defect Loss- Process defect loss – loss which caused by rework- Understanding the production system to reduce or eliminate losses- definition - process-operation- Calculating overall Equipment Effectiveness (OEE) – TPM Principles and Zero failures-Establishing basic condition-Keep operating records good – prevent equipment from deterioration-Improve weak points in design-Improve skills-set up and adjustment time loss reduction -Internal and external changes.

### V Autonomous Maintenance

Text Book:

1. Total Productive Maintenance by K. Ganapathy, V. Narayana, B. Subramaniam and D.K. Srivarsa published quality circle forum of India October 2004

Reference Book:

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (MACHINE TOOL MAINTENANCE AND REPAIRS) (SANDWICH)

III YEAR
M – SCHEME

VI SEMESTER
2015 -2016 onwards

39264 MACHINE TOOL RECONDITIONING & OVERHAULING

CURRICULUM DEVELOPMENT CENTRE
M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs)

Course Code: 2022

Subject Code: 39264

Semester: VI

Subject Title: MACHINE TOOL RECONDITIONING & OVERHAULING

<table>
<thead>
<tr>
<th>Subject</th>
<th>Instructions</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours / Week</td>
<td>Hours /Sems</td>
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<tr>
<td></td>
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<td>ter</td>
</tr>
<tr>
<td>Machine Tool Reconditioning &amp; Overhauling</td>
<td>4</td>
<td>60</td>
</tr>
</tbody>
</table>

Total 3 Hrs

Topics and Allocation of Hours:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reconditioning Of Machine Tools</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>Maintenance Activity And Major Overhaul Machine Tools</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>Principles of Acceptance Test</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>Details of Testing of Various Machine Tools</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>Condition Based Maintenance</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>Test and Revision</td>
<td>5</td>
</tr>
</tbody>
</table>

Total 60

RATIONALE:
The exponential growth of engineering industries has made a vide scope for maintenance engineering. The student studying maintenance should have a thorough knowledge in various aspects of maintenance engineering

Objectives:

- To know about Reconditioning Of Machine Tools
- To know about Maintenance Activity And Major Overhaul Machine Tools
• To know about Principles of Acceptance Test
• To know about Details of Testing of Various Machine Tools
• To know about Condition Based Maintenance

Machine Tool Reconditioning & Overhauling
Detailed Syllabus

<table>
<thead>
<tr>
<th>Unit</th>
<th>Name of the Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Reconditioning Of Machine Tools</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>1.1 Sequence of maintenance operation: Procedure disassembly of machine tools, preparation of disassembly sequence and rules- examples of disassembly- washing of parts faultfinding- preparation for assembly- fitting in- balance of parts assembly of mechanisms and machines.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2 Scraping: Importance of scraping- techniques of scraping tools used for scraping- accuracy, tolerances and finish.</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Maintenance Activity And Major Overhaul Machine Tools</td>
<td>11</td>
</tr>
</tbody>
</table>
cracks in a cast iron body – technical requirements for the repaired lathe – standard chart for major overhaul of an engine lathe.

### III Principles of Acceptance Test

3.1 **Acceptance Test:** Acceptance test- reason for test- principles of acceptance test- machine tool under load – test charts execution of acceptance test – measuring equipments and methods.

3.2 **Dial Gauges:** Dial gauges – test mandrels – straight edges -squares- spirit levels- level measurement by water level- alignment by wire and measuring microscope.

3.3 **Alignment by Telescope:** Alignment by telescope and target magnitudes and direction of tolerances- straightness of slide ways and flatness of tables- alignment and true running of shafts- lead or pitch error of lead screws- pitch errors of gears and dividing errors of dividing heads

### IV Details of Testing of Various Machine Tools

4.1 **Milling and Gear cutting machines:** Milling and gear cutting machines – lathes - capstan and turret lathes, automatic lathes and vertical boring machines.

4.2 **Grinding Machines:** Grinding machines - drilling and boring machines - Acceptance tests and maintenance of machine tools. Test specification - the accuracy with which the machine has been manufactured - installation and leveling of the machines – testing the quality of slide ways and locating surfaces - testing the accuracy of the main spindle and of its alignment relative to other important parts of the machine

4.3 **Accuracy of the work Produced:** Accuracy of the work piece produced on the machine – power requirements - ISI test charts and detailed procedure – lathe, milling machine, grinding machine- drilling machines.

### V Condition Based Maintenance

<table>
<thead>
<tr>
<th>Page</th>
<th>11</th>
</tr>
</thead>
</table>

Curriculum Development Centre, DOTE.

5.2 **Off-load monitoring:** Crack detection – leak detection - vibration testing - corrosion monitoring - general purpose monitoring techniques - the systematic application of C.M.

5.3 **Lubricating monitoring:** Debris deposited- debris in suspension- condition of used oil- ferrography.

**Thermal monitoring:** Location of temperature measurement – temperature monitoring devices- contact sensors, liquid expansion sensors, bimetallic expansion sensors, thermocouple sensors, resistance sensors – temperature paints, Crayons and pellets- noncontact sensors- optical pyrometer, radiation pyrometer. Scanning DR camera. Malfunction that can be monitored thermally.

5.4 **Vibration and noise monitoring:** The cause of vibration and noise – measurement – equipment. The vibration or noise signals - vibration monitoring techniques- total signal monitoring – peak signal monitoring figure of merit shock pulse monitoring.

**Text Book:**
1. Industrial maintenance by HP Garg - S. Chand&Co, 1987

**Reference book:**
DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (MACHINE TOOL MAINTENANCE AND REPAIRS) (SANDWICH)

III YEAR

M – SCHEME

VI SEMESTER

2015 -2016 onwards

39265 ENGINEERING MANAGEMENT

CURRICULUM DEVELOPMENT CENTRE
M-Scheme
(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs)

Course Code: 2022

Subject Code: 39265

Semester: VI

Subject Title: ENGINEERING MANAGEMENT

<table>
<thead>
<tr>
<th>Subject</th>
<th>Instructions</th>
<th>Examinations</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours / Week</td>
<td>Hours / Semester</td>
</tr>
<tr>
<td>Engineering Management</td>
<td>4</td>
<td>60</td>
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<tr>
<td></td>
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</tbody>
</table>

Topics and Allocation of Hours:

<table>
<thead>
<tr>
<th>S.No</th>
<th>Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Plant Engineering And Plant Safety</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>Work Study, Method Study And Work Measurement</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>Production Planning And Quality Control</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>Principles Of Management And Personnel Management</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>Maintenance Management And Material Management</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>Test and Revision</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>60</strong></td>
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</tbody>
</table>

RATIONALE:
In the Indian Economy, Industries and enterprises always find prominent place. After globalization, the government of India has announced liberalization policy of starting an enterprise which resulted in the mushroom growth of industries. The present day students should be trained not only in manufacturing processes but also in managing activities of industries. Training must be imparted to students not only to shape them as technicians but also as good managers. The knowledge about plant, safety, work study techniques,
personnel management will definitely mould the students as managers to suit the industries. Due to the presence of such personalities the industries will leap for better prosperity and development.

**Objectives:**

- To know about Plant Engineering And Plant Safety
- To know about Work Study, Method Study And Work Measurement
- To know about Production Planning And Quality Control
- To know about Principles Of Management And Personnel Management
- To know about Maintenance Management And Material Management
# ENGINEERING MANAGEMENT
## Detailed Syllabus

<table>
<thead>
<tr>
<th>Unit</th>
<th>Name of the Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>PLANT ENGINEERING AND PLANT SAFETY</strong></td>
<td>11</td>
</tr>
<tr>
<td></td>
<td><strong>Plant Engineering</strong> :Plant – Selection of site of industry – Plant layout –Principles of a good layout – types – process, product and fixed position –techniques to improve layout – Principles of material handling equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Plant Safety</strong>: Importance –accident-causes and cost of an accident-accident proneness-prevention of accidents-Industrial disputes-settlement of Industrial disputes-Collective bargaining, conciliation, Mediation, arbitration-Indian Factories Act 1948 and its provisions related to health, welfare and safety</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td><strong>WORK STUDY, METHOD STUDY AND WORK MEASUREMENT</strong></td>
<td>11</td>
</tr>
<tr>
<td>III</td>
<td><strong>PRODUCTION PLANNING AND QUALITY CONTROL</strong></td>
<td>11</td>
</tr>
<tr>
<td></td>
<td><strong>Production Planning and Control</strong>: Introduction – Major functions of production planning and control – Pre planning – Methods of forecasting – Routing and scheduling – Dispatching and controlling – Concept of Critical Path Method(CPM)-</td>
<td></td>
</tr>
</tbody>
</table>
Description only. Production – types-Mass production, batch production and job order production- Characteristics – Economic Batch Quantity (EBQ) –Principles of product and process planning – make or buy decision.


IV PRINCIPLES OF MANAGEMENT AND PERSONNEL MANAGEMENT


V MAINTENANCE MANAGEMENT AND MATERIAL MANAGEMENT

Maintenance Management - types of maintenance strategies, Planned and unplanned maintenance, breakdown, preventive & predictive maintenance. Their comparison, advantages
disadvantages. Limitations, computer aided maintenance, maintenance scheduling, spare part Management, inventory control, organization of maintenance department.


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**Text Books:**
3) Maintenance & Spare parts Management Gopal Krishnan
4) Industrial Maintenance Management S.K. Shrivastava

**Reference Books:**
DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (MACHINE TOOL MAINTENANCE AND REPAIRS) (SANDWICH)

III YEAR

M – SCHEME

VI SEMESTER

2015 -2016 onwards

39266 CNC PROGRAMMING AND SIMULATION LAB

CURRICULUM DEVELOPMENT CENTRE
M-SCHME
(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs)

Course Code: 2022

Subject Code: 39266

Semester: VI

Subject Title: CNC Programming and Simulation Lab

<table>
<thead>
<tr>
<th>Subject</th>
<th>Instructions</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Hour(s) / Week</td>
<td>Hour(s) / Semester</td>
</tr>
<tr>
<td>CNC Programming and Simulation Lab</td>
<td>4</td>
<td>60</td>
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</table>

Rational:
The CNC Programming and Simulation Lab will give the students studying maintenance Course a overview of CNC lathe, milling machine, international standard G Codes and M codes and incremental system and absolute systems

Objectives:

1. Study of CNC lathe, milling machine
2. Study of international standard G Codes and M codes
3. Study of incremental system and absolute system
4. Study of part program format
5. Study of canned cycles for lathe and milling
Exercise

CNC TURNING

Writing program using g01, g02 & g03

1. Step turning
2. Taper turning
3. Circular interpolation

writing program using canned cycle

4. Step turning
5. Taper turning
6. Circular interpolation
7. Multiple turning
8. Thread cutting and grooving
9. Internal drilling and boring

CNC milling

10. Linear interpolation
11. Circular interpolation
12. Linear and circular interpolation
13. Drilling and counter sinking
14. Mirroring
15. Pocketing
BOARD EXAMINATION

Note: All the exercises in both sections have to be completed.
All the exercises should be given in the question paper and students are
allowed to select by a lot.
Record note book should be submitted during examination.

Detailed allocation

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Program writing</td>
<td>- 40 Marks</td>
</tr>
<tr>
<td>Simulation</td>
<td>- 30 Marks</td>
</tr>
<tr>
<td>Viva-voce</td>
<td>- 05 marks</td>
</tr>
</tbody>
</table>

Total - 75 marks

Equipment requirement:
Minimum Facilities required for 60 intakes.

1. Personal computer (Pentium processor) – 15 Nos.
2. Off line CNC Lathe and Milling simulation software – 15 users.
3. Laser Printer – 1 No.
DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (MACHINE TOOL MAINTENANCE AND REPAIRS) (SANDWICH)

III YEAR
M – SCHEME

VI SEMESTER
2015 -2016 onwards

39267 MAINTENANCE LAB I

CURRICULUM DEVELOPMENT CENTRE
M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs)

Course Code: 2022

Subject Code: 39267

Semester: VI

Subject Title: Maintenance Lab I

<table>
<thead>
<tr>
<th>Subject</th>
<th>Instructions</th>
<th>Examination</th>
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<tr>
<td></td>
<td>Hours / Week</td>
<td>Hours /Semester</td>
<td>Marks</td>
</tr>
<tr>
<td>Maintenance Lab I</td>
<td>4</td>
<td>60</td>
<td>Internal Assessment</td>
</tr>
<tr>
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<td>25</td>
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</table>

RATIONALE:
In Diploma level Engineering education skill development plays a vital role. The skill development can be achieved by on hand experience in handling various instruments, apparatus and equipment. This is accomplished by doing engineering related experiments in conducting alignment test for various machineries.

Objectives:
- To dismantle and assemble the components of lathe
- To dismantle and assemble motors
- Alignment Test for lathe
- Alignment Test for milling machine
- Alignment Test for Shaping machine
- Alignment Test for Testing of Tool and Cutter grinder
- Alignment Test for Testing of Pillar type drilling machine
- Alignment Test for Testing of Radial Drilling machine
- Alignment Test for Testing of Planning machine
Exercises:

1. Dismantling and assembly of tailstock of lathe
2. Dismantling and assembly of three jaw chuck
3. Dismantling and assembly of four jaw chuck
4. Dismantling and assembly of Bench vice
5. Dismantling and assembly of D C Motor
6. Dismantling and assembly of A.C. Induction Motor
7. Dismantling and assembly of Hydraulic cylinders
8. Dismantling and assembly of Directional control value
9. Testing of lathe
10. Testing of Horizontal milling machine
11. Testing of Shaping machine
12. Testing of Tool and Cutter grinder
13. Testing of Pillar type drilling machine
14. Testing of Radial Drilling machine
15. Testing of Planning machine
BOARD EXAMINATION

Note: All the exercises in both sections have to be completed.

All the exercises should be given in the question paper and students are allowed to select by a lot.

Record note book should be submitted during examination.

Detailed allocation

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Marks</th>
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</thead>
<tbody>
<tr>
<td>Procedure</td>
<td>10</td>
</tr>
<tr>
<td>Alignment / Dismantling and Assembling</td>
<td>35</td>
</tr>
<tr>
<td>Drawing</td>
<td>20</td>
</tr>
<tr>
<td>Result</td>
<td>05</td>
</tr>
<tr>
<td>Viva-voce</td>
<td>05</td>
</tr>
<tr>
<td>Total</td>
<td>75</td>
</tr>
</tbody>
</table>

Equipment required

1. Tailstock of lathe                          - 1No
2. Three jaw chuck                             - 1No
3. Four jaw chuck                              - 1No
4. Bench vice                                  - 1No
5. D C motor                                   - 1No
6. A.C. induction motor                        - 1No
7. Hydraulic cylinders                         - 1No
8. Directional control value                   - 1No
9. Lathe                                       - 1No
10. Horizontal milling machine                 - 1No
11. Shaping machine                            - 1No
12. Tool and cutter grinder                    - 1No
13. Pillar type drilling machine               - 1No
14. Radial drilling machine                    - 1No
15. Testing of planning machine                - 1No
DIRECTORATE OF TECHNICAL EDUCATION
DIPLOMA IN MECHANICAL ENGINEERING

M SCHEME
2015 -2016 onwards

III YEAR
VI SEMESTER

30002 – LIFE AND EMPLOYABILITY SKILLS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE
Course Name: All Branches of Diploma in Engineering and Technology and Special Programmes

Subject Code: 30002

Semester: VI

Subject Title: LIFE AND EMPLOYABILITY SKILLS PRACTICAL

Teaching and Scheme of Examination:
No. of Weeks per Semester: 15 Weeks

<table>
<thead>
<tr>
<th>Subject</th>
<th>Instruction</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours/Week</td>
<td>Hours/Semester</td>
</tr>
<tr>
<td>Life and Employability Skills</td>
<td>4 Hours</td>
<td>60 Hours</td>
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Topics and Allocation of Hours:

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<tr>
<th>Sl. No.</th>
<th>Section</th>
<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Part – A Communication</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Part – B Entrepreneurship, Project Preparation, Productivity,</td>
<td>20</td>
</tr>
</tbody>
</table>
Occupational Safety, Health, Hazard, Quality Tools & Labour Welfare

<table>
<thead>
<tr>
<th>Part – C</th>
<th>Environment, Global Warming, Pollution</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL</td>
<td></td>
<td>60</td>
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</tbody>
</table>

**RATIONALE**

Against the backdrop of the needs of the Industries, as well as based on fulfilling the expectations of the Industries, the Diploma Level students have to be trained directly and indirectly in toning up their competency levels. Proficiency in Communication only, equips them with confidence and capacity to cope with the employment. Hence, there is a necessity to focus on these in the curriculum. At the end of the Course, the student is better equipped to express himself in oral and written communication effectively.

**SPECIFIC INSTRUCTIONAL OBJECTIVES**

1. Emphasize and Enhance Speaking Skills

2. Increase Ability to Express Views & Opinions

3. Develop and Enhance Employability Skills

4. Induce Entrepreneurship and Plan for the Future

5. Expose & Induce Life Skills for Effective Managerial Ability
# LIFE AND EMPLOYABILITY SKILLS PRACTICAL

## SYLLABUS

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topics</th>
<th>Activity</th>
<th>Hours</th>
</tr>
</thead>
</table>
| I    | Communication, Listening, Training, Facing Interviews, Behavioural Skills | -- instant sentence making  
|      |        | -- say expressions/phrases--self- introduction/another higher official in company  
|      |        | -- describe/explain product  
|      |        | -- frame questions based on patterns  
|      |        | -- make sentences based on patterns  | 30 |
| II   | Entrepreneurship, Project Preparation, Marketing Analysis, Support & Procurement | -- prepare an outline of a project to obtain loan from bank in becoming an entrepreneur  
|      |        | -- prepare a resume  | 10 |
| III  | Productivity – comparison with developed countries, Quality Tools, Circles, Consciousness, Management, House Keeping | -- search in the website  
|      |        | -- prepare a presentation  
|      |        | -- discuss & interact  | 05 |
|      |        | -- prepare a presentation  
|      |        | -- discuss & interact  | 05 |
| V | Environment, Global Warming, Pollution | -- taking down notes / hints -- answering questions  
-- fill in blanks the exact words heard | 10 |
LEARNING STRUCTURE 100 Marks

-- Focus more on Speaking & Listening Skills
-- Attention less on Reading & Writing Skills
-- Apply the skills in fulfilling the Objectives on Focused Topics

a) Listening 25 Marks

1. Deductive Reasoning Skills (taking down notes/hints) 10
2. Cognitive Skills (answering questions) 10
3. Retention Skills (filing in blanks with exact words heard) 05

b) Speaking Extempore/ Prepared 30 Marks

1. Personality/Psychological Skills (instant sentence making) 05
2. Pleasing & Amiable Skills (say in phrases/expressions) 05
3. Assertive Skills (introducing oneself/others) 05
4. Expressive Skills (describe/explain things) 05
5. Fluency/Compatibility Skills (dialogue) 05
6. Leadership/Team Spirit Skills (group discussion) 05

c) Writing & Reading 20 Marks

1. Creative & Reasoning Skills (frame questions on patterns) 05
2. Creative & Composing Skills (make sentences on patterns) 05
3. Attitude & Aim Skills (prepare resume) 05
4. Entrepreneurship Skills (prepare outline of a project) 05

d) Continuous Assessment (Internal Marks) 25 Marks

(search, read, write down, speak, listen, interact & discuss)

1. Cognitive Skills (Google search on focused topics) 05
2. Presentation Skills & Interactive Skills (after listening, discuss)

Note down and present in the Record Note on any 5 topics 10 Marks
Other activities recorded in the Record note 10 Marks
Attendance 05 Marks

INTERNAL MARKS 25 MARKS

EXTERNAL MARKS AT END EXAMINATION 75 MARKS
MODEL QUESTION

Time: 3 Hours  Maximum Marks: 75

A. LISTENING  25 Marks

1. Listen to the content and take down notes/hints  10
2. Listen to the content and answer the following questions.  10
3. Listen to the content and fill in the blanks the exact words heard.  05

B. SPEAKING  30 Marks

1. Say in a sentence instantly on hearing the word(5 words, one after another).  05
2. Say any five expressions commonly used in communication.  05
3. Imagine, a consultant has come to your department.
   Introduce him to your subordinates.  05
4. Explain/describe the product you are about to launch in the market.  05
5. Speak with your immediate boss about the progress you have made.  05
6. Discuss within the group on the topic of focus in the syllabus.  05

C. WRITING & READING  20 Marks

1. Frame new questions from the pattern given by changing sets of words with your own.  05

   a. When do you return?

   b. How is his performance?

   c. Where has the manager gone?

   d. What is the progress today?

   e. Why are the machines not functioning?

2. Make sentences from the pattern given by changing sets of words with your own.  05

   a. The workers are on strike

   b. The labourers are paid well in this factory

   c. There is a rest room for the workers
3. Prepare a resume for the post of Department Manager.

4. Prepare an outline of a project to obtain a loan. (Provide headings and subheadings)

I. Guidelines for setting the question paper:

A. LISTENING:

   ONLY TOPICS related to
   POLLUTION /
   ENVIRONMENT /
   GLOBAL WARMING are to be taken. 
   These topics are common for all the three types of evaluation.

B. SPEAKING:

   1. WORDS of common usage
   2. Fragments – expression of politeness, courtesy, cordiality
   3. Introduce yourself as an engineer with designation or
      Introduce the official visiting your company/department
   4. Describe/Explain the product/machine/department
   5. Dialogue must be with someone in the place of work.
   6. Group of six/eight
      Discuss the focused topic prescribed in syllabus

C. WRITING & READING:

   1. Provide five different structures. 
      Students are to substitute at least one with some other
      word/words
   2. Provide five different structures. 
      Students are to substitute at least one with some other
      word/words
   3. Provide some post related to industries.
   4. Outline of the project (skeleton/structure) 
      Only the various headings and subheadings 
      Content is not needed

II. Guidelines for recording the material on the Focused Topics in the Record note.
Write in the record note, **on any five topics**, from the list of topics given below. **10 Marks**
(5 topics x 10 marks = 50 marks. Thus, the **Average of 5 topics is 10 Marks**)

1. Productivity in Industries – Comparison with developed countries
2. Quality Tools, Quality Circles and Quality Consciousness
3. Effective Management
4. House Keeping in Industries
5. Occupational Safety and Hazard
6. Occupational Accident and First Aid
7. Labour Welfare Legislations
8. Labour Welfare Acts and Rights
9. Entrepreneurship
10. Marketing Analysis, Support and Procurement

**LABORATORY REQUIREMENT:**

1. An echo-free room
2. Necessary furniture and comfortable chairs
3. A minimum of two Computers with internet access
4. A minimum of two different English dailies
5. A minimum of Three Mikes with and without cords
6. Colour Television (minimum size – 29")
7. DVD/VCD Player with Home Theatre speakers
8. Smart board
9. Projector

**Suggested Reading:**

1. Production and Operations Management by S.N. Chary, TMH
2. Essentials of Management by Koontz & Weihrich, TMH
5. Productions and Operations Management by A. Muhlmann, J. Oakland and K. Lockyer, Macmillan
8. Business Correspondence & Report Writing by R.C. Sharma and K. Mohan, TMH
9. How to prepare for Group Discussion & Interview (With Audio Cassette) by Prasad, TMH
10. Spoken English – A self-learning guide to conversation practice (with Cassette)
11. Introduction to Environmental Engineering by Mackenzie, L. Davis and A. David, Cornwell, McgrawHill, 3rd Ed.
12. Environmental Engineering by Peary, Rowe and Tchobanoglous, McgrawHill
13. Total Quality Management – An Introductory Text by Paul James, Prentice Hall
14. Quality Control and Applications by Housen & Ghose
15. Industrial Engineering Management by O.P. Khanna
DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (MACHINE TOOL MAINTENANCE AND REPAIRS) (SANDWICH)

M – SCHEME

VII SEMESTER
2015 -2016 onwards

39271 MAINTENANCE LAB II

CURRICULUM DEVELOPMENT CENTRE
M-Scheme

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs)

Course Code: 2022

Subject Code: 39271

Semester: VII

Subject Title: Maintenance Lab II

<table>
<thead>
<tr>
<th>Subject Title</th>
<th>Instructions</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours / Week</td>
<td>Hours / Semester</td>
</tr>
<tr>
<td>Maintenance Lab II</td>
<td>4</td>
<td>60</td>
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<td></td>
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</table>

RATIONALE:
The maintenance technicians should have a complete knowledge in determining the errors arising in machines. Further they should have knowledge handling portable tools.

Objectives:

- To determine errors in machine tools
- To determine wear of machine tools
- To know about portable tools
1. Conducting Non linearity test in bed ways of lathe using spirit level and feeler gauge method.
2. Conducting Non linearity test in bed ways of lathe using dial indicator with magnetic base method.
3. Conducting Straightness error test in the bed ways of lathe using dial indicator method.
4. Determining the amount of wear in the bedways of machine tool using straightedge and feeler gauge method.
5. Determining the amount of wear in the bedways of machine tool using dial indicator method.
6. Determining the amount of wear in the bedways of machine tool using spirit level and feeler gauge method.
7. Conduct the flatness test in the centre lathe using spirit level and feeler gauge.
8. Conduct the spiral/twist error test using spirit level and feeler gauge.
9. Determine error in the lead or pitch error of lead screw of lathe by comparison with an end gauge method.
10. Determine error in the lead or pitch error of lead screw of lathe by Cazeneuve test.
11. Dismantle and assemble the given portable pneumatic drill.
12. Dismantle and assemble the given portable Electric drill.
13. Dismantle and assemble the speed reduction gearbox unit used in hoisting mechanism.
15. Conduct the alignment test in the pulley and belt drive mechanism using straight edge and slip gauge method.
BOARD EXAMINATION

Note: All the exercises in both sections have to be completed. All the exercises should be given in the question paper and students are allowed to select by a lot. Record note book should be submitted during examination.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedure</td>
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</tr>
<tr>
<td>Alignment / Dismantling and Assembling</td>
<td>35</td>
</tr>
<tr>
<td>Drawing</td>
<td>20</td>
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<tr>
<td>Result</td>
<td>05</td>
</tr>
<tr>
<td>Viva-voce</td>
<td>05</td>
</tr>
<tr>
<td>Total</td>
<td>75</td>
</tr>
</tbody>
</table>

Equipment Requirement:

1. Spirit level
2. Feeler gauge
3. Dial indicator with magnetic base method.
4. Portable pneumatic drill.
5. Electric drill.
6. Speed reduction gearbox unit.
DIRECTORATE OF TECHNICAL EDUCATION
DIPLOMA IN MECHANICAL ENGINEERING

[MTMR]

M SCHEME
2015 -2016 onwards

VII SEMESTER

32055 – PROCESS AUTOMATION PRACTICAL

CURRICULUM DEVELOPMENT CENTRE
M-SCHME
(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [MTMR]
Course Code : 2022
Subject Code : 32055
Semester : VII
Subject Title : PROCESS AUTOMATION PRACTICAL

TEACHING AND SCHEME OF EXAMINATIONS:
No. of Weeks per Semester: 15 Weeks

<table>
<thead>
<tr>
<th>Subject</th>
<th>Instructions</th>
<th>Examination</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Automation</td>
<td>4 Weeks</td>
<td>60 Hours / Week</td>
<td>3 Hrs</td>
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<tr>
<td>Practical</td>
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<td></td>
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<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours/ Week</th>
<th>Hours/ Semester</th>
<th>Marks</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Assessment</td>
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<td></td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Board Examination</td>
<td></td>
<td></td>
<td>75</td>
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</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

OBJECTIVES:

- Design and operate pneumatic circuits.
- Design and operate fluid power circuits
- Use PLC system and its elements for process control
- Familiarize the working of function blocks in PLC
- Use ON-Delay timer to control a motor
- Use OFF-Delay timer to control a motor
- Use counter function block (Up counter and Down counter)
- Control the automatic operation of pneumatic cylinder using PLC
- Record of work to be prepared.
Exercises

Pneumatics Lab.
1. Direct operation of single and double acting cylinder.
2. Operation of double acting cylinder with quick exhaust valve.

Hydraulics Lab.
1. Direct operation of double acting cylinder.
2. Direct operation of hydraulic motor.
3. Speed control of double acting cylinder metering-in and metering-out control.

PLC Lab.
1. Direct operation of a motor using latching circuit.
2. Operation of a motor using ‘AND’ logic control.
5. Automatic operation of a Double acting cylinder-single cycle.
6. Automatic operation of a Double acting cylinder-single cycle - forward, time delay, return.
8. Sequential operation of double acting cylinder and a motor.
Board of Examination

Note: All the exercises have to be completed. Two exercises will be given for examination by selecting one exercise from Pneumatics Lab. or Hydraulics lab. and one from PLC lab.
All the exercises should be given in the question paper and students are allowed to select by a lot.
Record note book should be submitted during examination.

Allocation of Marks

| Part A: Pneumatics/Hydraulics lab by lot | - 35 marks |
| Part B: One question from PLC lab.     | - 35 marks |
| Viva-voce                               | - 05 marks |
| **Total**                               | - 75 marks |

**LIST OF EQUIPMENTS**

1. Pneumatic Trainer Kit – 2Nos
   (All Cylinders, Control Valves, Limit switches and other accessories)
2. Hydraulics Trainer Kit – 1No.
   (All Cylinders, Control Valves, Limit switches and other accessories)
3. PLC kit. – 2 Nos.
DIRECTORATE OF TECHNICAL EDUCATION
DIPLOMA IN MECHANICAL ENGINEERING

M SCHEME
2015 -2016 onwards

III YEAR
VI SEMESTER

39273 – PROJECT WORK

CURRICULUM DEVELOPMENT CENTRE
M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [MTMR]
Course Code : 2022
Subject Code : 39273
Semester : VII
Subject Title : Project Work

TEACHING AND SCHEME OF EXAMINATIONS:
No. of Weeks per Semester: 15 Weeks

<table>
<thead>
<tr>
<th>Subject</th>
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<tr>
<td></td>
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<td>Hours/ Semester</td>
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<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>PROJECT WORK</td>
<td>4</td>
<td>60</td>
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</tbody>
</table>

Minimum Marks for Pass is 50 out of which minimum 35 marks should be obtained out of 75 marks in the board Examination alone.

OBJECTIVES:
- Implement the theoretical and practical knowledge gained through the curriculum into an application suitable for a real practical working environment preferably in an industrial environment
- Get exposure on industrial environment and its work ethics.
- Understand what entrepreneurship is and how to become an entrepreneur.
- Learn and understand the gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key dates, asynchronous document sharing and discussions, as well as to prepare collaborative edition of the final project report.
- Understand the facts and importance of environmental management.
- Understand and gain knowledge about disaster management.
INTERNATIONAL ASSESSMENT:

The internal assessment should be calculated based on the review of the progress of the work done by the student periodically as follows.

<table>
<thead>
<tr>
<th>Detail of assessment</th>
<th>Period of assessment</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Review</td>
<td>6th week</td>
<td>10</td>
</tr>
<tr>
<td>Second Review</td>
<td>12th week</td>
<td>10</td>
</tr>
<tr>
<td>Attendance</td>
<td>Entire semester</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>25</strong></td>
</tr>
</tbody>
</table>

EVALUATION FOR BOARD EXAMINATION:

<table>
<thead>
<tr>
<th>Details of Mark allocation</th>
<th>Max Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marks for Report Preparation, Demo, Viva-voce</td>
<td>65</td>
</tr>
<tr>
<td>Marks for answers of 4 questions which is to be set by the external examiner from the given question bank consisting of questions in the following two topics Disaster Management and Environmental Management. Out of four questions two questions to appear from each of the above topics i.e. 2 questions x 2 topics = 4 questions.</td>
<td>10</td>
</tr>
<tr>
<td>4 questions x 2 ½ marks = 10 Marks</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>75</td>
</tr>
</tbody>
</table>

DETAILED SYLLABUS

ENVIRONMENTAL & DISASTER MANAGEMENT

1. ENVIRONMENTAL MANAGEMENT

   Introduction – Environmental Ethics – Assessment of Socio Economic Impact – Environmental Audit – Mitigation of adverse impact on Environment – Importance of Pollution Control – Types of Industries and Industrial Pollution.

   Solid waste management – Characteristics of Industrial wastes – Methods of Collection, transfer and disposal of solid wastes – Converting waste to energy – Hazardous waste management Treatment technologies.

   Waste water management – Characteristics of Industrial effluents – Treatment and disposal methods – Pollution of water sources and effects on human health.
Air pollution management – Sources and effects – Dispersion of air pollutants – Air pollution control methods – Air quality management.

Noise pollution management – Effects of noise on people – Noise control methods.

2. DISASTER MANAGEMENT

Introduction – Disasters due to natural calamities such as Earthquake, Rain, Flood, Hurricane, Cyclones etc – Man made Disasters – Crisis due to fires, accidents, strikes etc – Loss of property and life.


LIST OF QUESTIONS

1. ENVIRONMENTAL MANAGEMENT

1. What is the responsibility of an Engineer-in-charge of an Industry with respect to Public Health?
2. Define Environmental Ethic.
3. How Industries play their role in polluting the environment?
4. What is the necessity of pollution control? What are all the different organizations you know, which deal with pollution control?
5. List out the different types of pollutions caused by a Chemical / Textile / Leather / Automobile / Cement factory.
6. What is meant by Hazardous waste?
7. Define Industrial waste management.
8. Differentiate between garbage, rubbish, refuse and trash based on their composition and source.
9. Explain briefly how the quantity of solid waste generated in an industry could be reduced.
10. What are the objectives of treatments of solid wastes before disposal?
11. What are the different methods of disposal of solid wastes?
12. Explain how the principle of recycling could be applied in the process of waste minimization.
13. Define the term ‘Environmental Waste Audit’.
14. List and discuss the factors pertinent to the selection of landfill site.
15. Explain the purpose of daily cover in a sanitary landfill and state the minimum desirable depth of daily cover.
17. What actions, a local body such as a municipality could take when the agency appointed for collecting and disposing the solid wastes fails to do the work continuously for number of days?
18. Write a note on Characteristics of hazardous waste.
19. What is the difference between municipal and industrial effluent?
20. List few of the undesirable parameters / pollutants anticipated in the effluents from oil refinery industry / thermal power plants / textile industries / woolen mills / dye industries / electroplating industries / cement plants / leather industries (any two may be asked)
21. Explain briefly the process of Equalization and Neutralization of waste water of varying characteristics discharged from an Industry.
22. Explain briefly the Physical treatments “Sedimentation” and “Floatation” processes in the waste water treatment.
23. Explain briefly when and how chemical / biological treatments are given to the waste water.
24. List the four common advanced waste water treatment processes and the pollutants they remove.
25. Describe refractory organics and the method used to remove them from the effluent.
26. Explain biological nitrification and de-nitrification.
27. Describe the basic approaches to land treatment of Industrial Effluent.
28. Describe the locations for the ultimate disposal of sludge and the treatment steps needed prior to ultimate disposal.
29. List any five Industries, which act as the major sources for Hazardous Air Pollutants.
30. List out the names of any three hazardous air pollutants and their effects on human health.
31. Explain the influence of moisture, temperature and sunlight on the severity of air pollution effects on materials.
32. Differentiate between acute and chronic health effects from Air pollution.
33. Define the term Acid rain and explain how it occurs.
34. Discuss briefly the causes for global warming and its consequences.
35. Suggest suitable Air pollution control devices for a few pollutants and sources.
36. Explain how evaporative emissions and exhaust emissions are commonly controlled.
37. What are the harmful elements present in the automobile smokes? How their presence could be controlled?
38. What is the Advantage of Ozone layer in the atmosphere? State few reasons for its destruction.
39. Explain the mechanism by which hearing damage occurs.
40. List any five effects of noise other than hearing damage.
41. Explain why impulsive noise is more dangerous than steady state noise.
42. Explain briefly the Source – Path – Receiver concept of Noise control.
43. Where silencers or mufflers are used? Explain how they reduce the noise.
44. Describe two techniques to protect the receiver from hearing loss when design / redress for noise control fail.
45. What are the problems faced by the people residing along the side of a railway track and near to an Airport? What provisions could be made in their houses to reduce the problem?

2. DISASTER MANAGEMENT
1. What is meant by Disaster Management? What are the different stages of Disaster management?
2. Differentiate Natural Disasters and Man made Disasters with examples.
3. Describe the necessity of Risk identification and Assessment Surveys while planning a project.
4. What is Disasters recovery and what does it mean to an Industry?
5. What are the factors to be considered while planning the rebuilding works after a major disaster due to flood / cyclone / earthquake? (Any one may be asked)
6. List out the public emergency services available in the state, which could be approached for help during a natural disaster.
7. Specify the role played by an Engineer in the process of Disaster management.
8. What is the cause for Earthquakes? How they are measured? Which parts of India are more vulnerable for frequent earthquakes?
9. What was the cause for the Tsunami 2004 which inflicted heavy loss to life and property along the coast of Tamilnadu? Specify its epicenter and magnitude.
10. Specify the Earthquake Hazard Zones in which the following towns of Tamilnadu lie: (a) Chennai (b) Nagapattinam (c) Coimbatore (d) Madurai (e) Salem.
11. Which parts of India are experiencing frequent natural calamities such as (a) heavy rain fall (b) huge losses due to floods (c) severe cyclones
12. Define basic wind speed. What will be the peak wind speed in (a) Very high damage risk zone – A, (b) High damage risk zone, (c) Low damage risk zone.
13. Specify the minimum distance from the Sea shore and minimum height above the mean sea level, desirable for the location of buildings.
14. Explain how the topography of the site plays a role in the disasters caused by floods and cyclones.
15. Explain how the shape and orientation of buildings could reduce the damages due to cyclones.
16. What is a cyclone shelter? When and where it is provided? What are its requirements?
17. What Precautionary measures have to be taken by the authorities before opening a dam for discharging the excess water into a canal/river?
18. What are the causes for fire accidents? Specify the remedial measures to be taken in buildings to avoid fire accidents.
19. What is a fire escape in multistoried buildings? What are its requirements?
20. How the imamates of a multistory building are to be evacuated in the event of a fire/Chemical spill/Toxic Air Situation/ Terrorist attack, (any one may be asked).
21. Describe different fire fighting arrangements to be provided in an Industry.
22. Explain the necessity of disaster warning systems in Industries.
23. Explain how rescue operations have to be carried out in the case of collapse of buildings due to earthquake / blast / Cyclone / flood.
24. What are the necessary steps to be taken to avoid dangerous epidemics after a flood disaster?
25. What relief works that have to be carried out to save the lives of workers when the factory area is suddenly affected by a dangerous gas leak / sudden flooding?
26. What are the difficulties faced by an Industry when there is a sudden power failure? How such a situation could be managed?
27. What are the difficulties faced by the Management when there is a group clash between the workers? How such a situation could be managed?
28. What will be the problems faced by the management of an Industry when a worker dies because of the failure of a mechanical device due to poor maintenance? How to manage such a situation?
29. What precautionary measures have to be taken to avoid accidents to labourers in the Industry in a workshop / during handling of dangerous Chemicals / during construction of buildings / during the building maintenance works.
30. Explain the necessity of medical care facilities in an Industry / Project site.
31. Explain the necessity of proper training to the employees of Industries dealing with hazardous products, to act during disasters.
32. What type of disaster is expected in coal mines, cotton mills, Oil refineries, ship yards and gas plants?
33. What is meant by Emergency Plan Rehearsal? What are the advantages of such Rehearsals?
34. What action you will take when your employees could not reach the factory site because of continuous strike by Public Transport workers?
35. What immediate actions you will initiate when the quarters of your factory workers are suddenly flooded due to the breach in a nearly lake / dam, during heavy rain?
36. What steps you will take to avoid a break down when the workers union of your Industry have given a strike notice?
37. List out few possible crisis in an organization caused by its workers? What could be the part of the middle level officials in managing such crisis?
38. What types of warning systems are available to alert the people in the case of predicted disasters, such as floods, cyclone etc.

39. Explain the necessity of Team work in the crisis management in an Industry / Local body.

40. What factors are to be considered while fixing compensation to the workers in the case of severe accidents causing disability / death to them?

41. Explain the legal / financial problems the management has to face if safely measures taken by them are found to be in adequate.

42. Describe the importance of insurance to men and machinery of an Industry dealing with dangerous jobs.

43. What precautions have to be taken while storing explosives in a match/ fire crackers factory?

44. What are the arrangements required for emergency rescue works in the case of Atomic Power Plants?

45. Why residential quarters are not constructed nearer to Atomic Power Plants?

***************
SANDWICH DIPLOMA COURSE-INDUSTRIAL TRAINING

39291 Industrial Training I (Report writing & Viva Voce)

39292 Industrial Training II (Report writing & Viva Voce)

1. Introduction

The main objective of the sandwich Diploma course is to mould a well rounded technician acclimated with industrial environment while being a student in the institution.

The Sandwich Diploma Course study is pursued by students, in 7 Semesters of 3 ½ years duration, the subjects of 3 years Full Time Diploma Course being regrouped for academic convenience.

While in the 4th semester students under Industrial Training for 6 months (December through May). They also do course work in the institution for one day in a week, While in the 7th semester they undergo another spell of 6 months (June through November) Industrial training.

The Apprenticeship (Amendment) Act 1973 is followed in regulating the Industrial training procedure for Sandwich Course.

2. Attendance Certification

Every month students have to get their attendance certified by industrial supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the institution supervisor. Regularity in attendance and submission of report will be duly considered while awarding the Internal Assessment mark.

3. Training Reports

The students have to prepare two types of reports:

- Weekly report in the form of diary to be submitted to the concerned staff in-charge of the institution. This will be reviewed while awarding Internal Assessment marks.

- Comprehensive report at the end of each spell which will be used for Board Examination.

3.1 Industrial Training Diary
Students are required to maintain the record of day-to-day work done. Such record is called Industrial training Diary. Students have to write this report regularly. All days for the week should be accounted for clearly giving attendance particulars (Presence, absence, Leave, Holidays etc). The concern Industrial supervisor is to check periodically these progress reports.

3.2 Comprehensive Training Report

In addition to the diary, students are required to submit a comprehensive report on training with details of the organisation where the training was undergone after attestation by the supervisors. The comprehensive report should be incorporating study of plant/product/process/construction along with intensive in-depth study on any one of the topics such as processes, methods, tooling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be completed in the last week of Industrial training. Any data, drawings etc should be incorporated with the consent of the Organisation.

a. Scheme of Evaluation

1.1 Internal Assessment Marks

   First Review (during 3rd month) : 10 marks
   Second Review (during 5th month) : 10 marks
   Attendance * : 05 marks (Awarded same as in Theory)
   Total : 25 marks

1.2 Board Examination

   Presentation about Industrial Training : 20 marks
   Comprehensive Training Report : 30 marks
   Viva-voce : 25 marks
   Total : 75 marks

* For awarding marks to attendance, the Industrial Training attendance has to be considered.