

Curriculum For three-Years(Six Semester) Diploma Course in
PLASTIC MOULD TECHNOLOGY

SYLLABUS FOR
DIPLOMA COURSE IN PLASTIC MOULD TECHNOLOGY

Effective From :-

Prepared by:

Curriculum development cell
Institute of Research Development & Training,
Kanpur

Approved by:
Board of Technical Education, U. P., Lucknow
On Dated 16.06.2017

0
Corrected and Approved By B T E on Dated 16.06.2017

STUDY AND EVALUATION SCHEME FOR
THREE YEARS (SIX SEMESTER) DIPLOMA COURSE IN PLASTIC MOULD TECHNOLOGY

(Effective From)

I Semester

| Curriculum | | | | | | Scheme of Examination | | | | | | | | | |
|------------------|-----|----|------|------|-----|-------------------------------|-------------|-------|-------|-------------|-----------|------------------------------------------------------------------|----|-------------|-----|
| Periods Per Week | | | | | | S U B J E C T | Theory | | | | Practical | | | Grand Total | |
| Le | Tut | Dr | Lab | Work | Tot | | Examination | Sess. | Total | Examination | Sess. | Total | | | |
| c. | ori | aw | Shop | al | | Dur. | Marks | | Dur. | Marks | | Marks | | | |
| 4 | - | - | - | - | 4 | 1.1 Foundational Communicaton | 2.5 | 50 | 20 | 70 | - | - | - | 70 | |
| 3 | 1 | - | - | - | 4 | 1.2 Applied Mathematics-I (A) | 2.5 | 50 | 20 | 70 | - | - | - | 70 | |
| 3 | 1 | - | - | - | 4 | 1.3 Applied Physics-I | 2.5 | 50 | 20 | 70 | - | - | - | 70 | |
| 6 | - | - | 4 | - | 10 | 1.4 Applied Chemistry | 2.5 | 50 | 20 | 70 | 3 | 40 | 20 | 130 | |
| 4 | - | 10 | - | - | 14 | 1.5 Engineering Drawing | 3.0 | 50 | 20 | 70 | - | - | - | 70 | |
| | | | 8 | | 8 | Student Centered Activities) | | | | | | | | | |
| 20 | 2 | 10 | 12 | - | 44 | <-----TOTAL-----> | | 250 | 100 | 350 | | 40 | 20 | 60 | 410 |
| | | | | | | | | | | | | Games/NCC/Social and Cultural Activities + Discipline (15 + 10) | | 25 | |
| | | | | | | | | | | | | TOTAL | | 435 | |

II Semester

| | | | | | | | | | | | | | | | |
|----|---|---|----|----|----|-------------------------------|-----|-----|----|-----|---|------------------------------------------------------------------|-----|-----|-----|
| 3 | 1 | - | - | - | 4 | 2.1 Applied Mathematics-I(B) | 2.5 | 50 | 20 | 70 | - | - | - | 70 | |
| 3 | 1 | - | 4 | - | 8 | 2.2 Applied Physics-II | 2.5 | 50 | 20 | 70 | 3 | 40 | 20 | 130 | |
| 5 | 1 | - | 4 | - | 8 | 2.3 Applied Mechanics | 2.5 | 50 | 20 | 70 | 3 | 40 | 20 | 130 | |
| 5 | - | - | - | - | 5 | 2.4 Elementary Workshop Tech. | 2.5 | 50 | 20 | 70 | - | - | - | 70 | |
| - | - | - | - | 14 | 14 | 2.5 Workshop Practice | -- | -- | -- | -- | 4 | 60 | 30 | 90 | |
| | | | | | | 2.6 Field Exposure-I | -- | -- | -- | -- | 2 | -- | 30 | 30 | |
| | | | | | | (Assessment at Instt. Level) | | | | | | | | | |
| | | | 8 | | 8 | Student Centered Activities) | | | | | | | | | |
| 16 | 3 | - | 14 | 14 | 47 | <-----TOTAL-----> | | 200 | 80 | 280 | | 140 | 100 | 240 | 520 |
| | | | | | | | | | | | | Games/NCC/Social and Cultural Activities + Discipline (15 + 10) | | 25 | |
| | | | | | | | | | | | | TOTAL | | 545 | |

NOTE:-

- (1) Each period will be 50 minutes duration.
- (2) Each session will be of 16 weeks.
- (3) Effective teaching will be at least 14 weeks.
- (4) Remaining periods will be utilised for revision etc.
- (5) Student centered activities will compromise of various co-curricular activities like semina,
Extension lectures, field visits, NCC, NSS, Hobby clubs, Games and cultural activities
- (6) After the I Semester Exam. two week visit of a small/medium size industry. It will be structured and supervised by the institution. Purpose of the visit is to give students an exposure of industrial setup and that of simple tools, instruments and the skill there in day to day use. Every student will submit the institution a report of his visit. The report will invariably contain the discription of his observations about
 - (1) Products/Work
 - (2) Tools and Equipments Used.
 He will be evaluated at the institution level for 30 marks--20 for viva and 10 for the reprot presented. See Annexure -I.

STUDY AND EVALUATION SCHEME FOR
THREE YEARS (SIX SEMESTER) DIPLOMA COURSE IN PLASTIC MOULD TECHNOLOGY

(Effective From)
III Semester

| Curriculum | | | | | | Scheme of Examination | | | | | | | | | | | |
|------------------|-----|----|-----|------|-----|----------------------------------------------------------|-------------|-------|-------|-------------|-------|-----------|------------------------------------------------------------------|-----|-----|--|-------|
| Periods Per Week | | | | | | S U B J E C T | Theory | | | | | Practical | | | | | Gr-nd |
| Le | Tut | Dr | Lab | Work | Tot | | Examination | Sess. | Total | Examination | Sess. | Total | Tot | | | | |
| c. | ori | aw | | Shop | al | | Dur. | Marks | Marks | Dur. | Marks | Marks | al | | | | |
| 5 | 2 | - | - | - | 7 | 3.1 Applied Mathematics-II | 2.5 | 50 | 20 | 70 | -- | -- | -- | 70 | | | |
| 5 | 2 | - | 4 | - | 11 | 3.2 Metrology & Measuring Instrument | 2.5 | 50 | 20 | 70 | 3 | 40 | 20 | 60 | | | |
| 5 | 2 | - | 4 | - | 11 | 3.3 Hydraulics & Pneumatic System | 2.5 | 50 | 20 | 70 | 3 | 20 | 10 | 30 | | | |
| 4 | 2 | - | 4 | - | 10 | 3.4 Materials & Metallurgy (Student Centered Activities) | 2.5 | 50 | 20 | 70 | 3 | 50 | 20 | 70 | | | |
| 19 | 8 | - | 20 | - | 47 | <-----TOTAL-----> | -- | 200 | 80 | 280 | | 110 | 50 | 160 | | | |
| | | | | | | | | | | | | | Games/NCC/Social and Cultural Activities + Discipline (15 + 10) | | 25 | | |
| | | | | | | | | | | | | | TOTAL | | 465 | | |

IV Semester

| | | | | | | | | | | | | | | | |
|----|---|---|----|---|----|------------------------------------------------------------|-----|-----|-----|-----|----|-----|------------------------------------------------------------------|-----|-----|
| 4 | - | - | - | - | 4 | 4.1 Functional Communicaton | 2.5 | 50 | 20 | 70 | - | -- | -- | -- | 70 |
| 2 | - | - | 5 | - | 7 | 4.2 Basics of Inforation Tech. | 2.5 | 50 | 20 | 70 | 3 | 60 | 30 | 90 | |
| 5 | - | - | - | - | 5 | 4.3 Electrical Technology and Electronics | 2.5 | 50 | 20 | 70 | -- | -- | -- | 70 | |
| 7 | - | - | - | - | 7 | 4.4 Plastic Materials | 2.5 | 50 | 20 | 70 | -- | -- | -- | 70 | |
| 4 | 1 | - | 4 | - | 9 | 4.5 Plastic Process Techniques-I | 2.5 | 50 | 20 | 70 | 3 | 50 | 20 | 70 | |
| 4 | 1 | - | 3 | - | 8 | 4.6 Design of Dies & Mould-I (Student Centered Activities) | 2.5 | 50 | 20 | 70 | 3 | 50 | 20 | 70 | |
| 3 | - | - | 2 | | 5 | 4.7 Energy Conservation | 2.5 | 50 | 20 | 70 | 3 | 20 | 10 | 30 | |
| 29 | 2 | - | 17 | - | 48 | <-----TOTAL-----> | -- | 350 | 140 | 490 | | 180 | 80 | 260 | |
| | | | | | | | | | | | | | Games/NCC/Social and Cultural Activities + Discipline (15 + 10) | | 25 |
| | | | | | | | | | | | | | TOTAL | | 775 |

- NOTE:-
- (1) Each period will be 50 minutes duration.
 - (2) Each session will be of 16 weeks.
 - (3) Effective teaching will be at least 1425 weeks.
 - (4) Remaining periods will be utilised for revision etc.
 - (5) S. I. system of units shall be used in each subject.
 - (6) Student centered activities will compromise of various co-curricular activities like semina, Extension lectures, field visits, NCC, NSS, Hobby clubs, Games and cultural activities
 - (7) Minumum 4 weeks industrial/field visit to be organized after IV semester exam. Student will submit a report to the external examiner in VI semester(See Ann. II)

STUDY AND EVALUATION SCHEME FOR
THREE YEARS (SIX SEMESTER) DIPLOMA COURSE IN PLASTIC MOULD TECHNOLOGY

(Effective From)

V Semester

| Curriculum | | | | | | S U B J E C T | Scheme of Examination | | | | | | | | |
|------------|-----|----|------|------|-----|------------------------------------------------------------|-----------------------|-------|-------------|-----------|-------|------------------------------------------------------------------|----|-----|-----|
| Le | Tut | Pr | Lab | Work | Tot | | Theory | | | Practical | | | Gr | | |
| c. | ori | je | Shop | al | | Examination | Sess. | Total | Examination | Sess. | Total | nd | | | |
| al | ct | | | | | Dur. | Marks | | Dur. | Marks | | al | | | |
| - | - | - | 4 | - | 4 | 5.1 Integrative Communication | 2.5 | -- | -- | -- | 3 | 40 | 20 | 60 | 60 |
| 6 | 2 | - | - | - | 8 | 5.2 Industrial Management and Entrepreneurship Development | 2.5 | 50 | 20 | 70 | -- | -- | -- | -- | 70 |
| 5 | 2 | - | 7 | - | 14 | 5.3 Plastic Process Techniques-II | 2.5 | 50 | 20 | 70 | 3 | 60 | 30 | 90 | 160 |
| 5 | 2 | - | 7 | - | 14 | 5.4 Design of Dies & Mould-II | 2.5 | 50 | 20 | 70 | 3 | 50 | 30 | 80 | 150 |
| | | | 8 | | 8 | Student Centered Activities) | | | | | | | | | |
| 16 | 6 | - | 26 | - | 48 | <-----TOTAL-----> | -- | 150 | 60 | 210 | -- | 150 | 80 | 230 | 440 |
| | | | | | | | | | | | | Games/NCC/Social and Cultural Activities + Discipline (15 + 10) | | 25 | |
| | | | | | | | | | | | | TOTAL | | 465 | |

VI Semester

| Curriculum | | | | | | S U B J E C T | Scheme of Examination | | | | | | | | |
|------------|-----|----|------|------|-----|------------------------------------------------------|-----------------------|-------|-------------|-----------|-------|------------------------------------------------------------------|-----|-----|-----|
| Le | Tut | Pr | Lab | Work | Tot | | Theory | | | Practical | | | Gr | | |
| c. | ori | je | Shop | al | | Examination | Sess. | Total | Examination | Sess. | Total | nd | | | |
| al | ct | | | | | Dur. | Marks | | Dur. | Marks | | al | | | |
| 5 | 2 | - | 5 | - | 12 | 6.1 Environmental Pollution in in Plastic Industries | 2.5 | 50 | 20 | 70 | 3 | 50 | 20 | 70 | 140 |
| 6 | 2 | - | 6 | - | 14 | 6.2 Plastic Testing & Quality Control | 2.5 | 50 | 20 | 70 | 3 | 50 | 30 | 80 | 150 |
| - | - | - | 12 | - | 12 | 6.3 Computer Aided Mould Design Lab Practicals | -- | -- | -- | -- | 3 | 50 | 20 | 70 | 70 |
| - | - | - | 5 | - | 5 | 6.4 Project | -- | -- | -- | -- | 3 | 100 | 50 | 150 | 150 |
| - | - | - | - | - | - | 6.5 Field Exposure | -- | -- | -- | -- | - | 40 | 20 | 60 | 60 |
| | | | 5 | | 5 | Student Centered Activities) | | | | | | | | | |
| 11 | 4 | 5 | 28 | - | 48 | <-----TOTAL-----> | -- | 100 | 40 | 140 | -- | 290 | 140 | 430 | 570 |
| | | | | | | | | | | | | Games/NCC/Social and Cultural Activities + Discipline (15 + 10) | | 25 | |
| | | | | | | | | | | | | TOTAL | | 595 | |

- NOTE:-
- | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------|
| (1) Each period will of be 50 minutes duration. | 30% Carry Over of I & II Semester | 294 |
| (2) Each session will be of 16 weeks. | 70% Carry Over of III & IV Semester | 868 |
| (3) Effective teaching will be at least 14 weeks. | 100% Carry Over of V & VI Semester | 1060 |
| (4) Remaining periods will be utilised for revision etc. | | |
| (5) Each group of 2 to 3 students may choose one problem from the project paper. | Aggegate | 2222 |
| (6) Field visits and Extension lectures at institute level as per need be arranged. | | |
| (7) (*) It is compulsory to appear & to pass in examination, But marks will not be included for division and percentage of obtained marks. | | |

C O N T E N T S

| Sl.No. | Particulars | Page No. |
|--------|---------------------------------------|----------|
| I. | Study and Evaluation Schemes | |
| II. | Main Features of the Curriculum | 1 |
| III. | List of Experts | 2 |
| IV. | Need Analysis and Curriculum Profile | 3 -4 |
| V. | Job Opportunities & Curriculum Design | 5 |

DETAILED COURSE CONTENTS

I Semester

| | | |
|-----|----------------------------|-------|
| 1.1 | Foundational Communication | 6 -9 |
| 1.2 | Applied Mathematics-I(A) | 10-11 |
| 1.3 | Applied Physics -I | 12-13 |
| 1.4 | Applied Chemistry | 14-18 |
| 1.5 | Engineering Drawing | 19-21 |

II Semester

| | | |
|-----|---------------------------------|-------|
| 2.1 | Applied Mathematics-I(B) | 22-23 |
| 2.2 | Applied Physics -I | 24-26 |
| 2.3 | Applied Mechanics | 37-30 |
| 2.4 | Elementary Workshop Technology. | 31-37 |
| 2.5 | Workshop Practice | 38-40 |
| 2.6 | Field Exposure-I | 41 |

III Semester

| | | |
|-----|--------------------------------------|-------|
| 3.1 | Applied Mathematics-II | 42-44 |
| 3.2 | Metrology and Measuring Instruments. | 45-49 |
| 3.3 | Hydraulics and Pneumatic Systems. | 50-51 |
| 3.4 | Materials & Metallurgy | 52-54 |

IV Semester

| | | |
|-----|--------------------------------------|-------|
| 4.1 | Functional Communication | 55-58 |
| 4.2 | Basics of Information Technology. | 55-58 |
| 4.3 | Electrical Technology & Electronics. | 59-63 |
| 4.4 | Plastics Materials | 64 |
| 4.5 | Plastic Process Techniques-I. | 65-66 |
| 4.6 | Design of Dies & Moulds- I | 67-68 |
| 4.7 | Energy Conservation | |

V Semester

| | | |
|-----|-----------------------------------------------------------|-------|
| 5.1 | Integrative Communication | 69-70 |
| 5.2 | Industrial Management and Entrepreneurship Development | 69-70 |
| 5.3 | Plastic Process Techniques- II | 71-72 |
| 5.4 | Design of Dies & Moulds-II | 73-74 |

VI Semester

| | | |
|-----|--------------------------------------------------|-------|
| 6.1 | Environmental & Pollution in Plastic Industries. | 75-76 |
| 6.2 | Plastic Testing & Quality Control. | 77-78 |

| | | |
|-----|-------------------------------|---------|
| 6.3 | Computer aided Moulds Design. | 79 |
| 6.4 | Project. | 80 |
| 6.5 | Field Exposure-II | 80 |
| | Staff Structure | 81 |
| | Space Requirement | 82-84 |
| | List of Equipment | 85-95 |
| | Annexure-I | 96 |
| | Annexure-II | 97-98 |
| | Recommended Books | 99-101 |
| | Questionnaire | 102-105 |

II- MAIN FEATURES OF THE CURRICULUM

Title of the course: Diploma Course in '**PLASTIC MOULD TECHNOLOGY**'

Duration: Three Years(Six Semester)

Pattern of the course: Semester System

Intake: 60

Type of course: Full Time

Entry qualification: Passed High School with 35% Marks

Mode of admission: Through Joint Entrance Examination

III-LIST OF EXPERTS

List of experts whose contribution helped the development of curriculum in semester system for Three Year(Six Semester) Diploma Course in Plastic Mould Technology are honorably named below on dated 17.04.15 at IRDT, UP, Kanpur

1. Sh. D. P. Yadav
Chief Manager C. I. P. E. T., Lucknow
2. Sh. Abdul Rehman
Manager C. I. P. E. T., Lucknow
3. Sh. R. C. Soni
H. O. D. Mech. Engg. Govt. Polytechnic, Faethpur
4. Sh. S. N. Maurya
H. O. D. Mech. Engg. Govt. Polytechnic, Sikendra
5. Sh. C. B. Prajapati
Lecturer Govt. Polytechnic, Faethpur
6. Mrs. Meenu Dwivedi
Lecturer Govt. Poly, Lucknow
7. Shri. M.P. Singh Bhadauria
H. O. D. & C. D. C Co. ordinator I. R. D. T. U. P., Kanpur

List of experts whose contribution helped the development of curriculum in semester system for Three Year(Six Semester) Diploma Course in Plastic Mould Technology are honorably named below on dated 22.11.16 at IRDT, UP, Kanpur

1. Sh. R. C. Soni
H. O. D. Mech. Engg. Govt. Polytechnic, Kanpur
2. Sh. C. B. Prajapati
Lecturer Govt. Polytechnic, Faethpur
3. Sh. C. S. Yadav
Lecturer Govt. Polytechnic, Kanpur
4. Shri. M.P. Singh Bhadauria
H. O. D. & C. D. C Co. ordinator I. R. D. T. U. P., Kanpur

LIST OF EXPERTS

A Curriculum Workshop for Development of Curriculum on the Subject “Energy Conservation” was held on 22nd January, 2018 at NITTTR, Chandigarh. The following participated in the workshop:-

| S. No. | Name, Designation and Official address |
|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| From Field/Industries/Institutions of Higher Learning | |
| 1. | Shri Jotinder Singh, Engineer-in-Chief(Retd.) Punjab State Power Corpn. Ltd.(PSPCL), Punjab |
| 2. | Shri Punit Sharma, Asstt.General Manager, Electrical & Energy Management, Godrej Appliances Ltd. Mohali, Punjab |
| 3. | Ms. Anu Singla, Associate Professor, Chitkara University, Rajpura, Punjab |
| 4. | Shri Girish Kumar, UP New and Renewable Energy Development Authority (UPNEDA), Lucknow, U.P. |
| 5. | Sh. Lal Ji Patel, TBO/ CDC Officer, IRDT Kanpur, U.P. |
| 6. | Shri Ravinder Kumar, Research Assistant, IRDT, Kanpur, U.P. |
| From NITTTR, Chandigarh | |
| 7. | Dr. AB Gupta, Professor & Head, Curriculum Development Centre, Coordinator |

IV-NEED ANALYSIS AND CURRICULUM PROFILE

There has been significant development and acceptance of synthetic plastic goods in last few decades, mainly due to advances in organic chemistry. Uses of Moldable plastics are in today's day-to-day life is incredible, through extension of its use in all spheres of changing lifestyle. Since there is no competition material, the future of moldable plastic and professional opportunities is becoming unlimited.

The word "**Plastic**" is derived from Greek word "**Plastikos**" means "to form". Mostly in today's modern plastic era, the word plastic refers to groups of synthetic components of high molecular weight, which carries the moldable characteristic by heating and pressure which gives finished products by retaining its shape, dimension, and quality under normal usable condition.

The modern plastic industry predominantly addresses the Moldable Materials, Processing, Applications, Tooling and Plant and Equipment related to plastics. The professionals in plastics industries convert plastic granules (raw material) into finished products by different kind processing methods like Extrusion, Injection, Blow, Transfer, Compression, Thermo forming and thermo setting, based on part shape, size and its use, by using precision mould made up of high grade Die Metals. A typical Plastic industry includes different department like Plastic Product Design and Mould Design, Tool Room that fabricate moulds using high level CNC and EDM Machines to get perfect finish and intricate shape. Processing department converts raw materials into ready to use finished part or to fit in an assembly. Quality control tests the part mostly performs Distractive testing. The process differs based on the Shape, Use and Materials. To say few examples PET Jars are the Hollow components that normally uses Blow molding technique, and Industrial/house hold part are done by Injection molding methods. So the professionals differ from process to process like Designers, Mould maker, Processing and testing technicians.

Role of Plastics:

There is dispute in use of all plastics as understands by common people and even well informed man understands in this way is really painful. The restriction is only applicable to 20 Micron thickness polyethylene bags and some of the non-recyclable, thus used/wasted bags/cups becoming pollution due to non- biodegradable. All thermoplastic materials are re-moldable thus no harm to human society. Simply to say what ever you touch in day to day life there may be almost 99% of plastic parts. It includes unimaginable Human body spare parts, Functional Artificial Limbs, Shelters, Robots, Seating system of all kind from locomotive to air capsules, All Automobile interior assemblies, Clothing and Foot wears and all except to be specific eatables.

Working in plastic industry needs high grade skill, to convert the knowledge into reality and confidant to accommodate the fast changing design methods. Based on the process the performing professional varies, mainly Designer and Processing Technologist are the specialized key players. Other professionals include Plastic Testing Technologist, Plastic Mould Makers and the Mould designers. The Plastic Part designers who design Industrial and Consumer parts by using high end CAD System. Mould Designer plays a vital role who extras Core and cavity of the Part Design and Build Automatic Mould Design adding Runner, Ejection system etc. Before

releasing drawing he finalizes the design by doing mould flow analysis which addresses Solidification, Mould temperature, Gating, Clamping and Injection pressure, Shrinkage and Draft analysis. He is a professional who knows the entire process of Know-how of plastic industry and perform his duties on CAD/CAE/CAM System. Plastic Mould Maker converts the Mould design into reality; it is a highly skilled and honored job in Tool Room, a set-up with team of professional who makes all kinds of Moulds and Dies in CAM and CNC. Mould maker is on-hand Professional who converts Know-how to Do-how and is one of the important factor in Indian industries. After mounting the mould on machine, The Processing technician take care of the production normally done in lots. He sets the requires injection and claming pressure, cycle time, Mould temperature so that perfect finished part comes out at regular intervals. The finished part goes to the Quality control where a team of Plastic Testing Technicians works and uses UTM for Mechanical testing like tensile test, Flexural Testing, Compressive testing etc. They also perform Thermal tests like Specific heat, Thermal conductivity; linear coefficient expansion etc and also they perform Electrical Testing as per requirement. Testing is a kind of scientific job and enjoys the most privileged certifying authority for most critical products. This is the final stage which eligible the part for the shipment. The Polymers Professional studies and work on the science of polymer, more specifically raw material

Research and developments Institutions offering courses:

Though there are ample of varied unknown exciting opportunities across the country, but very few institutes offer course in Plastics mould Tech. and its related fields. CIPET, SIDO TRs, NTTF, Tamil Nadu State owned Institutions and few among others offers related courses in this field. These institutions's course curriculum mostly addresses Do-How along with know how. One can understand by visiting "Plast India" a largest organized industrial Expo of this kind, which exhibits the tremendous capability of Indian plastic market.

V-JOB OPPORTUNITIES & CURRICULUM DESIGN

The plastics and polymer industry is growing at fast pace. The transport sector, household appliances and goods, packaging and electricity and telecommunication are the major areas, which demand plastics, hence are creating employment opportunities in this sector. For instance, synthetic rubber is now in great demand. In the public sector, plastics engineers / technologists and technicians may find employment in:

- The Ministry of Petroleum and Natural Gas
- Oil and Natural Gas Commission, and
- Oil India Laboratories
- Petrochemicals Engineering Plants
- Indian Institute of Petroleum
- Polymers Corporations of different states
- Petroleum Conservation Research Association of India
- Petrofiles Cooperative Limited and other such organizations.

Many private companies and MNCs that deal with the production and marketing of plastic commodities also offer employment to plastics technologists and engineers. Plastic technologists also play a significant role in the key sectors of the economy, including agriculture and water management, automobiles and transportation, building and construction, telecommunication and electronics, besides defense and aerospace, computers and power transmissions and even in manufacture of artificial limbs. Polymer use in India is very less as compared to the other developed countries, so this field offers a high potential of growth and so are the employment opportunities.

Designer and Processing Technologist are the specialized key players. Other professionals include Plastic Testing Technologist, Plastic Mould Makers and the Mould designers. The Plastic Part designers who design Industrial and Consumer parts by using high end CAD System. Mould Designer plays a vital role who extras Core and cavity of the Part Design and Build Automatic Mould Design adding Runner, Ejection system etc. Before releasing drawing he finalizes the design by doing mould flow analysis, which addresses Solidification, Mould temperature, Gating, Clamping and Injection pressure etc. He is a professional who knows the entire process of Know-how of plastic industry and perform his duties on CAD/CAE/CAM System. Plastic Mould Maker converts the Mould design into reality; it is a highly skilled and honored job in Tool Room, a set-up with team of professional who makes all kinds of Moulds and Dies in CAM and CNC. Mould maker is on-hand Professional who converts Know-how to Do-how and is one of the important factors in Indian industries. The Processing technician takes care of the production normally done in lots. The Polymers Professional studies and work on the science of polymer, more specifically raw material research and developments.

**1.1 FOUNDATIONAL COMMUNICATION
SECTION "A" (ENGLISH)**

L T P
4 - -

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Units | Coverage Time | | |
|--------------------------|-----------------------------------------|---------------|---|---|
| | | L | T | P |
| Section A English | | | | |
| 1. | PARTS OF SPEECH | 12 | - | - |
| 2. | VOCABULARY BUILDING | 05 | - | - |
| 3. | Grammar | 15 | - | - |
| 4. | DEVELOPMENT OF EXPRESSION (Composition) | 12 | - | - |
| Section B Hindi | | | | |
| 5. | Topic 5 | 2 | - | - |
| 6. | Topic 6 | 5 | - | - |
| 7. | Topic 7 | 5 | - | - |
| 56 | | - | - | - |

DETAILED CONTENTS

1. **PARTS OF SPEECH** :
 - a. Noun
 - b. The pronoun : Kinds and Usage
 - c. The adjective : Kinds and Degree
 - d. Determiner : Articles
 - e. The verb : Kinds
 - f. The Adverb : Kinds, Degree and Usage
 - g. Prepositions
 - h. Conjunctions
 - i. The Interjections
 - j. Subject: Verb Agreement (Concord)

2. **VOCABULARY BUILDING** :
 - a. Antonyms and Synonyms
 - b. Homophones
 - c. One word substitutions
 - d. Idioms and Phrases
 - e. Abbreviations

3. **Grammar**
 - a. Sentence & its types

- a. Tenses
- b. Punctuations
- c. Active and Passive voice
- d. Transformation of Sentences
- e. Synthesis of Sentences
- f. Direct and Indirect Narrations

4. **DEVELOPMENT OF EXPRESSION (Composition) :**

- a. Paragraph Writing
- b. Essay Writing
- c. Proposal Writing
- d. Letter Writing (Formal, Informal, Business, official etc.)
- f. Report Writing
- g. Note Making
- h. News Making
- i. Application Writing
- j. Minute Writing
- k. Invitation Letter Writing

SECTION "B" (Hindi)

- 5- संज्ञा, सर्वनाम, विशेषण, क्रिया विशेषण, वर्ण समास, संधि, अलंकार, रस, उपसर्ग प्रत्यय।
- 6- पत्र लेखन, निविदा संविदा, दर आमंत्रण (कोटेशन) अपील, स्वतन्त्र अभिव्यक्ति, प्रतिवेदन लेखन, प्रेस विज्ञप्ति।
- 7- वाक्य/वाक्यांश के लिए शब्द, पर्यायवाची या समानार्थी शब्द, विलोम शब्द, अनेकार्थी शब्द, शब्दयुग्म या समुच्चारित शब्द समूह, वाक्य शुद्धि (शुद्ध अशुद्ध वाक्य), मुहावरे एवं लोकोक्तियाँ।

1.2 APPLIED MATHEMATICS I(A)
[Common to All Engineering Courses]

L T P
3 2/2 -

Rationale:

The study of mathematics is an important requirement for the understanding and development of any branch of engineering. The purpose of teaching mathematics to diploma engineering students is to impart them basic knowledge of mathematics which is needed for full understanding and study of engineering subjects.

| S.N. | Units | Coverage Time | | |
|------|--------------------------|---------------|----|---|
| | | L | T | P |
| 1. | Algebra- I | 8 | 3 | - |
| 2. | Algebra- II | 8 | 3 | - |
| 3. | Trigonometry | 6 | 2 | - |
| 4. | Differential Calculus-I | 10 | 3 | - |
| 5. | Differential Calculus-II | 10 | 3 | - |
| | | 42 | 14 | - |

DETAILED CONTENTS:

1. ALGEBRA-I : (10 Marks)
 - 1.1 Series : AP and GP; Sum, nth term, Mean
 - 1.2 Binomial theorem for positive, negative and fractional index (without proof). Application of Binomial theorem.
 - 1.3 Determinants : Elementary properties of determinant of order 2 and 3, Multiplication system of algebraic equation, Consistency of equation, Cramer's rule
2. ALGEBRA-II:(10 Marks)
 - 2.1 Vector algebra : Dot and Cross product, Scaler and vector triple product.
 - 2.2 Complex number.

Complex numbers, Representation, Modulus and amplitud Demoivre theorem, its application in solving algebraic equations, Mod. function and its properties..
3. TRIGONOMETRY : (8 Marks)
 - 3.1 Relation between sides and angles of a triangle : Statement

of various formulae showing relation ship between sides and angle of a triangle.

3.2 Inverse circular functions : Simple case only

4. DIFFERENTIAL CALCULUS - I : (12 Marks)

4.1 Functions, limits, continuity, - functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.

4.2 Methods of finding derivative, - Function of a function, Logarithmic differentiation, Differentiation of implicit functions.

5. DIFFERENTIAL CALCULUS -II :(10 Marks)

5.1 Higher order derivatives, Leibnitz theorem.

5.2 Special functions (Exponential, Logarithmic, Inverse circular and function), Definition, Graphs, range and Domain and Derivations of each of these functions.

5.3 Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.

1.3 APPLIED PHYSICS-I

[Common to All Engineering Courses]

L T P
3 2/2 -

Rationale:

Engineering physics is a foundation Course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. While teaching the subject, teachers should make maximum use of demonstrations to make the subject interesting to the students.

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Topics | L | T | P |
|--------|--------------------------------------------|----|----|---|
| 1. | Units & Dimensions | 3 | 1 | - |
| 2. | Errors in Measurement | 3 | 1 | - |
| 3. | Circular Motion | 4 | 1 | - |
| 4. | Motion of Planets | 4 | 1 | - |
| 5. | Dynamics of rigid body (Rotational Motion) | 5 | 1 | - |
| 6. | Fluid Mechanics and Friction | 4 | 1 | - |
| 7. | Friction | 4 | 1 | - |
| 8. | Harmonic Motion | 5 | 2 | - |
| 9. | Heat & Thermodynamics | 6 | 4 | - |
| 10. | Acoustics | 4 | 1 | - |
| | | 42 | 14 | - |

DETAILED CONTENTS:

1. Units and Dimensions (4 Marks)

S.I. Units & Dimensions of physical quantities, Dimensional formula and dimensional equation. Principle of homogeneity of dimensions and applications of homogeneity principle to:

- i) Checking the correctness of physical equations,
- ii) Deriving relations among various physical quantities,
- iii) Conversion of numerical values of physical quantities from one system of units into another. Limitations of dimensional analysis.

2. ERRORS AND MEASUREMENT (4 Marks)

Errors in measurements, accuracy and precision, random and

systematic errors, estimation of probable errors in the results of measurement (Combination of errors in addition, subtraction, multiplication and powers). Significant figures, and order of accuracy in respect to instruments,

3. Circular Motion (5 Marks)

Central forces. Uniform Circular motion (Horizontal and Vertical cases), angular velocity, angular acceleration and centripetal acceleration. Relationship between linear and angular velocity and acceleration. Centripetal and centrifugal forces. Practical applications of centripetal forces. Principle of centrifuge.

4. MOTION OF PLANETS AND SATELLITES : (5 Marks)

Gravitational force, Acceleration due to gravity and its variation w.r. to height and depth from earth, Kepler's Law, Escape and orbital velocity, Time period of satellite, Geostationary, Polar satellites (Concept Only)

5. Dynamics of Rigid Body (Rotational Motion) (6 Marks)

Rigid body, Rotational motion, Moment of inertia, Theorems (Perpendicular and Parallel axis) of moment of inertia (Statement). Expression of M.I. of regular bodies (Lamina, Sphere, Disc, Cylinderical), Concept of Radius of gyration, angular momentum, Conservation of angular momentum, Torque, Rotational kinetic energy. Rolling of sphere on the slant plane. Concept of Fly wheel.

6. Fluid Mechanics : (5 Marks)

Surface tension, Capillary action and determination of surface tension from capillary rise method, Equation of continuity ($A_1V_1=A_2V_2$), Bernoulli's theorem, and its application stream line and Turbulent flow, Reynold's number.

7. Friction : (4 Marks)

Introduction, Physical significance of friction, Advantage and disadvantage of friction and its role in every day life. Coefficients of static and dynamic friction and their measurements. viscosity, coeff. of viscosity, & its determination by stoke's method.

8. Harmonic Motion (6 Marks)

Periodic Motion, characteristics of simple harmonic motion; equation of S.H.M. and determination of velocity and acceleration. Graphical representation. Spring-mass system.

Simple pendulum. Derivation of its periodic time. Energy conservation in S.H.M.. Concept of phase, phase difference, Definition of free, forced, undamped and damped vibrations, Resonance and its sharpness, Q-factor.

9. Heat & Thermodynamics: (6 Marks)

Modes of heat transfer (Conduction, Convection and Radiation), coefficient of thermal conductivity Isothermal and adiabatic process. Zeroth First, Second Law of Thermodynamics and Carnot cycle, Heat Engine (Concept Only).

10. Acoustics (5 Marks)

Definition of pitch, loudness, quality and intensity of sound waves. Echo, reverberation and reverberation time. Sabine's formula without Derivation. Control of reverberation time (problems on reverberation time). Acoustics of building defects and remedy.

1.4 APPLIED CHEMISTRY

[Common to All Engineering Courses]

L T P
6 - 4

Rationale:

Engineering Chemistry has profound and deep relationship with the industrial and environmental technology. This curriculum intends to impart technical knowledge alongwith productive practice to the students of the diploma engineering. The teachers are expected to guide the students in the classroom and the laboratories according to the curriculum by demonstrations and by showing relevant materials and equipments to inculcate interests in learning among students.

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Topics | L | T | P |
|--------|-------------------------------|----|---|----|
| 1. | Atomic Structure | 4 | - | - |
| 2 | Chemical Bonding | 6 | - | - |
| 3. | Classification of Elements | 4 | - | - |
| 4. | Electro Chemistry-I | 7 | - | - |
| 5. | Electro Chemistry-II | 8 | - | - |
| 6. | Chemical Kinetics | 4 | - | - |
| 7. | Catalysis | 4 | - | - |
| 8. | Solid State | 4 | - | - |
| 9. | Fuels | 4 | - | - |
| 10. | Water Treatment | 6 | - | - |
| 11. | Colloidal State | 4 | - | - |
| 12. | Lubricants | 4 | - | - |
| 13. | Hydrocarbons | 7 | - | - |
| 14. | Organic Reactions & Mechanism | 8 | - | - |
| 15 | Polymers | 4 | - | - |
| 16 | Synthetic Materials | 6 | - | - |
| | | 84 | - | 56 |

DETAILED CONTENTS:

1. ATOMIC STRUCTURE : (3 MARKS)

Basic concept of atomic structure, Matter wave concept, Quantum number, Haiseberg's Uncertainty Principle, Shaples of orbitals.

2. CHEMICAL BONDING : (4 MARKS)

Covalent bond, Ionic & Co-ordinate, Hydrogen bonding, Valence bond theory, Hybridisation, VSEPR theory, Molecular orbital theory.

3. CLASSIFICATION OF ELEMENTS : (3 MARKS)

Modern classification of elements (s,p,d and f block elements), Periodic properties : Ionisation potential, electro negativity, Electron affinity.

4. ELECTRO CHEMISTRY-I: (3 MARKS)

Arrhenius Theory of electrolytic dissociation, Transport number, Electrolytic conductance, Ostwald dilution law. Concept of Acid and bases : Bronsted, Arrhenius and Lewis theory. Concept of pH and numericals. Buffer solutions, Indicators, Solubility product, Common ion effect with their application,

5. ELECTRO CHEMISTRY-II: (3 MARKS)

Redox reactions, Electrode potential (Nernst Equation), Electro-chemical cell (Galvanic and Electrolytic). EMF of a cell and free energy change. Standard electrode potential, Electro chemical series and its application. Chemical and Electrochemical theory of corrosion, Galvenic Series. Prevention of corrosion by various method.

6. CHEMICAL KINETICS : (3 MARKS)

Law of mass action, order and molecularity of reaction. Activation energy, rate constants, 1st order reactions and 2nd order reactions.

7. CATALYSIS : (2 MARKS)

Definition Characteristics of catalytic reactions, Catalytic promoters and poison , Autocatalysis and Negative catalysis, Theory of catalysis, Application.

8. SOLID STATE : (2 MARKS)

Types of solids (Amorphous and Crystalline), Classification (Molecular, Ionic, Covalent, Metallic), Band theory of solids (Conductors, Semiconductors and Insulators), types of Crystals, FCC, BCC, Crystal imperfection.

9. FUELS : (3 MARKS)

Definition, its classification, high & low Calorific

value. Determination of calorific value of solid and liquid fuels by Bomb calorimeter.

Liquid fuel - Petroleum and its refining, distillate of petroleum (Kerosene oil, Diesel and Petrol), Benzol and Power alcohol. Knocking, Anti-knocking agents, Octane number and Cetane number.

Cracking and its type, Gasolining from hydrogenation of coal (Bergius process and Fischer tropesch's process)

Gaseous Fuel - Coal gas, Oil gas, Water gas, Producer gas, Bio gas, LPG and CNG.

Numerical Problems based on topics

10. WATER TREATMENT : (3 MARKS)

Hardness of water, Its limits and determination of hardness of water by EDTA method. Softening methods (Only Sods lime, Zeolote and Ion exchange resin process). Disadvantage of hard water in different industries, scale and sludge formation, Corrosion, Caustic embrittlement, primming and foarming in biolers.

Disinfecting of Water By Chloramine-T, Ozone and Chlorine. Advantage and disadvantage of chlorinational, Industrial waste and sewage, Municipality waste water treatment, Definition of BOD and COD. Numerical Problems based on topics.

11. COLLOIDAL STATE OF MATTER : (3 MARKS)

Concept of collidal and its types, Different system of colloids, Dispersed phase and dispersion medium. Methods of preparation of colloidal solutions, Dialysis and electrodialysis. Properties of colloidal solution with special reference to absorption, Brownian Movement, tyndal effect, Electro phoresis and coagulation. relative stability of hydrophillic and hydrophobie colloids. Protection and protective colloids. Emulsion, Types, preparation, properties and uses. Application of colloids chemistry in different industries.

12. LUBRICANTS : (3 MARKS)

Definition, classification, Necessasity and various kinds of lubricants. Function and mechanism of action of lubricants and examples. Properties of lubricants, Importance of additive compunds in lubricants, Synthetic lubricants and cutting fluids. Industrial application, its function in bearing.

13. HYDROCARBONS: (4 MARKS)
- A. Classification and IUPAC nomenclature of organic compounds homologous series (Functional Group)
 - B. Preparation, properties and uses of Ethane, Ethene, Ethyne (Acetylene), Benzene and Toluene.
14. ORGANIC REACTIONS & MECHANISM: (4 MARKS)
- 1. Fundamental aspects -
 - A. Electrophiles and nucleophiles, Reaction Intermediates, Free radical, Carbocation, Carbanion
 - B. Inductive effect, Mesomeric effect, Electromeric effect.
 - 2.A. Mechanism of addition reaction (Markovnikov's Rule, Cyanohydrin and Peroxide effect),
 - B. Mechanism of Substitution reactions; (Nucleophilic) hydrolysis of alkyl halide, electrophilic substitution halogenation, Sulphonation, Nitration and Friedel-Craft reaction.
 - C. Mechanism of Elimination reaction - Dehydration of primary alcohol, Dehydrohalogenation of primary alkyl halide.
15. POLYMERS : (3 MARKS)
- 1. Polymers and their classification. Average degree of polymerisation, Average molecular weight, Free radical polymerisation (Mechanisms)
 - 2. Thermosetting and Thermoplastic resins -
 - A. Addition polymers and their industrial application - Polystyrene, PVA, PVC, PAN, PMMA, Buna-S, Buna-N, Teflon.
 - B. Condensation polymer and their industrial application : Nylon 6, Nylon 6,6, Bakelite, Melamine formaldehyde, Urea formaldehyde, Terylene or Decron, Polyurethanes.
 - 3. General concept of Bio polymers, Biodegradable polymers and inorganic polymers (Silicon)
16. SYNTHETIC MATERIALS : (4 MARKS)
- A. Introduction - Fats and Oils
 - B. Saponification of fats and oils, Manufacturing of soap.
 - C. Synthetic detergents, types of detergents and its

manufacturing.

3. EXPLOSIVES: TNT, RDX, Dynamite.
4. Paint and Varnish

LIST OF PRACTICALS

1. To analyse inorganic mixture for two acid and basic radicals from following radicals
 - A. Basic Radicals :
NH₄⁺, Pb⁺⁺, Cu⁺⁺, Bi⁺⁺⁺, Cd⁺⁺, As⁺⁺⁺, Sb⁺⁺⁺,
Sn⁺⁺, Al⁺⁺⁺, Fe⁺⁺⁺, Cr⁺⁺⁺, Mn⁺⁺, Zn⁺⁺, Co⁺⁺
Ni⁺⁺, Ba⁺⁺, Sr⁺⁺, Ca⁺⁺, Mg⁺⁺
 - B. Acid Radicals :
CO₃⁻⁻, S⁻⁻, SO₃⁻⁻, CH₃COO⁻, NO₂⁻,
NO₃⁻, Cl⁻, Br⁻, I⁻, SO₄⁻⁻
2. To determine the percentage of available Chlorine in the supplied sample of Bleaching powder.
3. To determine the total hardness of water sample in terms of CaCO₃ by EDTA titration method using Eriochroma black-T indicator.
4. To determine the strength of given HCl solution by titration against NaOH solution using Phenolphthalein as indicator.
5. To determine the Chloride content in supplied water sample by using Mohr's methods.
6. Determination of temporary hardness of water sample by O-Henry's method.

1.5 ENGINEERING DRAWING

[Common to Three years Diploma Course in Civil Engg., Electrical Engg., Chemical Engg., Dairy, Ceramic, Textile Technology, Textile Chemistry]

[Also Common to Four year Part-time Diploma Course in Electrical Engineering, Mechanical Engineering (Specilization in Production Engineering)]

[Also common to First year Diploma Course in Chemical Technology : (1) Fertilizer Technology, (2) Rubber and Plastic Technology]

L T P
4 - 10

Rationale

Drawing, which is known as the language of engineers, is a widely used means of communication among the designers, engineers, technicians, draftmen and craftsmen in the industry. The translation of ideas into practice without the use of this graphic language is really beyond imagination. Thus, for the effective and efficient communication among all those involved in an industrial system, it becomes necessary that the perosnnel working in different capacities acquire appropriate skills in the use of this graphic language in varying degrees of proficiency in accordance with their job requirements.

Generally speaking, an engineering technician working at the middle level of the threetier technical manpower spectrum, is required to read and interpret the designs and drawings, provided to him by technologists and subsequently to translate them to the craftsmen for actual execution of the job.

This course in Engineering Drawing has been designed, keeping in view, the above refered job functions of a technician in the industry. This preliminary course aims at building a foundation for the further courses in drawing and other allied subjects. The contents of the course have been selected as to form a core for the various deversified fields of engineering. It is expected that at the end of this session, the students acquires sufficient skill drafting and some ability in spetial visualization of simple objects.

| Sl.N. | Units | Coverage Time | | |
|-------|------------------------------------------------------|---------------|---|----|
| | | L | T | P |
| 1. | Drawing Instruents and their use | 5 | - | 4 |
| 2. | A. Lettering techniques | 3 | - | 16 |
| | B. Introduction to scales | 2 | - | 8 |
| 3. | Conventional Presentation | 5 | - | 8 |
| 4. | A. Principles of projections | 3 | - | 12 |
| | B. Point Line, Plane | 2 | - | 28 |
| 5. | Orthographic projection of simple geometrical solids | 5 | - | 12 |
| 6. | Section of Solids | 5 | - | 20 |

| | | | | |
|-----|----------------------------------------------|---|---|----------|
| 7. | Isometric Projection | 5 | - | 20 |
| 8. | Free Hand Sketching | 5 | - | 8 |
| 9. | Development of surfaces | 5 | - | 24 |
| 10. | Orthographics Projection of Machine Parts | 5 | - | 12 |
| 11. | Practice on Auto Cad | 6 | - | 24 |
| | | | | 56 - 140 |

C O N T E N T S

NOTE : Latest Indian Standards Code of Practice to be followed.

| | | |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 1. | Drawing, instruments and their uses. | 1 Sheet |
| 1.1 | Introduction to various drawing, instruments. | |
| 1.2 | Correct use and care of Instruments. | |
| 1.3 | Sizes of drawing sheets and their layouts. | |
| 2. (a) | Lettering Techniques | 2 Sheet |
| | Printing of vertical and inclined, normal single stroke capital letters. | |
| | Printing of vertical and inclined normal single stroke numbers. | |
| | Stencils and their use. | |
| (b) | Introduction to Scales | 2 Sheet |
| | Necesssity and use, R F | |
| | Types of scales used in general engineering drawing. Plane, diagonal and chord scales. | |
| 3. | Conventional Presentaion : | 1 Sheet |
| | Thread (Internal and External), Welded joint, Types of lines, Conventional representation of materials, Conventional representation of machine parts. | |
| 4. (a) | Principles of Projection | 1 Sheet |
| | Orthographic, Pictorial and perspective. | |
| | Concept of horizontal and vertical planes. | |

- Difference between I and III angle projections.
 Dimensconing techniques.
- (b) Projections of points, lines and planes. 1 Sheet
- 5 (a) Orthographic Projections of Simple 2 Sheet
- Geometrical Solids
- Edge and axis making given angles with the reference planes. Face making given angles with reference planes. Face and its edge making given angles with referance planes.
- (b) Orthographic views of simple composite solids from their isometric views.
- (c) Exercises on missing surfaces and views
6. Section of Solids 2 Sheet
- Concept of sectioning
- Cases involving cutting plane parallel to one of the reference planes and prependicular to the others.
- Cases involving cutting plane perpendicular to one of the reference planes and inclind to the others plane, true shape of the section
7. Isometric Projection. 2 Sheet
- Isometric scale
- Isometric projection of solids.
8. Free hand sketching 1 Sheet
- Use of squared paper
- Orthographic views of simple solids
- Isometric views of simple job like carpentary joints
9. Development of Surfaces 2 Sheet
- Parallel line and radial line methods of developments.

Development of simple and truncated surfaces (Cube, prism, cylinder, cone and pyramid).

10. ORTHOGRAPHIC PROJECTION OF MACHINE PARTS: 2 Sheet

Nut and Bolt, Locking device, Wall bracket

11. PRACTICE ON AUTO CAD : 2 Sheet

Concept of AutoCAD, Tool bars in AutoCAD, Coordinate System, Snap, Grid and Ortho mode. Drawing Command - Point, Line, Arc, Circle, Ellipse. Editing Commands - Scale, Erase, Copy, Stretch, Lengthen and Explode. Dimensioning and Placing text in drawing area. Sectioning and hatching. Inquiry for different parameters of drawing.

NOTE :

- A. The drawing should include dimension with tolerance wherever necessary, material list according to I.S. code. 25% of the drawing sheet should be drawn in first angle projection and rest 75% drawing sheet should be in third angle figure
- B. Practice on AutoCAD latest software is to be done in AutoCAD lab of Mechanical Engineering Department of the Institute.

II Semester

2.1 APPLIED MATHEMATICS I (B)
[Common to All Engineering Courses]

L T P
3 2/2 -

Rationale:

The study of mathematics is an important requirement for the understanding and development of any branch of engineering. The purpose of teaching mathematics to diploma engineering students is to impart them basic knowledge of mathematics which is needed for full understanding and study of engineering subjects.

| S.N. | Units | Coverage Time | | |
|------|-------------------------------------|---------------|----|---|
| | | L | T | P |
| 1. | Integral Calculus-I | 12 | 4 | - |
| 2. | Integral Calculus-II | 12 | 4 | - |
| 3. | Coordinate Geometry (2 Dimensional) | 10 | 3 | - |
| 4. | Coordinate Geometry (3 Dimensional) | 8 | 3 | - |
| | | 42 | 14 | - |

DETAILED CONTENTS:

1. INTEGRAL CALCULUS - I : (14 Marks)

Methods of Indefinite Integration :-

- 1.1 Integration by substitution.
- 1.2 Integration by rational function.
- 1.3 Integration by partial fraction.
- 1.4 Integration by parts.

2. INTEGRAL CALCULUS -II :(14 Marks)

- 2.1 Meaning and properties of definite integrals, Evaluation of definite integrals. Integration of special function.
- 2.2 Application : Finding areas bounded by simple curves, Length of simple curves, Volume of solids of revolution, centre of mean of plane areas.
- 2.3 Simposns 1/3rd and Simposns3/8th rule and Trapezoidal Rule : their application in simple cases.

3. CO-ORDINATE GEOMETRY (2 DIMENSION):(14 Marks)

3.1 CIRCLE :

Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.

3.2 Standard form and simple properties

Parabola $x^2=4ay$, $y^2=4ax$,

Ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

Hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

4. CO-ORDINATE GEOMETRY (3 DIMENSION):(8 Marks)

4.1 Straight lines and planes in space -

Distance between two points in space, direction cosine and direction ratios, Finding equation of a straight line and Plane (Different Forms),

4.2 Sphere $x^2 + y^2 + z^2 + 2gx + 2fy + 2wz=d$ (Radius, Centre and General Equation)

2.2 APPLIED PHYSICS-II

[Common to All Engineering Courses]

L T P
3 2/2 4

Rationale:

Engineering physics is a foundation Course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. While teaching the subject, teachers should make maximum use of demonstrations to make the subject interesting to the students.

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Topics | L | T | P |
|--------|---------------------------------------|----|----|----|
| 1. | Optics | 4 | 1 | - |
| 2. | Introduction To Fiber Optics | 4 | 1 | - |
| 3. | Laser & its Application | 4 | 1 | - |
| 4. | Electrostatics | 4 | 1 | - |
| 5. | D.C. Circuits | 4 | 1 | - |
| 6. | Magnetic Materials & Their Properties | 4 | 1 | - |
| 7. | Semi Conductor Physics | 4 | 1 | - |
| 8. | Introduction Diode & Transistors | 4 | 2 | - |
| 9. | Introduction To Digital Electronics | 4 | 2 | - |
| 10. | Non-conventional energy sources | 6 | 3 | - |
| <hr/> | | 42 | 14 | 56 |

1. Optics (4 Marks)

Nature of light, Laws of Reflection and Refraction, Snell's Law, Interference (Constructive and Destructive), Diffraction and Polarization (Concept Only), Law of Malus and Polaroids.

2. Introduction To Fibre Optics :(5 Marks)

Critical angle, Total internal reflection, Principle of fibre optics, Optical fibre, Pulse dispersion in step-index fibres, Graded index fibre, Single mode fibre, Optical sensor.

3. Lasers and its Applications (4 Marks)

Absorption and Emission of energy by atom, Spontaneous and Stimulated Emission, Population inversion, Main component of

laser and types of laser- Ruby Laser, He-Ne laser and their applications. Introduction to MASER.

4. Electrostatics :(4 Marks)

Coulomb's Law, Electric field, Electric potential, Potential energy, Capacitor, Energy of a charged capacitor, Effect of dielectric on capacitors.

5. D.C. Circuits (5 Marks)

Ohm's Law, Kirchoff's Law and their simple application, Principle of Wheat Stone bridge and application of this principle in measurement of resistance (Meter bridge and Post Office Box); Carey Foster's bridge, potentiometer.

6. Magnetic Materials and Their Properties: (5 Marks)

Dia, Para and Ferro-magnetism, Ferrites, Magnetic Hysteresis Curve and its utility. Basic idea of super conductivity, Meissner's effect.

7. Semiconductor Physics (4 Marks)

Concept of Energy bands in solids, classification of solids into conductors, insulators and semiconductors on the basis of energy band structure. Intrinsic and extrinsic semiconductors, Electrons and holes as charge carriers in semiconductors, P-type and N-type semiconductors.

8. Junction Diode and Transistor : (6 Marks)

Majority and Minority charge carriers, P-N junction formation, barrier voltage, Forward and reverse biasing of a junction diode, P-N junction device characteristics, Formation of transistor, transistor-action, Base, emitter and collector currents and their relationship LED's.

9. Introduction To Digital Electronics : (6 Marks)

Concept of binary numbers, Interconversion from binary to decimal and decimal to binary. Concepts of Gates (AND, NOT, OR).

10. Non-conventional energy sources: (7 Marks)

- (a) Wind energy : Introduction, scope and significance, measurement of wind velocity by anemometer, general principle of wind mill.
- (b) Solar energy: Solar radiation and potentiality of

solar radiation in India, uses of solar energy:
Solar Cooker, solar water heater, solar photovoltaic
cells, solar energy collector.

PHYSICS LAB

Note: Any 4 experiments are to be performed.

1. Determination of coefficient of friction on a horizontal plane.
2. Determination of 'g' by plotting a graph T² verses l and using the formula $g = 4\pi^2 / \text{Slope of the graph line}$
3. Determine the force constant of combination of springs in case of 1. Series 2. Parallel.
4. To verify the series and parallel combination of Resistances with the help of meter bridge.
5. To determine the velocity of sound with the help of resonance tube.
6. Determination of viscosity coefficient of a lubricant by Stoke's law.
7. Determination of E₁/E₂ of cells by potentiometer.
8. Determination of specific resistance by Carry Foster bridge.
9. Determination of resistivity by P.O.Box.
10. Verification of Kirchoff's Law.
11. To draw Characteristics of p-n Junction diode.

12. To measure instantaneous and average wind velocity by indicating cup type anemometer/hand held anemometer.

NOTE :

Students should be asked to plot a graph in experiments (where possible) and graph should be used for calculation of results. Results should be given in significant figures only.

2.3 APPLIED MECHANICS

[Common to three years Diploma Course in Civil Engg., Agriculture, Dairy, Ceramic, Civil & Rural Engg., Chemical Engineering, Architecture Assistantship, Computer Science & Engineering]

[Also Common to Mechanical Engineering (Spacialization In Production Engineering)

[Also common to First year Diploma Course in Chemical Technology : (1) Fertilizer Technology, (2) Rubber and Plastic Technology]

| | | |
|---|---|---|
| L | T | P |
| 5 | 1 | 2 |

RATIONALE

The subject Applied Mechanics deals with fundamental

concepts of mechanics which are useful for the students for further understanding of the second & final year subjects like S.O.M. and theory and design of steel & masonry structures as well as RCC designs. The subject enhances the method ability of the students.

TOPIC WISE DISTRIBUTION OF PERIODS

| SL.No. | Topic | L | T | P |
|--------|-----------------------------------------------------|----|----|----|
| 1. | Introduction | 4 | 1 | |
| 2. | System of Forces & General Condition of Equilibrium | 18 | 4 | |
| 3. | Moment and Couple | 8 | 1 | |
| 4. | Friction | 8 | 1 | |
| 5. | Machines | 8 | 1 | |
| 6. | Center of Gravity | 8 | 2 | |
| 7. | Moment of Inertia | 8 | 2 | |
| 8. | Beam & Trusses | 8 | 2 | |
| Total | | 70 | 14 | 28 |

DETAILED CONTENTS

1. Introduction:

Mechanics and its utility. Concept of scalar and vector quantities. Effect of a force. Tension & compression. Rigid body. Principle of physical independence of force. Principle of transmissibility of a force.

2.A. System of Forces :

Concept of coplaner and non-coplaner forces including parallel forces. Concurrent and non-concurrent forces. Resultant force. Equilibrium of forces. Law of parallelogram of forces. Law of triangle of forces and its converse. Law of polygon of forces. Solution of simple engineering problems by analytical and graphical methods such as simple wall crane, jib crane and other structures. Determination of resultant of any number of forces in one plane acting upon a particle, conditions of equilibrium of coplaner concurrent force system.

B. General Condition of Equilibrium:

General condition of equilibrium of a rigid body under the action of coplaner forces, statement of force law of equilibrium, moment law of equilibrium, application of above on body.

3. Moment & couple:

Concept of Varignon's theorem. Generalised theorem of moments. Application to simple problems on levers-Bell crank lever, compound lever, steel yard, beams and wheels, lever safety valve, wireless mast, moment of a couple; Properties of a couple ; Simple applied problems such as pulley and shaft.

4. Friction:

Types of friction:statical,limiting and dynamical friction, statement of laws of sliding friction, Coefficient of friction, angle of friction; problems on equilibrium of a body resting on a rough inclined plane, simple problems on friction. Conditions of sliding and toppling.

5. Machines:

Definition of a machine. Mechanical advantage, velocity ratio, input, output, mechanical efficiency and relation between them for ideal and actual machines. Law of a machine Lifting machines such as levers, single pulley, three system of pulleys. Weston differential pulley, simple wheel and axle, differential wheel and axle. Simple screw jack, differential screw jack, simple worm and worm wheel.

6. Centre of Gravity:

Concept, definition of centroid of plain figures and center of gravity of symmetrical solid bodies. Determination of centroid of plain and composite lamina using moment method only, Centroid of bodies with removed portion. Determination of center of 'gravity' of solid bodies - cone, cylinder, hemisphere and sphere, composite bodies and bodies with portion removed.

7. Moment of Inertia:

Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical section : rectangle, triangle, circle (without derivations). Second moment of area for L, T, I and channel section, section of modulus.

8. Beams & Trusses:

Definition of statically determinate and indeterminate trusses. Types of supports. Concept of tie & strut, Bow's

notation, space diagram, polar diagram, funicular polygon; calculation of reaction at the support of cantilever and simply supported beams and trusses graphically and analytically; graphical solution of simple determinate trusses with reference to force diagram for determining the magnitude and nature of forces in its various members. Analytical methods: method of joints and method of sections. (simple problems only)

Applied Mechanics Lab : Practicals

1. To verify the law of Polygon of forces.
2. To verify the law of parallelogram and triangle of forces.
3. To verify the law of principle of moments.
4. To find the coefficient of friction between wood, steel, copper and glass.
5. To find the reaction at supports of a simply supported beam carrying point loads only.
6. To find the forces in the jib & tie of a jib crane
7. To find the forces in the members of a loaded roof truss.
(King / Queen post truss)
8. To find the mechanical advantage, velocity ratio and efficiency of any three of the following machines:
 - (i) Simple wheel & axle
 - (ii) Differential wheel & axle
 - (iii) Differential pulley block
 - (iv) Simple Screw jack
 - (v) Simple Worm & worm wheel
 - (vi) System of Pulleys (any type).

9. To find out center of gravity of regular lamina.
10. To find out center of gravity of irregular lamina.

2.4 ELEMENTARY WORKSHOP TECHNOLOGY
(Common with Diploma In Dairy Engineering)

L T P
5 - -

Rationale :

The knowledge of " Workshop Technology " is very basis of mechanical engineering practice. For a beginner to technician course, familiarity with hand tools is a matter of utmost importance. The classroom teaching and a practice in shop will meet this need well.

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Units | Coverage Time | | |
|--------|------------------------------------------|---------------|---|---|
| | | L | T | P |
| 1. | General Introduction | 3 | - | - |
| 2. | Carpentry | | | |
| a. | Fundamentals of Wood Working Operations. | 3 | - | - |
| b. | Common Carpentry Tools | 6 | - | - |
| c. | Joining of timber Components | 3 | - | |
| 3. | Metal Fabrication | | | |
| A. | Metal Shaping | | | |

| | | | | |
|----|----------------------------------------------------|----|---|---|
| 1. | Smithy | 9 | - | - |
| 2. | Sheet Metal Working | 9 | - | - |
| B. | Metal Joining | | | |
| 1. | Permanent Jointing | 9 | - | - |
| 2. | Temporary Jointing | 5 | - | - |
| C. | Familiarity With Tools | 5 | - | - |
| 4. | Protection of Fabricated Structure from Weather | | | |
| 1. | Painting | 5 | - | - |
| 2. | Varnishing & Polishing | 3 | - | - |
| 5. | Foundry Work | 5 | - | - |
| 6. | Machine Shop | 5 | - | - |
| | | 70 | - | - |

DETAILED CONTENTS

1. GENERAL INTRODUCTION:

- (a) Scope of subject "Workshop Technology" in engineering.
- (b) Different shop activities and broad division of the shops on the basis of nature of work done such as
 - (i) Wooden Fabrication (Carpentry)
 - (ii) Metal Fabrication (shaping and Forming, Smithy, Sheet metal and Joining-welding, Rivetting, Fitting and Plumbing.
- (c) Organization and layout of workshop.
- (d) General safety preaction in workshop

2. CARPENTRY :

- (a) Types of wood and timber, Cutting and seasoning of wood, Decaying of wooden component.
- (b) Fundamental of wood working operations:
 - Marking & Measuring.
 - Holding & Supporting.
 - Cutting & Sawing.
 - Drilling & Boring.
 - Turning.
 - Jointing.
- (c) Common Carpentry Tools:

Their classification, size, specification (name of the

parts and use only).

(1) Marking and measuring tools:

Rules, try square, Bevel Square, Marking gauge, Mortise gauge, Scriber (marking knife). Combination set

(2) Holding and supporting Tools:

Carpentary vice, Bench hold fast, Bar clamp, Bench hook, Hand clamp C and G clamp.

(3) Cutting and Sawing Tools:

Saws: (Grip or Hand, panel, cross cut, Tenon, dove tail, compass, key hole and bow saw),

Chisel: (Firmer, dovetail, mortise and gauge),

Planes: (Wooden & Iron plane. Jack plane, Smoothing plane).

(4) Drilling and Boring tools: Auger, Gimlet, Hand drill, Brace and bits.

(5) Striking Tools: Mallet and Claw hammer.

(6) Turning Tools & Equipments: Wood working lathe and lathe tools.

(7) Miscellaneous Tools: Screw driver, Rasp, Pincer, Oil stone, Triangular file and Saw set.

(d) Joining of Timber Components For Fabrication Works:

Assembly of joints (Preparation steps and tools used only) Mortise, Tenon, Rivet, Groove, Tongue, Dowel, operations in assembly-Simple lap and butt, Mortise, Tenon, Dovetail, Mitre & bridle joints. Uses of glue, dowelpin and screw in preparation of joints. Common defects likely to occur during and after joining, defects due to wrong use of tools, defects due to wrong operation, defects due to improper seasoning of timber-their identification and remedy. Safety (personal and equipment) to be observed.

3. METAL FABRICATION:

(A) Metal Shaping :

Smithy:

- (1) Operations involved (concept only)-Preparation of fire, Supporting and holding the metal, cutting the metal in size, heating, drawing down or fullering, usetting, swaging, bending, punching, blanking, drifting and forge welding,
 - (2) Tools and equipment used (Names, size, specification for identification only).
 - (3) Heating and fuel handling equipment-Smithy Forge, Blower, Shovel, Poker.
 - (4) Holding and supporting tools-Common tongs, anvil, swage block.
 - (5) Striking Tools-Ball pein, cross pein ,Straight pein double face and sledge hammers .
 - (6) Cutting tools - Hot and cold chisel and shear set.
 - (7) Punching & Drifiting Tools - Punch & Drift.
 - (8) Bending Tools and fixture.
 - (9) Forming & Finishing Tools - Fullers, Swage Flatters, Set hammers.
 - (10) Defects likely to Occur during and after operations their Identification and Remedy. Defects due to wrong operation , wrong tool and wrong heating.
 - (11) Safety of Personnel, Equipment & Tools to be observed.
 - (12) Study of forge hammers and power presses.
- (2) Sheet metal working:
- (I) Tools and Operation:
- (1) Operations involved (Names and concept only)
Laying out, marking and measuring, cutting, Shearing and blanking, Straightening bending and seaming, Punching and piercing , burring and stamping,
 - (2) Sheet metal joints - Lap, seam, Locked seam,hemp,wirededge, cup or circuler, Flange, angular and cap.
 - (3) Tools and equipments used (Name, size,

specification for identification only).

- (4) Marking Tools- Scriber, Divider and Trammel, Protractor, Trysquare, Dot punch, Steel Rule, Steel tape, Sheet metal gauge.
 - (5) Cutting and shearing Tools-hand Shear and lever, Snips, Chisels.
 - (6) Straightening tool-Straight edge.
 - (7) Striking Tools-Mallet, Hammer.
 - (8) Holding Tools-Vice, Plier, C or G clamps, Tongs.
 - (9) Supporting Tools-Stakes and Anvil.
 - (10) Bending Tools-Crimpers, Form dies, Roundnose plier, Rails.
 - (11) Punching-Piercing and Drifting tools.
 - (12) Burring Tools-Files.
 - (13) Common defects likely to occur during and after operation-Their identification and remedy. Defects due to wrong operation or wrong tool.
 - (14) Safety of Personnel, Equipment & Tools to be observed.
 - (15) Development and estimation of sheet for simple articles.
- (B) Metal Joining During Fabrication:
- (1) Permanent Joining:
 - (a) (1) Welding methods-Forgewelding, gas welding (high and low pressure-oxyacetylene welding, types of flames.
 - (2) Electric welding- D.C. & A.C., Connected tools, operation, materials and safety measures.
 - (b) Soldering & Brazing:

For black Galvanised and Tincoated Iron sheet, brass and copper sheets only.

 - (1) Its concept, comparison with welding as joining method and classification, electric soldering and

forge soldering.

- (2) Soldering operation- edge preparation of joints, Pickling and degreasing, Fluxing, Tinning and Soldering.
- (3) Materials Used-Common fluxes, soft and hard solder, solder wire (Plain and Resin core) and sticks, spelters and their specifications and discription (For Identification Only), forge soldering bits.
- (4) Electric soldering iron.
- (5) Common defects likely to occurs during and after soldering.
- (6) Safety of Personnel, Equipment & Tools to be observed.

(c) Rivetting:

- (1) Its comparison with welding as joining method.
- (2) Rivets and Materials.
- (3) Operation involved-Marking from given data, edge preparation, drilling and punching arrangements of joint elements (Lap, Butt with single cover plate and double cover plate) upsetting of rievet tail, shaping head and caulking.
- (4) Tools and equipments used- (Names, Size, Specification and uses)-Supporting and holding tools (Stakes and Tonqs)-Striking tools-Ball pien, Straight pien and Cross pien hammers and head forming tools (Shapes), drills punches and solid punches, drift, elementary knowledge about working of pneumatic, hydraulic and electric rivetor.

(2) Temporary Joining (Fastners & Their Uses):

Introduction to

- (1) Various types of Bolts (Names of prats and specification) and various types of washers and nuts used with them and their uses, material they are made of , studs and foundation bolts.
- (2) Screws, keys, pins and cottors-their material and use.
- (3) Pipe connectors-Sockets, elbows, tees, cross and

bends, unions, volves, glands packing and operation in use of pipe connectors-cutting, marking, threading, pipe bending, joining different pipe line fittings- (Steps of operation only).

Tools and equipment used in their operations (Name, Size, Specification and Discription for Identification).

Supporting and holding tools-Pipe vices (Bench, leg and hand), Pipe wrenches, Spanners.

Cutting Tools- Hack saw and Pipe cutters.

Threading Tools- Pipe dies and Taps.

Materials Used for Joining-White lead, Cotton and Gasket.

Common defects lickely to occur during and after operation and their remedies.

(3) Familiarity with The Use of Various Tools Used In Mechanical Engineering Workshop:

Marking & Measuring:

Steel rule, surface gauge, marking block, protractor, trysquare, scriber, punches, divider and callipers, surface plate, V. block, gauges- (screw, pitch, radius, feeler), Vernier callipers, Micrometer, Vernier height and depth gauge, use of dialgauge.

Holding Tools:

Vices (Bench, leg and hand vice), clamps tongs, pliers,

Cutting Tools:

Hack saw (Fixed and Adjustable framce), chisels-flat, cross cut, diamond, round nose.

Files:

According to section-Knife edge, Flat, Triangular round, Square, Half round,

According to grade - Rough, Bastard, Second cut, Smooth and Dead smooth,

Drills and Allied Tools:

Parallel and taper shank Twist drill,

Thread Cutting Tools:

Taps and Dies,

Miscellaneous Tools:

Wrenches, Keys, Spanners, Pliers, Screw drivers their specification and many others which have not been named for use in various shops. They should be shown physically to each student for familiarity.

4. PROTECTION OF FABRICATED STRUCTURES FROM WEATHER:

1. PAINTING:

Its need, Introduction to methods of paintings (Classification only); Manual, Machine (spray) and dip painting at room temperature, operations involved- description of steps only eg. surface preparation method for old and new surface in timber and iron structure-sanding, derusting, degreasing, filling of pore and dents, paint application- manual, machine (spray and dip painting drying of paint air drying and oven drying under coat and filler material (red oxide, putty, yellow clay), surface preparation materials (sand and emery papers); tools and equipments used (Name, size specification for indication).

Brushes-Round and flat wire brush, scraper, trowel , spray gun, compressor.

Defects likely to occur in painting and their remedies

Safety of Personnel, Equipment & Tools to be observed.

2. VARNISHING & POLISHING:

Its need operation involved (description of step only), surface preparation method of old and new articles, application of polishing materials, materials used for preparation of french and spirit polish, copal varnish. Defects likely to occur.

Safety of Personnel, Equipment & Tools to be observed.

5. FOUNDRY WORK:

Elementary idea of patterns, Types of moulds, sand and green

sand moulds and moulding, tools and equipment used in green sand moulding.

6. MACHINE SHOP:

Introduction to machine tools viz lathe, drilling machine, shaper and planer simple line and block diagram of components and their functions. Brief concept of NC and CNC machines.

2.5 WORKSHOP PRACTICE

[Common with Civil Engg., Civil Engg. (sp. in Rural Engg.), Electrical, Ceramic, Dairy, Agriculture, Chemical Technology (Rubber & Plastic), Chemical Technology (fertilizer), Four year chemical Engg.]

[Four year Past time Mechanical Engg. (sp. in Production Engg.)]

L T P
- - 14

Rationale

A diploma holder in any branch of engineering has to work in between a skilled workman and an Engineer. In order to have effective control over skilled workmen it is necessary that the supervisory staff must have adequate knowledge and skill. For development of skills workshop practice is very essential.

| Sl.No. | Units | Coverage Time | | |
|--------|-----------------------------------------|---------------|---|-----|
| | | L | T | P |
| 1. | Carpentry shop | - | - | 20 |
| 2. | Painting & polishing shop | - | - | 16 |
| 3. | Sheet metal and soldering shop | - | - | 56 |
| 4. | Fitting shop, Plumbing & Fastening Shop | - | - | 24 |
| 5. | Foundry shop | | | 20 |
| 6. | Smithy shop | - | - | 24 |
| 7. | Welding shop | - | - | 20 |
| 8. | Machine shop | - | - | 16 |
| | | - | - | 196 |

DETAILED CONTENTS

1. Carpentry Shop :
 - EX-1 Introduction & demonstration of tools used in carpentry shop and different types of joints, types of wood, seasoning and preservation of wood
 - EX-2 Planing and sawing practice
 - EX-3 Making of lap joint
 - EX-4 Making of mortise and tenon joint
 - Ex-5 Making of any one utility article such as wooden-picture frame, hanger, peg, name plate, etc.
2. Painting and Polishing Shop:
 - EX-1 Introduction of paints, varnishes, Reason for surface preparation, Advantage of painting, other method of surface coating i.e. electroplating etc.
 - EX-2 To prepare a wooden surface for painting apply primer

on one side and to paint the same side. To prepare french polish for wooden surface and polish the other side.

Ex-3 To prepare metal surface for painting, apply primer and paint the same.

EX-4 To prepare a metal surface for spray painting, first spray primer and paint the same by spray painting gun and compressor system.

* The sequence of polishing will be as below:

- i) Abrasive cutting by leather wheel.
- ii) Polishing with hard cotton wheel and with polishing material.
- iii) Buffing with cotton wheel or buff wheel.

3. Sheet Metal and Soldering Shop :

EX-1 Introduction and Types of sheets, measuring of sheets

EX-2 Study and sketch of various types of stakes/anvil.

EX-3 Introduction & demonstration of tools used in Sheet metal working shop.

EX-4 Cutting, shearing and bending of sheet.

EX-5 To prepare a soap case by the metal sheet.

EX-6 To make a funnel with thin sheet and to solder the seam of the same.

EX-7 To make a cylinder and to solder the same.

EX-8 Preparation of different type of joints such as Lap joint-single seam, double seam. Hemp and wired joints.

EX-9 To braze small tube/conduit joints.

4. Fitting Shop, Plumbing Shop & Fastening Shop:

EX-1 Study of materials, limits, fits and tolerances.

EX-2 Introduction & demonstration of tools used in Fitting Shop.

EX-3 Hacksawing and chipping of M.S. flat. Filing and squaring of chipped M.S. job. Filing on square or rectangular M.S. piece.

EX-4 Making bolt & nut by tap and die set and make its joints

EX-5 To drill a hole in M.S. Plate and tapping the same to create threads as per need.

EX-6 Utility article-to prepare double open mouth spanner for 18" hexagonal head of a bolt.

EX-7 Cutting and threading practice for using socket, elbow and tee etc. and to fit it on wooden practice board.

EX-8 Study of-bib cock, cistern or stop cock, wheel valve and gate valve etc.

EX-9 Practice of bolted joints

EX-10 To prepare a rivetted joint

EX-11 To make a pipe joint

- EX-12 To make a threaded joint
- EX-13 Practice of sleeve joint

5. Foundry Work

- Ex-1 Study of metal and non metals
- Ex-2 Study & sketch of the foundry tools.
- Ex-3 Study & sketch of cupula & pit furnace.
- Ex-4 To prepare the green moulding sand and to prepare moulds (single piece and double piece pattern sweep mould)
- Ex-5 Casting of non ferrous (lead or aluminium) as per exercise 3.

6. Smithy Shop :

- EX-1 Study & Sketch of Tools used in smithy shop.
- EX-2 To prepare square or rectangular piece by the M.S. rod.
- EX-3 To make a ring with hook for wooden doors.
- EX-4 Utility article-to prepare a ceiling fan hook.

7. Welding Shop :

- EX-1 Introduction to welding, classification of welding, types of weld joints.
- EX-2 Welding practice-gas and electric.
- EX-3 Welding for lap joint after preparing the edge.
- EX-4 Welding of Butt joint after preparation of the edge.
- EX-5 'T' joint welding after preparation of edge.
- EX-6 Spot welding, by spot welding machine.

8. Machine Shop

- EX-1 Study & sketch of lathe machine.
- EX-1 Study & sketch of grinders, milling M/c, Drilling M/c and CNC Machines
- Ex-2 Plain and step turning & knurling practice.
- Ex-3 Study and sketch of planing/Shaping machine and to plane a Rectangle of cast iron.

2.6 FIELD EXPOSURE-1

The purpose of this course is to train the students to learn working in factory situations under supervision of factory staff and polytechnic staff. The whole department faculty should be deputed for this purpose.

Head of faculty should procure seats for giving summer training for students with the assistance of Director, Board of Apprenticeship Training.

A small project like study of material handling system,

Plant layout study, Inventory control, Work study, Process control rejection and rework study, Inspection system and Quality control, etc. may be allotted.

III Semester

3.1 APPLIED MATHEMATICS II

[Common to All Engineering Courses]

| L | T | P |
|---|---|---|
| 5 | 2 | - |

Rationale :

The study of mathematics is an important requirement for the understanding and development of concepts of Engg. The purpose of teaching mathematics to the Diploma Engg. students is to give them basic foundation and understanding of mathematics so that they can use the same for the understanding of engineering subjects and their advancements.

| Sl.No. | Units | Coverage Time | | |
|--------|--------------------------|---------------|----|---|
| | | L | T | P |
| 1. | Matrices | 16 | 6 | - |
| 2. | Differential Calculus | 15 | 6 | - |
| 2. | Differential Equations | 15 | 6 | - |
| 4. | Integral Calculus | 12 | 5 | - |
| 5. | Probability & Statistics | 12 | 5 | - |
| | | 70 | 28 | - |

DETAILED CONTENTS

1. MATRICES : (12 Marks)

1.1 Algebra of Matrices, Inverse :

Addition, Multiplication of matrices, Null matrix and a unit matrix, Square matrix, Symmetric, Skew symmetric, Hermitian, Skew hermitian, Orthogonal, Unitary, diagonal and Triangular matrix, Determinant of a matrix.

Definition and Computation of inverse of a matrix.

1.2 Elementary Row/Column Transformation :

Meaning and use in computing inverse and rank of a matrix.

1.3 Linear Dependence, Rank of a Matrix :

Linear dependence/independence of vectors, Definition and computation of a rank of matrix. Computing rank through determinants, Elementary row transformation and through the concept of a set of independent vectors, Consistency of equations.

1.4 Eigen Pairs, Cayley-Hamilton Theorem :

Definition and evaluation of eigen values and eigen vectors of a matrix of order two and three, Cayley-Hamilton theorem

(without Proof) and its verification, Use in finding inverse and powers of a matrix.

2. DIFFERENTIAL CALCULUS :(10 Marks)

2.1 Function of two variables, identification of surfaces in space, conicoids

2.2 Partial Differentiation :

Directional derivative, Gradient, Use of gradient f , Partial derivatives, Chain rule, Higher order derivatives, Eulens theorem for homogeneous functions, Jacobians.

2.3 Vector Calculus :

Vector function, Introduction to double and triple integral, differentiation and integration of vector functions, gradient, divergence and curl, differential derivatives.

3. DIFFERENTIAL EQUATION :(10 Marks)

3.1 Formation, Order, Degree, Types, Solution :

Formation of differential equations through physical, geometrical, mechanical and electrical considerations, Order, Degree of a differential equation, Linear, Nonlinear equation.

3.2 First Order Equations :

Variable seperable, equations reducible to seperable forms, Homogeneous equtions, equtions reducible to homogeneous forms, Linear and Bernoulli form exact equation and their solutions.

3.3 Higher Order Linear Equation :

Property of solution, Linear differential equation with constant coefficients (PI for $X=e^{ax}$, $\sin ax$, $\cos ax$, X^n , $e^{ax}V$, XV).

3.4 Simple Applications :

LCR circuit, Motion under gravity, Newton's law of cooling, radioactive decay, Population growth, Force vibration of a mass point attached to spring with and without damping effect. Equivalence of electrical and mechanical system

4. INTEGRAL CALCULUS - II: (12 Marks)

4.1 Beta and Gamma Functions :

Definition, Use, Relation between the two, their use in evaluating integrals.

4.2 Fourier Series :

Fourier series of $f(x)$, $-n < x < n$, Odd and even function, Half range series.

4.3 Laplace Transform :

Definition, Basic theorem and properties, Unit step and Periodic functions, inverse laplace transform, Solution of ordinary differential equations.

5. PROBABILITY AND STATISTICS :(6 Marks)

5.1 Probability :

Introduction, Addition and Multiplication theorem and simple problem.

5.2 Distribution :

Discrete and continuous distribution, Binomial Distribution, Poisson Distribution, Normal Distribution..

3.2 METROLOGY AND MEASURING INSTRUMENTS

[Common to Three years Diploma Course in Mech Engg.]

L T P
5 2 4

Rationale:

Measuring is the very basis of every decision making activity. How should we measure is a matter of still more importance. Metrology is the philosophy of subject and measuring instruments are means. Both are equally important for engineer's at every stage of their work pursuit. The paper aims to enable the student to envisage such aspects of the job at hand.

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Units | Coverage Time | | |
|--------|------------------------------------------------------|---------------|----|----|
| | | L | T | P |
| 1. | Introduction | 5 | 2 | - |
| 2. | Principle & Classifications of Measuring Instruments | 9 | 3 | - |
| 3. | Transducers | 5 | 2 | - |
| 4. | Comparators | 9 | 3 | - |
| 5. | Surface Finish | 6 | 2 | - |
| 6. | Various Types of Instruments Used For | 12 | 5 | - |
| | i. a. Physical Measurement | | | |
| | b. Liquid Level & Viscosity | | | |
| | ii. Mechanical Quantities | | | |
| 7. | Temperature Measurement | 5 | 2 | - |
| 8. | Special Measuring Devices | 5 | 2 | - |
| 9. | Measurement of Vibrations | 5 | 2 | - |
| 10. | Inspection of Geometrical Errors | 9 | 3 | - |
| | | 75 | 28 | 56 |

DETAILED CONTENTS

1. INTRODUCTION:

Meaning and scope of metrology in field of engineering. standards and types of measurements (Line and Wave length, Primary, Secondary and Tertiary measurement concept only). Limits, Fits and Tolerances. Interchangeability, precision and accuracy, Sources of error.

2. PRINCIPLES AND CLASSIFICATIONS OF MEASURING INSTRUMENTS:

(A) Principle of Mechanical Measuring Instruments:

Lever method, vernier method, screw and screwnut method, compound gearing and helical spring methods.

(B) Principles of Optical Instruments:

Reflection, Refraction, Interference, Polarisation, Optical prisms, Lenses and Optical projection (Magnification)

(C) Principle of Electrical measuring instruments

(D) Principle of Hydraulic and Pneumatic Instruments.

3. TRANSDUCERS:

Definition, various types of transducers such as resistive, capacitive, inductive, electromagnetic, photo electric, piezo electric and their use in instrumentation.

4. COMPARATORS:

General principles of constructions, balancing and graduation of measuring instruments, characteristics of comparators, use of comparators, difference between comparators, limit gauges and measuring instruments. Classification of comparators, construction and working of dial indicator, johanssen "Mikrokator", read type mechanical comparator, mechanical-optical, zeiss optotest, electro limit, electromechanical, electronics, pneumatic comparators, gauges, tool makers microscope.

5. SURFACE FINISH:

Geometrical characteristics of surface roughness- Wavyness.

Lay, flaws. Effect of surface quality on its functional properties. Factor affecting the surface finish. Drafting symbols for surface roughness. Evaluation of surface finish. RMS and CLA values. Methods of measuring surface roughness. Qualitative and quantitative methods. Comparison of surfaces produced by common production methods.

6 VARIOUS TYPES OF INSTRUMENTS USED FOR:

(i) (a) Physical Measurements such as - Length, Depth height, Thickness, Gaps, Curvature, Angle, Taper, Area, Undulations, Surface finish, Thread and Gear measurement.

(b) Liquid Level & Viscosity - Liquid level measuring methods and devices Viscometer - Plate and Cone viscometer, Two float viscometer, Rheo viscometer.

(ii) Mechanical Quantities:

(a) Displacement, velocity, acceleration, speed, torque-Use of transducers and electronic counters, stroboscope, vibrating reeds and techno meters.

(b) Pressure and Vacuum - Idea of atmospheric pressure, Gauge pressure and vacuum - Use of instruments such as manometers and pressure gauge using elastic elements such as diaphragm, Capsule, Bellows, Bourdon tube and various transducers and thermo couple, vacuum gauges.

(c) Strain circularity (By dial gauge and telerod). Gauge - Use of strain gauge and load cells.

7. TEMPERATURE MEASUREMENT:

Various types of thermometers, thermocouples, pyrometers (Radiation and optical type both).

8. SPECIAL MEASURING DEVICES:

Computerized 3-D measuring machine (Working Only).

9. MEASUREMENT OF VIBRATIONS:

Use of seismic Accelerometer, Potentio metric type and L. V. D. T. type, piezoelectric type accelerometer.

10. INSPECTION OF GEOMETRICAL ERRORS:

Construction and working of auto collimeter, checking of straightness, flatness, squareness and parallelism,

METROLOGY LAB

1. Measurement of angle with the help of sine bar/vernier Bevel protractor.
2. Study and sketch of various types of optical projectors.
3. Use of comparators for measurement
4. To measure the diameter of a hole with the help of precision balls.
5. Measurement of Taper by standard balls and rollers.
6. To test the squareness of a component with autocollimeter.
7. To measure the pitch, angle and form of thread of a screw.
8. Measurement of gear elements by using gear tooth vernier.
9. To measure the straightness of the edge of a component with the help of autocollimeter.
10. Use of linear measuring instrument such as vernier calliper and micrometer.
11. Use of height gauge and vernier callipers.
12. Calibration of vernier callipers/micrometers with slip gauge.
13. Calibration of height gauge/depth gauge with slip gauge.
14. Measurement of Thread Parameter by using tool maker's microscope.
15. Use of slip gauge in measurement of centre distance between two pin.
16. Checking of accuracy of a plug gauge with micrometer.
17. Measurement of surface roughness of a surface.
18. Use of feeler, wire, radius and fillet gauges for checking of standard parameters.

NOTE:

Institute is at liberty to develop and conduct practical according to availability of items to be measured by the instrument. Every year the items to be measured, shall be changed to perform practical so that the repetition may be avoided. The student shall conduct and tabulate the experiments individually and teachers will evaluate each student.

3.3 HYDRAULIC AND PNEUMATIC SYSTEMS

L T P

5 2 4

RATIONALE

The diploma holders are supposed to have knowledge of hydraulic and pneumatic systems. Hence this subject has been introduced.

DETAILED CONTENT

1. Introduction

Properties of liquid, intensity of pressure, pressure head, centre of pressure, total pressure on vertical and inclined flat surfaces. Gauge pressure and absolute pressure, atmospheric pressure, vacuum differential pressure with simple problems. Classification of fluids
Pascals Law and its simple numerical problems.

(6 hrs)

2. Pressure Measurement

Measurement of pressure by piezometer tube, manometer, inclined manometer, differential manometer, inverted differential manometer, simple problems, bourdon's pressure gauge. Pressure gauge calibration.

(6 hrs)

3. Flow Measurement

Types of flow, total energy, velocity head, pressure head, potential head, measurement of velocity, Bernoulli's theorem, Continuity equation, applications of Bernoulli's theorem, simple problems.

(8 hrs)

4. Flow Through Orifices

Types of orifices, jet of water, vena contracta. Hydraulic coefficients, relation between C , C_v and C_d . Time for emptying a tank.

(4 hrs)

5. Flow Through Pipes

Minor and Major losses, darcy's equation, chezy's equation (Without proof), simple problems.

(6 hrs)

6. Pumps

Study of Pumps. Reciprocating and Centrifugal.

(4 hrs)

7. Hydraulic Circuits

Study of construction of elements of hydraulic power pack such as

(4 hrs)

hydraulic pump, filter & reservoir, cooler, heater, oil level gauge & temperature gauge.

8. Pneumatic Systems

Comparison of pneumatics with fluids, elements of pneumatic system, types of compressors- reciprocating, rotary. Selection of compressor.

Air receivers. Industrial applications of pneumatics. Air filters, pressure regulator, and lubricators. Pneumatic valves- direction control valve, pilot operated valve. Pneumatic actuators. Pneumatic tools- rotary, piston type, hammer type.
(10 hrs)

HYDRAULIC AND PNEUMATIC LAB

LIST OF PRACTICALS

1. Study of piezometer tube, manometer and pressure gauge and its calibration.
2. To verify Bernoullie's Theorem.
3. To find coefficient of discharge for a venturimeter.
4. To determine coefficient of contraction, coefficient of velocity and coefficient of discharge for a given orifice.
5. Study of following equipment with a view to illustrate its constructional details, common problems and their remedies.
 - a. Centrifugal pumps
 - b. Single acting reciprocating pump
 - c. Hydraulic jack
6. Study of hydraulic circuit in general and its application on a surface grinder.
7. To study pneumatic circuit of any available machine or of Pneumatic brake of a vehicle.
8. To find the velocity of water flowing through pipe and also calculate the major head loss due to friction.

3.4 MATERIALS AND METALLURGY

L T P

4 2 4

RATIONALE

Materials play an important role in the construction and manufacturing of equipment/tools. Right selection of materials add to the economy, working and life of machinery. A diploma holder must be conversant with the properties, uses, availability and costs of materials used for construction/fabrication to enable him to perform his functions confidently. The subject of Materials and Metallurgy has been designed to cover the above aspects.

DETAILED CONTENTS

1. Importance of Materials

Classification: Metals and non-metals, Ferrous and non-ferrous metals and their alloys

Names of common metals, their alloys and non-metals used in Industry

Properties of metals and alloys

Physical properties - Appearance, luster, colour, density and melting point

Mechanical Properties: Strength, stiffness, elasticity, plasticity, toughness, ductility, malleability, brittleness, hardness, fatigue and creep.

Thermal and electrical conductivity

Corrosion, causes, effects and prevention.

(4 hrs)

2. Metallurgical Considerations

Solidification of metals from liquid to solid state of pure metals, cooling curves of pure metals, dendritic solidification, crystal formation, types of crystal structure. Phase diagram of:

(i)

Solid-state solubility.

(ii)

Partial solubility.

(iii)

Nil solubility i.e. eutectic solution (Binary only). Effects of all alloying elements on engineering materials. Effect of grain size on mechanical properties.

(6 hrs)

3. Ferrous Metals and Alloys

Flow diagram for the production of ferrous metals from their ores, constituents of iron, iron carbon diagram.

Classification, composition and uses of cast iron and plain carbon steels. IS, BS and SAE Grades

Effect of alloying elements such as Aluminium, chromium, Nickel, Cobalt, Manganese, Molybdenum, tungsten, Vanadium, Silicon,

Sulphur and Phosphorous on steels.

Composition, properties, grades and uses of special steels such as High speed steel, Stainless steels, Silicon steels, Heat resistant steels, Spring steel.

Heat treatment: Iron-carbon diagram, objectives and practical aspects of Heat treatment. Brief description and uses with examples of principal Heat treatment processes, Annealing, Normalizing, Tempering, Hardening, Carburising, Nitriding and Cyaniding and applications. Examples in heat-treating engineering components time, temperature transformation curve.

(12 hrs)

4. Non-ferrous Metals and Alloys

Copper: Properties and uses

Composition, properties and uses of copper alloys.

Brasses: Cartridge brass, Nickel silver.

Bronzes: Phosphor bronze, Al-bronze, Mn-bronze, and Gun metal.

Properties and uses of Aluminium.

Composition, properties and uses of Al-alloys e.g., Duralumin, Yellow metal, Magnalium and Hindalium

Properties and uses of alloys of lead, tin and magnesium.

Bearing Metals: Requisite qualities. Composition, properties and uses of white metal bearing, copper based bearing metals. Aluminium based bearing metals. Use of nylon/PTFE for bushes/bearings, bi-metallic and tri-metallic bushes

(12 hrs)

5. Identification and Examination of Metals and Alloys

Identification tests - Appearance, sound, filing, weight, magnetic, spark, bend and microstructure. Different types of etchants for preparation of surface structure.

(1 hrs)

6. Other Important Materials

Heat insulating materials: Properties and uses of asbestos, glass wool, thermocole, cork, mica.

Electrical insulating materials. Properties and uses of china clay, leather, bakelite, ebonite, glass wool, rubber, felt.

Sound insulating materials: Cork, fibre boards.

Fabrication materials: Wood, plywood, rubber - natural and synthetic, Glass - plate glass, toughened glass, safety glass.

Refractory materials: General characteristics and uses of dolomite, ceramics.

Protective coating materials: Paints, primers, varnishes, enamels, putti, electroplating materials, rubasil, teflon coating.

Sealant and adhesives - Application and availability of sealant and adhesives for industrial user.

(10 hrs)

7. Selection, specifications and commercial availability of materials

Practical considerations for selection of material for different purposes
ISO/Bureau of Indian standard specifications for metals, non-metals,
various components and materials.

(3 hrs)

MATERIALS AND METALLURGY LAB

LIST OF PRACTICALS

1. Classification of about 25 specimen of materials/parts in material lab, identify and indicate the type of materials with respect to their properties
2. Study of metallurgical microscope.
3. To prepare microscopic structure for examination and to examine the micro structure of specimens of various metals and alloys.
4. Study of heat treatment furnaces.
5. To study the effects of heat treatments processes on the following materials:
 - (i) Low carbon steel
 - (ii) Mild steel
 - (iii) High Carbon Steel

IV Semester

4.1 Functional Communication

| | | |
|---|---|---|
| L | T | P |
| 4 | - | - |

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Units | Coverage Time | | |
|--------------------------|------------------------------|---------------|---|---|
| | | L | T | P |
| Section A English | | | | |
| 1. | On Communication | 04 | - | - |
| 2. | Exploring Space | 04 | - | - |
| 3. | Sir C.V. Raman | 04 | - | - |
| 4. | Professional Development | 04 | - | - |
| 5. | Buying a Second Hand Bicycle | 04 | - | - |
| 6. | Leadership and Supervision | 04 | - | - |
| 7. | First Aid | 03 | - | - |
| 8. | The Romanance of Reading | 03 | - | - |
| 9. | No Escape from Computers | 03 | - | - |
| 10. | Bureau of Indian Standards | 03 | - | - |
| Section B Hindi | | | | |
| 1. | Topic 1 | 02 | - | - |
| 2. | Topic 2 | 02 | - | - |
| 3. | Topic 3 | 02 | - | - |
| 4. | Topic 4 | 02 | - | - |
| 5. | Topic 5 | 02 | - | - |
| 6. | Topic 6 | 02 | - | - |
| 7. | Topic 7 | 02 | - | - |
| 8. | Topic 8 | 01 | - | - |
| 9. | Topic 9 | 02 | - | - |
| 10. | Topic 10 | 02 | - | - |
| 11. | Topic 11 | 01 | - | - |
| | | 56 | - | - |

Section "A" (English)

Text Lessons

| | |
|----------|-----------------------------------------|
| Unit I. | On Communication |
| Unit.II | Exploring Space |
| Unit.III | Sir C.V. Raman |
| Unit.IV | Professional Development of Technicians |
| Unit.V | Buying a Second Hand Bicycle |
| Unit.VI | Leadership and Supervision |
| Unit.VII | First Aid |

| | |
|-----------|----------------------------|
| Unit.VIII | The Romanance of Reading |
| Unit.IX | No Escape from Computers |
| Unit.X | Bureau of Indian Standards |

Section "B" Hindi

- 1- स्वरोजगार
- 2- भारतीय वैज्ञानिकों एवं तकनीकियों का भारत के विकास में योगदान
- 3- ग्राम्य विकास
- 4- परिवार नियोजन
- 5- सामाजिक संस्थायें
- 6- नियोजन और जन कल्याण
- 7- भारत में प्रौद्योगिकी के विकास का इतिहास
- 8- हरित क्रान्ति
- 9- पर्यावरण एवं मानव प्रदूषण
- 10- श्रमिक कल्याण
- 11- भारत में श्रमिक आन्दोलन

4.2 BASICS OF INFORMATION TECHNOLOGY

L T P

2 - 5

RATIONALE

Information technology has great influence on all aspects of life. Almost all work places and living environment are being computerized. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; use of various tools of MS office; using internet etc. form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

Note:

1. *Teaching of theory should be dovetailed with practical work*
2. *The following topics may be taught in the laboratory along with the practical exercises.*

DETAILED CONTENTS

Relevant Instructions for Practical's

1. Information Technology – its concept and scope
2. Computers for information storage, information seeking, information processing and information transmission
3. Elements of computer system, computer hardware and software; data – numeric data, alpha numeric data; contents of a program, processing
4. Computer organization, block diagram of a computer, CPU, memory
5. Input devices; keyboard, mouse etc; output devices; VDU and Printer, Scanner, Plotter
6. Electrical requirements, inter-connections between units, connectors and cables
7. Secondary storage; magnetic disks – tracks and sectors, optical disk (CD and DVD Memory), primary and secondary memory: RAM, ROM, PROM etc.,

Capacity; device controllers, serial port, parallel port, system bus

8. Exercises on file opening and closing; memory management; device management and input – output (I/O) management with respect of windows
9. Installation concept and precautions to be observed while installing the system and software
10. Introduction about Operating Systems such as MS-DOS and Windows
11. Special features, various commands of MS word and MS-Excel
12. About the internet – server types, connectivity (TCP/IP, shell); applications of internet like: e-mail and browsing
13. Various Browsers like WWW (World wide web); hyperlinks; HTTP (Hyper Text Transfer Protocol); FTP (File Transfer Protocol)
14. Basics of Networking – LAN, WAN, Topologies

LIST OF PRACTICALS

1. Given a PC, name its various components and list their functions
2. Identification of various parts of a computer and peripherals
3. Practice in installing a computer system by giving connection and loading the system software and application software
4. Installation of DOS and simple exercises on TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP commands
5. Exercises on entering text and data (Typing Practice)
6. Installation of Windows 2000 or XP etc.
Features of Windows as an operating system
 - Start
 - Shutdown and restore
 - Creating and operating on the icons
 - Opening closing and sizing the windows
 - Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file
 - Creating and operating on a folder
 - Changing setting like, date, time color (back ground and fore ground)
 - Using short cuts
- Using on line help
7. MS-WORD
 - File Management:
Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, Giving password protection for a file
 - Page Set up:
Setting margins, tab setting, ruler, indenting
 - Editing a document:
Entering text, Cut, copy, paste using tool- bars
 - Formatting a document:
Using different fonts, changing font size and colour, changing the appearance through bold/ italic/ underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
 - Aligning of text in a document, justification of document ,Inserting bullets and numbering
 - Formatting paragraph, inserting page breaks and column breaks
 - Use of headers, footers: Inserting footnote, end note, use of comments
 - Inserting date, time, special symbols, importing graphic images, drawing tools
 - Tables and Borders:
Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table
 - Print preview, zoom, page set up, printing options

- Using Find, Replace options
- Using Tools like: Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelopes and labels
- Using shapes and drawing toolbar,
- Working with more than one window in MS Word,
- How to change the version of the document from one window OS to another

- Conversion between different text editors, software and MS word

8. MS-EXCEL

- Starting excel, open worksheet, enter, edit, data, formulas to calculate values, format data, create chart, printing chart, save worksheet, switching from another spread sheet

- Menu commands:

create, format charts, organise, manage data, solving problem by analyzing data, exchange with other applications. Programming with MS Excel, getting information while working

- Work books:

Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations, working with arrays

- Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet

- Creating a chart:

Working with chart types, changing data in chart, formatting a chart, use chart to analyze data

- Using a list to organize data, sorting and filtering data in list

- Retrieve data with MS – query: Create a pivot table, customising a pivot table. Statistical analysis of data

- Customise MS-Excel:

How to change view of worksheet, outlining a worksheet, customise workspace, using templates to create default workbooks, protecting work book

- Exchange data with other application: linking and embedding, embedding objects, linking to other applications, import, export document.

9. Internet and its Applications

- a) Log-in to internet

- b) Navigation for information seeking on internet

- c) Browsing and down loading of information from internet

- d) Sending and receiving e-mail

- Creating a message

- Creating an address book

- Attaching a file with e-mail message
- Receiving a message
- Deleting a message

4.3 ELECTRICAL TECHNOLOGY & ELECTRONICS

(Common With Mech. Engg., Dairy Engineering)

| | | |
|---|---|---|
| L | T | P |
| 5 | - | - |

Rationale :

The superiority of electricity as power over other means in use in home or industry can not be denied. So it is imperative to introduce the mechanical engineering students with electrical machines and their various uses.

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Units | Coverage Time | | |
|--------|-------------------------------------|---------------|---|---|
| | | L | T | P |
| 1. | Electric Induction | 4 | - | - |
| 2. | A. C. Theory | 6 | - | - |
| 3. | Three Phase Circuits | 6 | - | - |
| 4. | Measurement & Measuring Instruments | 12 | - | - |
| 5. | Electronics | 8 | - | - |
| 6. | D. C. Machines | 8 | - | - |
| 7. | Transformers | 6 | - | - |
| 8. | Synchronous Machines | 6 | - | - |
| 9. | Induction Motors | 6 | - | - |
| 10. | Electro Heating | 4 | - | - |
| 11. | Electro Plating | 4 | - | - |
| | | 70 | - | - |

DETAILED CONTENTS

1. ELECTRIC INDUCTION:

Faraday's Laws of electromagnetic induction. Self and mutual induction. Statically and dynamically induced e.m.f., Lenz's law. Fleming's left hand and right hand rule.

2. A. C. THEORY:

Production of alternating e.m.f. Definition of cycle, Frequency, Amplitude, Time period, Instantaneous, Average, R.M.S. maximum values of sinusoidal wave. Form factor, peak factor.

Representation of a sinusoidal quantity by a mathematical expression and phasor, phase and phase difference, Relationship of voltage and current for pure resistance, pure inductance and pure capacitive reactance, impedance. Solution and phasor diagrams of simple R.L.C. series and parallel circuits. Active and reactive power. Significance of P.F.

3. THREE PHASE CIRCUITS:

Production of Three phase voltage, advantages of three phase supply. Concept of star and delta connections. Relationship between phase and line values of currents and voltages, Power in three phase circuits, simple numerical problems.

4. MEASUREMENT & MEASURING INSTRUMENTS:

(i) Primary and secondary instruments—Indicating, Recording and Integrated instruments.

(ii) Working principle and construction of the following instruments.

(a) Ammeter & Voltmeter (Moving coil & Moving Iron).

Extension of their ranges.

(b) Dynamometer type wattmeter.

(c) Single Phase A. C. Energy Meter.

(iii) Measurement of power in a single phase and three phase circuits by wattmeter, Use of digital multimeter for measurement of voltage, Current and testing of devices.

5. ELECTRONICS:

Basic idea of semi conductors P & N type. Semi conductor diodes, Zener diodes and their applications in rectifiers. Transistors-PNP and NPN-their characteristics and uses at an amplifier (Brief description only). Principle characteristics and application of SCR. Devices like UJT, FET, DIAC, TRIAC (Brief introduction, Introduction to operational amplifier, Introduction to basic logic gates and microprocessors.

6. D. C. MACHINES

D. C. Generator:

Working principle, Constructional details, e.m.f. equation, Types of generators and their applications.

D. C. Motor:

Working principle, Back e.m.f., Types of D. C. motor and elementary idea of their characteristics. Torque equation, Methods of speed control (Description Only).

7. TRANSFORMERS:

Working principle and constructional details of a single

phase and 3 phase transformers, e.m.f. equation, Losses and efficiency, Cooling of transformers, Elementary idea of auto transformers and welding transformers.

8. SYNCHRONOUS MACHINES:

(a) Alternators:

Working principle, Types of alternators, Constructional details, E.M.F. equation, Condition for parallel operation.

(b) Synchronous Motors:

Working principle, Constructional details, Vector diagram, Effect of excitation on armature current and power factor, Synchronous condenser.

9. INDUCTION MOTORS:

(a) Three Phase Induction Motors:

Working principle and constructional details—Types of induction motors—Slipring and Squirrel cage. Slip in induction motors. Speed torque characteristic, starting and speed control. Application of induction motors in industry. General faults and their remedies.

(b) Single Phase Induction Motors:

Working principle and constructional details and application of single phase motors (Split phase, Capacitor start and Run Motor). A. C. Series motors, General faults and their remedies.

10. ELECTRO HEATING:

Types of electro heating. Brief description of resistance ovens and induction furnace and core furnaces.

11. ELECTROPLATING:

Importance of electroplating, Principle of electroplating and equipment used. Processes used in electroplating, Anodizing.

4. 4 PLASTIC MATERIALS

L T P

7 - -

RATIONALE

This subject gives a detailed description of polymeric materials in category of thermoplastics, thermosets and thermoplastic elastomers. The students acquires the knowledge of advanced engineering and speciality polymers so that he/she can select the right type of materials for processing to make the product.

DETAILED CONTENTS

1. Genral Purpose Thermoplastics:
Polyolefines:LDPE, LLDPE, HDPE, PP, EVA, UHMHDPE.
Styrene Plastics:Polystyrene,high impact polystyrene,ABS,SAN and PAN.
Vinyl Polymer: PVC,PVDC.
2. Engineering thermoplastics – poly carbonates, polyamides, PEEK, poly phenylene oxide, acetals,Nylons:Nylon6,Nylon66,Polycarbonate,Polyacetol,PET and PBT,PPS, PPO,Polysulphone,PMMA,Polyurethanes.
3. Thermoset Materials: PF,UF,MF,EPOXY, ALKIA,POLY-ESTER
(8 hrs)
4. Reinforced plastics – principles of composite reinforcement, effect of reinforcement on strength of plastics. Role and nature of binders and coupling agents, properties and applications of fibres in reinforcement (glass and carbon). Miscellaneous fillers (Talc, mica, glass beads).
Properties and applications of FRPs
(10 hrs)
5. Polyblends and alloys – Definition, advantages of polymers, blends and alloys, role of composition, properties and applications of parameters for compability, PVC – Nitrile rubber, ABS-PVC and PP-EPDM
(6 hrs)
6. High performance polymers – polytetrafluroethylene, (Teflon), polysulphones, liquid crystalline polymers
(8 hrs)
7. Preliminary concept of new materials such as conducting polymers, biopolymers, onto-electronic plastics, nano-polymeric materials and plastics in biomedical applications, interpenetrating polymer networks, polymer concretes
(10 hrs)

4. 5 PLASTICS PROCESSING TECHNIQUES -I

L T P
4 1 4

RATIONALE

The purpose of this subject is to equip the students with the knowledge of processes utilized in extrusion and blow moulding. This subject develops the competence of the students in major industrially practiced processing techniques.

DETAILED CONTENTS

a) INJECTION

Basic concept of injection moulding: Hand injection, Semiautomatic injection (vertical and horizontal) and features of machine.

Automatic injection moulding machine: Various machine parts like; hopper, screw, barrel, heating devices, clamping unit etc. Injection moulding process and process control, machine parameter, shot capacity, injection pressure, injection speed, day light, limit switch etc., Basic concept of injection cycle, machine control, microprocessor controlled injection moulding, open loop and close loop control, multi colour injection moulding, gas assisted injection moulding, isotactic moulding, faults and remedies in injection moulding process like: Shrinkage, shrink mark, weld line parting line, flash etc.

b) EXTRUSION

1. Introduction

Introduction to extrusion process, different types of extruders:- single screw and twin screw extruder, vented barrel extruder, general principles of operation, die swell, function of various parts i.e. barrel, screw, screenpack, die, breaker plate, adaptor. (6 hrs)

2. Types of screws in use for processing different plastics, Feed, Compression and Metering zone, Die zone, L/D ratio and its significance. (3 hrs)

3. Nip rolls, Irishring, bubble casing, winding equipment, cutting devices, stretching and orientation. (3 hrs)

4. Extruder performance and their curves, faults & remedies. (4 hrs)

5. Blown film extrusion, extrusion of pipes, wires and cables, sheets and Filaments. (8 hrs)

6. Co extrusion of films and sheets. (6 hrs)

7. Printing techniques – flexographic printing, gravure printing, pad printing, screen printing, hot stamping. (4 hrs)

8. Conversion of plastic films into laminate e.g. metal plastic laminates, paper- plastic laminates, plastic - plastic laminates. Advantages of multi-layer packaging, disadvantages of multi layer packaging. (4 hrs)

c) BLOW MOULDING

7. Basic principles of blow moulding, Types of blow moulding :-

- Extrusion blow moulding, injection blow moulding. Blow molding irregular containers. (8 hrs)
8. Materials for blow moulding. (2 hrs)
 9. Production of parison, a). by extrusion b). by injection. Parison wall thickness control, Parison blowing systems, air requirement for blowing, effect of process variables on product design and properties. Parison programming, mould venting. (8 hrs)
 10. Newer concepts including extrusion- stretch blow moulding, injection stretch blow moulding, multi layer moulding etc. (8 hrs)

PLASTICS PROCESSING TECHNIQUES -I LAB

LIST OF PRACTICALS

LIST OF PRACTICALS

- 1.To study the specification of extruder available in the lab
- 2.To produce pipe of different diameters on extruder
- 3.To study the specification of automatic Blow Moulding Machine
- 4.Production of component on hand operated blow molding machine, using at least 3 moulds
- 5.Production of components on semi automatic blow machine by setting the process parameters
- 6.To do gravure printing
- 7.To do printing with pad printing machines

4.6 DESIGN OF DIES AND MOULDS-I

L T P

4 1 3

RATIONALE

A diploma holder in plastic technology is engaged in manufacturing plastic components for which design of moulds and dies is essential. This subject will impart them requisite knowledge and skill in design of moulds and dies.

DETAILED CONTENTS

1. Basic concept of mould designing, shrinkage, flash line, taper and draft
(3 hrs)
2. Materials used for dies and moulds and their characteristics
(3 hrs)
3. General design considerations for various types of moulds
(3 hrs)
4. Machining methods - general introduction to lathe machine, grinder, shaper, milling, spark erosion, CNC wirecut
(5 hrs)
5. Impressions - Core and cavity. Types of cavity and core, their advantages and disadvantages. Bolster plate and its types, guide pillar, guide bush, register ring and their types. Mould clamping - direct, indirect
(6 hrs)
6. Parting surface - Types of parting surface, selection of parting surface
(5 hrs)
7. Feed system
 - Runners - Sprue, runners and its types, balancing of runners, size of runners
 - Gates - Types of gates, size of gates(12 hrs)
8. Ejection system - Ejector grid, ejector plate assembly
(11 hrs)
9. Cooling system - Cooling methods, cooling circuits for an integer and insert core cavity moulds e.g. U-type, rectangular and Z-type
(7 hrs)
10. Injection mould - Types of moulds; 2-plate mould, 3-plate mould, split mould, runnerless mould
(9 hrs)

DESIGN OF DIES AND MOULDS-I LAB
LIST OF PRACTICALS

1. To design and draw various mould parts
2. To design and draw a two plate injection mould
3. To design and draw a three plate injection mould
4. To design and draw a split mould
5. To design and draw a runner less mould
6. To design & draw unscrewing.

Note: Maximum 10 sheets will be prepared by the students

4.7 ENERGY CONSERVATION

L T P
3 - 2

RATIONALE

The requirement of energy has increased manifold in last two decades due to rapid urbanization and growth in industrial/service sector. It has become a challenging task to meet ever increasing energy demands with limited conventional fuels and natural resources. Due to fast depletion of fossil fuels and a tremendous gap between supply and demand of energy, it is essential to adopt energy conservation techniques in almost every field like industries, commercial and residential sectors etc. Energy conservation has attained priority as it is regarded as an additional energy resource. Energy saved is energy produced. This course covers the concepts of energy management and its conservation. It gives the insight to energy conservation opportunities in general industry and details out energy audit methodology and energy audit instruments.

DETAILED CONTENTS

1. **Basics of Energy**
 - 1.1 Classification of energy- primary and secondary energy, commercial and non-commercial energy, non-renewable and renewable energy with special reference to solar energy, Capacity factor of solar and wind power generators.
 - 1.2 Global fuel reserve
 - 1.3 Energy scenario in India and state of U.P. Sector-wise energy consumption (domestic, industrial, agricultural and other sectors)
 - 1.4 Impact of energy usage on climate
2. **Energy Conservation and EC Act 2001**
 - 2.1 Introduction to energy management, energy conservation, energy efficiency and its need
 - 2.2 Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance. Prominent organizations at centre and state level responsible for its implementation.
 - 2.3 Standards and Labeling
 - 2.3.1 Concept of star rating and its importance
 - 2.3.2 Types of product available for star rating
3. **Electrical Supply System and Motors**
 - 3.1 Types of electrical supply system
 - 3.2 Single line diagram
 - 3.3 Losses in electrical power distribution system
 - 3.4 Understanding Electricity Bill
 - 3.4.1 Transformers Tariff structure
 - 3.4.2 Components of power (kW, kVA and kVAR) and power factor, improvement of power factor
 - 3.4.3 Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC)

- 3.5 Transformers
 - 3.5.1 Introduction
 - 3.5.2 Losses in transformer
 - 3.5.3 Transformer Loading
 - 3.5.4 Tips for energy savings in transformers

- 3.6 Electric Motors
 - 3.6.1 Types of motors
 - 3.6.2 Losses in induction motors
 - 3.6.3 Features and characteristics of energy efficient motors
 - 3.6.4 Estimation of motor loading
 - 3.6.5 Variation in efficiency and power factor with loading
 - 3.6.6 Tips for energy savings in motors

4. Energy Efficiency in Electrical Utilities

- 4.1 Pumps
 - 4.1.1 Introduction to pump and its applications
 - 4.1.2 Efficient pumping system operation
 - 4.1.3 Energy efficiency in agriculture pumps
 - 4.1.4 Tips for energy saving in pumps
- 4.2 Compressed Air System
 - 4.2.1 Types of air compressor and its applications
 - 4.2.2 Leakage test
 - 4.2.3 Energy saving opportunities in compressors.
- 4.3 Energy Conservation in HVAC and Refrigeration System
 - 4.3.1 Introduction
 - 4.3.2 Concept of Energy Efficiency Ratio (EER)
 - 4.3.3 Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems.

5 Lighting and DG Systems

- 5.1 Lighting Systems
 - 5.1.1 Basic definitions- Lux, lumen and efficacy
 - 5.1.2 Types of different lamps and their features
 - 5.1.3 Energy efficient practices in lighting
- 5.2 DG Systems
 - 5.2.1 Introduction
 - 5.2.2 Energy efficiency opportunities in DG systems
 - 5.2.3 Loading estimation

6 Energy Efficiency in Thermal Utilities

- 6.1 Thermal Basics
 - 6.1.1 Types of fuels
 - 6.1.2 Thermal energy
 - 6.1.3 Energy content in fuels

6.1.4 Energy Units and its conversions in terms of Metric Tonne of Oil Equivalent (MTOE)

6.2 Energy Conservation in boilers and furnaces

6.2.1 Introduction and types of boilers

6.2.2 Energy performance assessment of boilers

6.2.3 Concept of stoichiometric air and excess air for combustion

6.2.4 Energy conservation in boilers and furnaces

6.2.5 Do's and Don'ts for efficient use of boilers and furnaces

6.3 Cooling Towers

6.3.1 Basic concept of cooling towers

6.3.2 Tips for energy savings in cooling towers

6.4 Efficient Steam Utilization

7 Energy Conservation Building Code (ECBC)

7.1 ECBC and its salient features

7.2 Tips for energy savings in buildings

7.2.1 New Buildings

7.2.2 Existing Buildings

8 Waste Heat Recovery and Co-Generation

8.1 Concept, classification and benefits of waste heat recovery

8.2 Concept and types of co-generation system

9 General Energy Saving Tips

Energy saving tips in:

9.1 Lighting

9.2 Room Air Conditioner

9.3 Refrigerator

9.4 Water Heater

9.5 Computer

9.6 Fan, Heater, Blower and Washing Machine

9.7 Colour Television

9.8 Water Pump

9.9 Cooking

9.10 Transport

10 Energy Audit

10.1 Types and methodology

10.2 Energy audit instruments

10.3 Energy auditing reporting format

PRACTICAL EXERCISES

1. To conduct load survey and power consumption calculations of small building.
2. To check efficacy of different lamps by measuring power consumption and lumens using lux meter.
3. To measure energy efficiency ratio (EER) of an air conditioner.
4. To measure effect of valve throttling and variable frequency drive (VFD) on energy consumption by centrifugal pump.
5. To measure and calculate energy saving by arresting air leakages in compressor.
6. To measure the effect of blower speed on energy consumed by it.

5.1 INTEGRATIVE COMMUNICATION

| | | |
|---|---|---|
| L | T | P |
| - | - | 4 |

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Units | Coverage Time | | |
|--------|-----------------------------------------------|---------------|---|----|
| | | L | T | P |
| 1. | Introduction to Personality Development | - | - | 02 |
| 2. | Factors Influencing / Shaping Personality | - | - | 02 |
| 3. | Self Awareness - 1 | - | - | 03 |
| 4. | Self Awareness - 2 | - | - | 02 |
| 5. | Self Awareness - 3 | - | - | 02 |
| 6. | Change Your Mind Set | - | - | 02 |
| 7. | Interpersonal Relationship and Communication | - | - | 03 |
| 8. | Non-Verbal communication Communication Skills | - | - | 02 |
| 9. | Communication Skills ACTIVITIES | - | - | 06 |
| 10. | Body Language skills | - | - | 03 |
| 11. | Leadership Traits & Skills | - | - | 03 |
| 12. | Attitude | - | - | 03 |
| 13. | Analyzing & Solving a Problem skills | - | - | 02 |
| 14. | Time Management skills | - | - | 03 |
| 15. | Stress Management Skills | - | - | 02 |
| 16. | Interview Skills | - | - | 04 |
| 17. | Conflict Motives | - | - | 02 |
| 18. | Negotiation / Influencing Skills | - | - | 02 |
| 19. | Sociability | - | - | 03 |
| 20. | Importance of Group | - | - | 03 |
| 21. | Values / Code of Ethics | - | - | 02 |
| | | - | - | 56 |

PERSONALITY DEVELOPMENT**1 Introduction to Personality Development**

AIM, Skills, Types of Skills, LIFE SKILLS VS OTHER SKILLS, Concept of Life Skills. Ten core Life Skills identified by WHO

2. Factors Influencing / Shaping Personality :

Introduction, Physical and Social Factors Influencing / Shaping Personality (Hereditary, Self-Development, Environment, Education, Life-situations) Psychological AND Philosophical Factors Influencing / Shaping Personality (Past Experiences, Dreams and Ambitions, Self-Image, Values)

3. Self Awareness - 1

DIMENSIONS OF SELF AWARENESS (Self Realization, Self Knowledge or Self Exploration, Self Confidence, Self Talk, Self

Motivation, Self Esteem, Self Image, Self Control, Self Purpose, Individuality and Uniqueness, Personality, Values, Attitude, Character), SELF REALIZATION AND SELF EXPLORATION THROUGH SWOT ANALYSIS AND JOHARI WINDOW,

4. **Self Awareness - 2**

SYMPATHY VS EMPATHY AND ALTRUISM,
Importance of Empathizing with Others,

5. **Self Awareness - 3**

Self-Awareness through Activity, Body Image (What is Body Image, What Decides our Body Image, What is Poor Body Image, What are the Harmful Effects of Poor Body Image), Tackling Poor Body Image(Enhance Self-Esteem, Build Up Critical Thinking, Build up Positive Qualities, Understand Cultural Variation, Dispel Myths, Utilize Life Skills)

6. **Change Your Mind Set**

What is Mindset, HOW TO CHANGE YOUR MINDSET (Get the Best Information Only, Make the best people your Role Model, Examine Your Current Beliefs, Shape Your Mindset with Vision and Goals, Find Your Voice, Protect Your Mindset, Let Go of Comparisons, Put An End To Perfectionism, Look At The Evidence, Redefine What Failure Means, Stop Worrying About What "People" Think)

INTERPERSONAL SKILLS

7. **Interpersonal Relationship and Communication**

INTERPERSONAL RELATIONSHIP , Forms of Interpersonal Relationship, Must Have in an Interpersonal Relationship, Interpersonal Relationship between a Man and a Woman (Passion, Intimacy, Commitment), Relationship Between Friends, ROLE OF COMMUNICATION IN INTERPERSONAL RELATIONSHIP (Take Care Of Your Tone And Pitch, Choice of Words is Important in Relationships, Interact Regularly, Be Polite, Try To Understand The Other Person's Point Of View As Well, Individuals Can Also Communicate Through Emails,

8. **NON-VERBAL COMMUNICATION Communication Skills**

Non-Verbal Communication,
We Communicate with Our Eyes, Communication with Facial Expression, A Good Gesture, Appearance, Posture and Gait, Proximity and Touch), IMPORTANCE OF LISTENING, Characteristics of Good and Effective Listener(Is Attentive, Do Not Assume, Listen for Feelings and Facts, Concentrate on the Other Speakers Kindly and Generously, Opportunities)

9. **Communication Skills ACTIVITIES -**

Activities in Making Collages, Making Advertisements, PPT Preparation &
Presentation, Speaking -Seminars, Group Discussions, Debates, Extempore Speeches, Listening to an audio clip and telling its gist, Answering a telephone call, Making enquiries, General tips- Pronunciation, Tone, Pitch, Pace, Volume, relevance, brief, simple Reading Newspaper, Magazines (Current Affairs, Economic magazines, Technical magazines), How to read a

report, article, Writing- Resume Writing, Writing joining report, Notice writing, Report making, Proposal writing, Advertisement, Notice for tender, Minutes writing, E-Mail writing, Listening News, Listening to audio clips.(Lecture, poetry, speech, songs),

10. Body Language skills

Introduction, What is Body Language , Body Language Parts, Personal Space Distances (Intimate Distance, Personal Distance, Social Distance, Public Distance), IMPORTANT BODY LANGUAGE SIGNS AND THEIR MEANING

UNDERSTANDING OTHERS

11. Leadership Traits & Skills :

Introduction, Important Leadership Traits (Alertness, Bearing, Courage, Decisiveness, Dependability, Endurance, Enthusiasm, Initiative, Integrity, Judgment, Justice, Knowledge, Loyalty, Sense of Humour), Other Useful traits (Truthfulness, Esprit-de-corps, Unselfishness, Humility and sympathy, Tact without loss of moral courage, Patience and a sense of urgency as appropriate, Selfconfidence, Maturity, Mental including emotional stability)

12. Attitude

Types of Attitude, Components of Attitudes (Cognitive Component, Affective Component, Behavioral Component), Types of Attitudes (Positive Attitude, Negative Attitude, Neutral Attitude, Rebellious Attitude, Rational and Irrational Attitudes, Individual and Social Attitudes), Kinds of Attitude, ASSERTIVENESS, How to Develop Assertiveness (Experiment and Try New Things, Extend Your Social Circle, Learn to Make Decisions for Yourself, Indulge in Knowledge, Admire Yourself & Others), Negotiation (Be Sensitive to The Needs Others, Be Willing To Compromise, Develop Your Problem-Solving Skills, Learn to Welcome Conflict, Practice Patience, Increase Your Tolerance For Stress, Improve Your Listening Skills, Learn To Identify Bottom-Line Issues Quickly, Be Assertive, Not Aggressive)

PROBLEM SOLVING

13. Analyzing & Solving a Problem skills

Critical Thinking, Creative Thinking, Decision Making, Goal Setting & Planning, Problem Solving

14. Time Management skills

Need of Time Management, TIME WASTERS (Telephone, Visitors , Paper work, Lack of Planning & Fire Fighting , Socializing , Indecision , TV , Procrastination), PRINCIPLES OF TIME MANAGEMENT - Develop a Personal Sense of Time (Time Log , value of other people's time), Identify Long-Term Goals , Concentrate on High Return Activities , Weekly & Daily Planning (The Mechanics of Weekly Planning , Daily Planning), Make the

Best Use of Your Best Time , Organize Office Work (Controlling Interruptions , Organizing Paper Work) , Manage Meetings, Delegate Effectively, Make Use of Committed Time, Manage Your Health,

15. **Stress Management Skills**

INTRODUCTION, Understanding Stress and its Impact, Expected Responses (Physical, Emotional, Behavioral), stress signals(thoughts, feelings, behaviors and physical), STRESS MANAGEMENT TECHNIQUES (Take Deep Breath, Talk It Out, Take A Break, Create a Quiet Place in Your Mind, Pay Attention to Physical Comfort, Move, Take Care of Your Body, Laugh, Manage Your Time, Know Your Limits, Do You Have To Be Right Always, Have A Good Cry, Look for the Good Things Around You, Talk Less, Listen More), UNDERSTANDING EMOTIONS AND FEELINGS-through Activity

16. **Interview Skills (2 sessions from Industry Expert is Compulsory)**

Curriculum Vitae (When Should a CV be Used, What Information Should a CV Include, personal profile, Covering Letter, What Makes a Good CV, How Long Should a CV Be, Tips on Presentation), Different Types of CV (Chronological, Skills-Based), BEFORE THE INTERVIEW , CONDUCTING YOURSELF DURING THE INTERVIEW , FOLLOWING THROUGH AFTER THE INTERVIEW , Interview Questions To Think About , MOCK INTERVIEW - Activity (MOCK INTERVIEW EVALUATION - NON-VERBAL BEHAVIORS, VERBAL BEHAVIORS, General Etiquettes to face the Board , Telephonic interview

17. **Conflict Motives -Resolution**

Motives of Conflict(Competition for Limited Resources, The Generation Gap and Personality Clashes, Aggressive Personalities, Culturally Diverse Teams, Competing Work and Family Demands, Gender Based Harassment), Merits and Demerits of Conflict , Levels of Conflict (Interpersonal Conflict, Role Conflict, Inter-group Conflict, Multi-Party Conflict, International Conflict), Methods of Conflict Resolution (The Win-Lose Approach, The Lose-Lose Strategy, The Win-Win Approach), Techniques for Resolving Conflicts (Confrontation and Problem Solving Leading to Win-Win, Disarm the Opposition, Cognitive Restructuring, Appeal to Third Party, The Grievance Procedure)

18. **Negotiation / Influencing Skills**

Why Influencing, What Is Influencing, TYPES OF INFLUENCING SKILLS (Probing And Listening, Building Rapport, Sign Posting, Pacing, Selling, Assertiveness), LAWS AND PRINCIPLES OF INFLUENCE, The Six Laws of Influence (The Law of Scarcity, The Law of Reciprocity, The Law of Authority, The Law of Liking, The Law of Social Proof, The Law of Commitment and Consistency), Influencing Principles (Making a Start, Buy Yourself Thinking Time, Dealing With Disagreement, Difficult And Sensitive Situations)

19. **Sociability : Etiquettes And Mannerism & Social Skills**

Need for Etiquette , Types of Etiquettes (Social Etiquette, Bathroom Etiquette, Corporate Etiquette, Wedding Etiquette, Meeting Etiquette, Telephone Etiquette, Eating Etiquette, Business Etiquette, E-Mail Etiquettes,), MANNERISMS, HOW TO IMPROVE YOUR SOCIAL SKILLS (Be Yourself, Be Responsible, Be Open & Approachable, Be Attentive, Be Polite, Be Aware, Be Cautious)

20. Importance of Group / Cross Cultural Teams / Team Work skills

Introduction, Types and Characteristics of Groups

(Definition of a

Group, Classification / Types of Groups, Friendship Group, Task Group, Formal Groups, Informal Group, Effective Group), Importance of a Group, Characteristics of a Mature Group, TYPES AND CHARACTERISTICS OF A TEAM (Definition of a Team, Types of Teams, Functional Teams, Problem Solving Teams, Cross - Functional Teams, Self - Managed Teams), Importance of a Team, Characteristics of a Team

21. VALUES / CODE OF ETHICS

Meaning, A FEW IMPORTANT VALUES (Honesty, Integrity, Purity, Discipline, Selflessness, Loyalty, Fairness, Equality, Trust, Support, Respect, etc)

Note : One Orientation module for the faculty is must.

Involvement of Industry Experts is necessary for Interview Skills

5.2 INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

L T P
6 2 -

RATIONALE

The knowledge of this subject is required for all engineers/technicians who wish to choose industry/field as their career. This course is designed to develop understanding of various functions of management, role of workers and engineers and providing knowledge about industrial and tax laws.

TOPIC WISE DISTRIBUTION OF PERIODS

| Sl.No. | Units | Coverage Time | | |
|--------|--------------------------------|---------------|----|---|
| | | L | T | P |
| 1. | Principles of Management | 8 | - | - |
| 2. | Human Resource Development | 10 | - | - |
| 3. | Wages and Incentives | 4 | - | - |
| 4. | Human and Industrial Relations | 6 | - | - |
| 5. | Professional Ethics | 2 | - | - |
| 6. | Sales and Marketing management | | 10 | - |
| 7. | Labour Legislation Act | | 10 | - |
| 8. | Material Management | 8 | - | - |
| 9. | Financial Management | 8 | - | - |
| 10. | Entrepreneurship Development | | 8 | - |
| 11. | Fundamental of Economics | 5 | - | - |
| 12. | Accidents and Safety | | 5 | - |
| | | 84 | - | - |

DETAILED CONTENTS

1. **Principles of Management**
 - 1.1 Management, Different Functions: Planning, Organising, Leading, Controlling.
 - 1.2 Organizational Structure, Types, Functions of different departments.
 - 1.3 Motivation: Factors, characteristics, methods of improving motivation, incentives, pay, promotion, rewards, job satisfaction, job enrichment.
 - 1.4 Need for leadership, Functions of a leader, Factors for accomplishing effective leadership, Manager as a leader, promoting team work.
2. **Human Resource Development**
 - 2.1 Introduction, objectives and functions of human resource development (HRD) department.
 - 2.2 Recruitment, methods of selection, training strategies and career development.
 - 2.3 Responsibilities of human resource management - policies and functions, selection - Mode of selection - Procedure - training of workers, Job evaluation and Merit rating.

3. **Wages and Incentives**
 - 3.1 Definition and factors affecting wages, methods of wage payment.
 - 3.2 Wage incentive - type of incentive, difference in wage, incentive and bonus; incentives of supervisor.
 - 3.3 Job evaluation and merit rating.
4. **Human and Industrial Relations**
 - 4.1 Industrial relations and disputes.
 - 4.2 Relations with subordinates, peers and superiors.
 - 4.3 Characteristics of group behaviour and trade unionism.
 - 4.4 Mob psychology.
 - 4.5 Grievance, Handling of grievances.
 - 4.6 Agitations, strikes, Lockouts, Picketing and Gherao.
 - 4.7 Labour welfare schemes.
 - 4.8 Workers' participation in management.
5. **Professional Ethics**
 - 5.1 Concept of professional ethics.
 - 5.2 Need for code of professional ethics.
 - 5.3 Professional bodies and their role.
6. **Sales and Marketing management**
 - 6.1 Functions and duties of sales department.
 - 6.2 Sales forecasting, sales promotion, advertisement and after sale services.
 - 6.3 Concept of marketing.
 - 6.4 Problems of marketing.
 - 6.5 Pricing policy, break even analysis.
 - 6.6 Distribution channels and methods of marketing.
7. **Labour Legislation Act (as amended on date)**
 - 7.1 Factory Act 1948.
 - 7.2 Workmen's Compensation Act 1923.
 - 7.3 Apprentices Act 1961.
 - 7.4 PF Act, ESI Act.
 - 7.5 Industrial Dispute Act 1947.
 - 7.6 Employers State Insurance Act 1948.
 - 7.7 Payment of Wages Act, 1936.
 - 7.8 Intellectual Property Rights Act
8. **Material Management**
 - 8.1 Inventory control models.
 - 8.2 ABC Analysis, Safety stock, Economic ordering quantity.
 - 8.3 Stores equipment, Stores records, purchasing procedures, Bin card, Cardex.
 - 8.4 Material handling techniques.
9. **Financial Management**
 - 9.1 Importance of ledger and cash book.
 - 9.2 Profit and loss Account, Balance sheet.
 - 9.3 Interpretation of Statements, Project financing, Project appraisal, return on investments.
10. **Entrepreneurship Development**
 - 10.1 Concept of entrepreneur and need of entrepreneurship in the context of prevailing employment conditions.

- 10.2 Distinction between an entrepreneur and a manager.
- 10.3 Project identification and selection.
- 10.4 Project formulation.
- 10.5 Project appraisal.
- 10.6 Facilities and incentives to an entrepreneur.
- 11. **Fundamental of Economics**
 - 11.1 Micro economics.
 - 11.2 Macro economics.
- 12. **Accidents and Safety**
 - 12.1 Classification of accidents based on nature of injuries, event and place.
 - 12.2 Causes and effects of accidents.
 - 12.3 Accident-prone workers.
 - 12.4 Action to be taken in case of accidents with machines, electric shock, fires and erection and construction accidents.
 - 12.5 Safety consciousness and publicity.
 - 12.6 Safety procedures.
 - 12.7 Safety measures - Do's and Don'ts and god housing keeping.

5.3 PLASTIC PROCESSING TECHNIQUES - II

L T P

5 2 7

RATIONALE

After fabrication of the product post processing operations are necessary to make the product commercially presentable. Finishing and other decorating and printing operations are instrumental in enhancing the aesthetics and visual appeal of the product. The emphasis is given especially on printing, lamination, coating techniques, compression and transfer moulding and rotational moulding.

DETAILED CONTENTS

1. Compression moulding

General principles and working of compression molding machine.
 Types of compression molding machine - hand operated, automatic, single and multi daylight machines, bulk factor, preheating, Compression molds, cycle time ,process variables and their control. Effect of process variables on product properties, compression molding of Semiconductor and DMC compounds

(12 hrs)

2. Transfer Moulding

Principles of transfer molding. Types of transfer molding machines, molding cycle, theoretical calculation of line pressure, injection ram pressure, clamping pressure, pot capacity, compression force transfer molding and compression molding

(10 hrs)

3. Introduction to Pultrusion, hand lay up technique (4 hrs)

4. Forming

Basic principles, method of forming – straight forming, free forming, plug assist forming, drape forming, matched mold forming, slip forming, snap back forming, reverse draw forming, limitations and advantages of forming, materials for thermoforming, types of heating systems

(10 hrs)

5. Casting

Introduction, casting of PMMA, unsaturated polyesters and phenolic resins

(6 hrs)

6. Calendering

Introduction to calendering, types of calenders, advantages, limitations of calendering and major applications

(6 hrs)

7. Rotational moulding of large containers (4 hrs)

8. Foam Moulding

Definition of molding, processes, blowing agents, applications

(4 hrs)

9. Finishing of Plastics

Cutting, turning, drilling, sanding, polishing different types of welding

(8 hrs)

PLASTIC PROCESSING TECHNIQUES - II LAB

LIST OF PRACTICALS

1. To produce small components on hand operated compression molding machine
2. To produce components on automatic/semi automatic compression molding machine
3. To produce articles on vacuum forming machine
4. Preparation of FRP sheet by hand lay up technique

5.4 DESIGN OF DIES AND MOULDS - II

L T P
5 2 7

RATIONALE

A diploma holder in Plastic Mould Technology is engaged in manufacturing plastic components for which design of moulds and dies is essential. This subject will impart them requisite knowledge and skills in design of moulds and dies.

DETAILED CONTENTS

Dies

1. General features of extrusion dies
(3 hrs)
2. Die materials
(3 hrs)
3. Design features dies – Polymer melt flow, die geometry, material of construction, ease of maintenance and cleaning. Die land, die swell
(8 hrs)
4. Heating system and temperature control
(2 hrs)
5. Types of dies
(2 hrs)
6. Dies for rod, flexible tube, wire coating
(10 hrs)

Compression Mould and Transfer Moulds

7. Types of compression molds – positive, semi-positive, flash and landed positive type
(8 hrs)
8. Calculation of clamp pressure, ram pressure, platen size, no. of impressions. Selection of compression molding machine
(5 hrs)
9. Principles of transfer molding, pot capacity, design of sprue, runner and gates
(7 hrs)

Blow Moulds

10. Materials for flow moulds
(2 hrs)
11. Extrusion blow moulds – cavity and pinch off
(6 hrs)
12. Injection blow moulds – neck design, mandrel design, Parison thickness control
(5 hrs)
13. Mould cooling (3 hrs)

DESIGN OF DIES AND MOULDS - II LAB
LIST OF PRACTICALS

1. Design and drawing of a single impression compression mould
2. Design and drawing of a multi-impression compression mould
3. Design and drawing of a transfer mould
4. Design and drawing of elbow mould
5. Design and drawing of a die for pipe/tubing

Note: Minimum 10 sheets will be prepared by the students.

RATIONALE

The objective of this subject is to create awareness in the students about the pollution aspects related to the plastic solid waste disposal, air pollution by plastics waste, Incineration, reusability and reprocessing of plastics and bio-degradation of plastics.

DETAILED CONTENTS

1. Environment

Environment and its components; water, soil, air and living things. Ecosystems, ecological balance, interaction of environment with humans. Cause of ecological imbalance
(6 hrs)

2. Classification of Plastic Materials

Natural and synthetic polymer and their compatibility with surroundings (starch and proteins, silicon's and other man made fabrics). Life expectancy of different plastics in environment and thermal degradation, biodegradation and photo degradation. Agents for increasing life expectancy of polymers
(8 hrs)

3. Pollution and Hazards related to Plastics

Pollution caused by plastics, loading of toxic chemicals from plastics into soil and water (including additives, flame retardants, chonnated additives etc.)
ISI Standards regarding limits of these chemicals in effluents
(8 hrs)

4. Reusability and Reprocessing of Plastics

Need and importance of reprocessing. Stages in recycling (primary, secondary and tertiary), Advantages and disadvantages of recycling
(10 hrs)

5. Plastic Waste Management

Public awareness regarding hazards caused by indiscriminate use of plastics, proper disposal of plastics. Collection of recyclable plastics. Landfill. Incineration of plastics. Hospital Plastic Waste Management, Case Study of Bhopal Gas Tragedy.
(8 hrs)

6. Use of Plastics in Conservation of Natural Resources

Mulching, waste water recovery by membrane separation, use of plastics in rain water harvesting, plastic pipes for transportation of

potable water (as compared to iron pipes) and canal lining.

Power Generation from waste plastics

(8 hrs)

7. Disaster Management

Definition of disaster - Natural and Manmade, Type of disaster management, How disaster forms, Destructive power, Causes and Hazards, Case study of Tsunami Disaster, National policy- Its objective and main features, National Environment Policy, Need for central intervention, State Disaster Authority- Duties and powers, Case studies of various Disaster in the country, Meaning and benefit of vulnerability reduction, Factor promoting vulnerability reduction and mitigation, Emergency support function plan.

Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

ENVIRONMENT AND POLLUTION LAB

LIST OF PRACTICALS

Demonstration/operation of the following practicals (5 experiments)

1. To conduct recyclability test
2. Collection of different plastic wastes and their segregation in various groups
3. Conversion of collected samples into plastic granules
4. Property modification of plastic granules by adding natural material like cellulose
5. Determination of BOD and COD of given samples of effluents of plastic industry
6. Mixing of virgin polymers with recycled polymers (both by melt method and solvent method)
7. To carry out plastic waste management of at least one department/section of the polytechnic

6.2 PLASTIC TESTING AND QUALITY CONTROL

L T P

6 2 6

RATIONALE

It is necessary to test the raw materials and the products during various stages of their manufacture to control the quality. This subject provides the essential knowledge and skills to the students for doing this function.

DETAILED CONTENTS

Testing

1. Overview of various testing methods and organisations such as ASTM, BIS, DIN and ISO
(2 hrs)
2. Test specimens preparation : milling, punching, template, cutting from sheets or films product
(4 hrs)
3. Identification of plastic
 - Visual, burning, heating
 - Element, detection, analysis; chemistry, groups analysis(4 hrs)
4. Physical properties
Specific gravity, Water absorption, Moisture content analysis
(4 hrs)
5. Mechanical Properties
 - Short term Mechanical properties - Tensile strength, impact strength (izod & charpy), flexural strength, fatigue resistance, compression strength, tear test
 - Long term Mechanical properties - creep and stress relaxation.
 - Hardness, shore and rockwell hardness, Abrasion resistance.(6 hrs)
6. Thermal properties
Melting point, Vicat softening point, heat distortion temperature
(6 hrs)
7. Electrical properties
Dielectric strength, Arc resistance, Insulation resistance, Volume and surface resistivity
(6 hrs)
8. Optical properties
Light transmittance, Haze, Gloss, refractive index
(4 hrs)
9. Flow properties
Melt flow index, capillary rheometer, cone and plate viscometer
(4 hrs)

Quality Control

10. Basic concept of statistical quality control, Visual inspection, Testing of a finished product, Analysis of test data to control finished product in relation to service requirement, Special tests on individual products to improve the quality
(8 hrs)

PLASTIC TESTING AND QUALITY CONTROL LAB

LIST OF PRACTICALS

1. To carry out volume and surface resistivity test on given samples of plastic
2. To determine the tensile strength, flexural strength of plastics specimen.
3. To determine impact strength of different plastics specimen.
4. To determine hardness (shore and rockwell) of different specimen of plastics.
5. To carry out dart impact test on given plastics films/laminates.
6. To determine the Melt Flow Index of given samples of plastics.
7. To carry out (i) heat detection test on given samples of plastics.
(ii) vicat softening point test on given samples of plastics
8. To measure gloss of plastic specimen.
9. To carry out environmental stress cracking resistance test on given samples of Plastics with notch cutting equipment.

6.3 COMPUTER AIDED MOULD DESIGN

L T P

- - 12

In this practical subject, the students are required to learn the basics of software such as :

Mechanical Desktop, Mould Creator, Mould Flow etc. and further to design at least 2 moulds for given components using these software.

6.4 PROJECT

The project paper will be of two parts. Part-A will contain the problems to evaluate students learning. The Part-B will be regarding students awareness of the plans and programmes running for rural development, Ecological balance and Environmental pollution control.

Part-A

Choose any one problem of mould for any type of plastic products used in daily life in commercial or domestic.

PART-B:

The student will survey a village and prepare a report giving details of population, Means of lively hood, Health and hygienic conditions, Education facilities and various Programmes/projects running for the development and the personnel's and agencies involved in the work. He will also make observation on environmental pollution and ecological disturbances and will make a mention of that in his report with its reason, suggesting remedies or ways to minimise it. Without it the project will not be taken as complete. The student will also do some constructive work for pollution Control as advised by the guiding teacher.

6.5 FIELD EXPOSURE-II

SEE ANNESURE-II

DIPLOMA IN PLASTIC MOULD TECHNOLOGY
STAFF STRUCTURE

Intake of the Course 60
Pattern of the Course System Pattern

| Sl. No. | Name of Post | No. |
|---------|------------------------------------|------------------------------------------|
| 1. | Principal | 1 |
| 2. | H. O. D. (Mechanical) | 1 |
| 3. | Lecturer Plastic/Mech. Engineering | 1/3 |
| 4. | Lecturer in Electrical Engg. | 1 |
| 5. | Lecturer in Maths | 1 Part Time |
| | | OR |
| 6. | Lecturer in Chemistry | 1 Common with |
| 7. | Lecturer in Physics | 1 other |
| | | discipline |
| 8. | Lecturer in Comm. Tech. | 1 |
| 9. | Computer Programmer | 1 |
| 10. | Steno Typist | 1 |
| 11. | Accountant / Cashier | 1 |
| 12. | Student / Library Clerk | 1 |
| 13. | Store Keeper | 1 |
| 14. | Class IV | 6 |
| 15. | Sweeper | Part time or as per requirement |
| 16. | Chaukidar & Mali | as per justification |
| 17. | Lecturer in Computer | 1(Only for Computer Aided Design Group.) |

Note :

1. Services of other discipline staff of the Institute may be utilized if possible
2. Qualifications of Staff: as per service rule
3. The post of "Computer Programmer" is not needed in the institutions where diploma in "Electronics Engineering" is running.

SPACE STRUCTURE

[A] ADMINISTRATIVE BLOCK

| Sl. No. | Details of Space | Floor Area Sq. meters | Remark |
|---------|--------------------------------------------------|--------------------------|--------|
| 1. | Principal's Room | 30 | |
| 2. | Confidential Room | 10 | |
| 3. | Steno's Room | 6 | |
| 4. (a) | Office Room | 80 | |
| (b) | Record Room | 20 | |
| 5. | Staff Room | | |
| | (a) Head 1 | 15 | |
| | (b) Lecturer 10 sq.m. / Lect. for 8 Lecturers | 80 | |
| 6. | Library and Reading room | 150 | |
| 7. | Store | 100 | |
| 8. | Students Common room | 80 | |
| 9. | Model Room | 90 | |

[B] Academic Block

| Sl.No. | Detail of Space | No. | @ Sq. m | Floor Area Sq. m. |
|--------|--------------------------------------------------------------|-----|------------|----------------------|
| 1. | Class Room | 2 | 60 | 120 |
| 2. | Drawing Hall | 1 | 120 | 120 |
| 3. | Physics Lab | | | 90 |
| 4. | Chemistry Lab | | | 120 |
| 5. | App. Mechanics Lab. / Elements of Mechanical Engg Lab. | | | 120 |
| 6. | Material Science Lab. | | | 120 |
| 7. | Thermal Engg. Lab. | | | 120 |

| | | |
|-----|------------------------------------------------------------------------------------------------|-----|
| 8. | Hydraulics Lab. | 120 |
| 9. | Electrical Technology & Electronics Lab or Common with Electrical Engineering. | 90 |
| 10. | Metrology Lab. | 90 |
| 11 | Computer Lab (Air Cond.Glass Partition and Special type pvc flooring and false ceiling) | 60 |
| 12. | Advance Welding Lab/Shop | 90 |

[C] Work shop

| | | |
|-----|---------------------------------------|-----|
| I | Workshop Supdt. Room | 12 |
| II | Store | 20 |
| III | Shops | |
| (a) | Carpentry Shop | 50 |
| (b) | Smithy Shop | 70 |
| (c) | Fitting Shop | 50 |
| (d) | Welding Shop | 50 |
| (e) | Painting Shop | 50 |
| (f) | Sheet Metal ,Soldering & Brazing shop | 50 |
| (g) | Plumbing shop | 50 |
| (h) | Machine Shop | 150 |
| (i) | Foundry | 75 |

[D] Student's Amenities

| | | |
|----|---------------------------|--------------------------------------|
| 1. | Hostel | For 40 % of Strength of Students |
| 2. | Cycle Stand | For 50 % of Strength of Students |
| 3. | Canteen and Tuck shop | 50 Sqm. |
| 4. | N.C.C. Room | 70 Sqm. |
| 5. | Dispensary | 40 Sqm. |
| 6. | Guest Room(Attached Bath) | 45 Sqm. including kitchen & store |

[E] STAFF RESIDENCES

| | | | | |
|----|--------------------|---|-----|-----|
| 1. | Principal | 1 | 100 | 100 |
| 2. | Head of Department | 1 | 100 | 100 |
| 3. | Lecturer | 4 | 80 | 320 |

| | | | | |
|----|---------------------------------|---|----|-----|
| 4. | Non teaching & Supporting staff | 8 | 60 | 480 |
| 5. | Class IV | 6 | 30 | 180 |

Priority to be given in following order

(1)

- a. Administrative Building
- b. Labs
- c. Workshop
- d. Over head Tank
- e. Boundary Wall
- f. Principal Residence
- g. Fourth Class Quarters (2/3)

(2)

- a. Hostel
- b. Students Amenities

(3)

Residences of employees

LIST OF EQUIPMENTS

Only those of the equipments given below which are essentially required for the conduction of practicals mentioned in the curriculum are to be procured by the institutions.

"Machine/Equipments/Instruments of old BTE list which are not included below are to be retained in the Lab/Shop for Demonstration purpose but not to be demanded fresh for purchase."

NOTE : Equipment for different shop and lab of latest version should be purchased.

I. APPLIED PHYSICS LAB

| S.No. | Name of Equipment | No. | @ Rs. | Amt. in Rs. |
|-------|---------------------------------------------------------------------------------------------------|-------|-------|-------------|
| 1. | Brass ball with hook 2 cm. dia | 2 | 20 | 40 |
| 2. | Stop clock least count 0.1 Sec | 2 | 500 | 1000 |
| 3. | Wall bracket with clamping arrangement | 2 | 50 | 100 |
| 4. | Meter scale | 5 | 20 | 100 |
| 5. | Convex lenses of focal length 10 cm., 20 cm., 50 cm. and 100 cm. 2 nos. of each | 8 | 10 | 80 |
| 6. | Optical bench steel with pin and lens holders | 2 | 500 | 1000 |
| 7. | Astronomical telescope | 1 | 500 | 500 |
| 8. | Searle's conductivity apparatus with copper & steel rods 25 X 4 cm. diameter with all accessories | 1 set | 1000 | 1000 |
| 9. | Lee's conductivity app. complete with all accessories | 1 set | 1000 | 1000 |
| 10. | Constant water flow arrangement | 2 | 400 | 800 |
| 11. | Boiler made of copper 2 lt. cap. | 4 | 200 | 800 |
| 12. | Platinum resistance thermometer | 2 | 800 | 1600 |
| 13. | Potentiometer - 10 wires with jockey | 1 | 500 | 500 |
| 14. | Meter bridge complete | 1 | 250 | 250 |
| 15. | Lead accumulator 2.2 V. and 20 amp. hour capacity | 2 | 250 | 500 |
| 16. | Moving coil galvanometer | 3 | 200 | 600 |
| 17. | Moving coil ammeter 0-1 amp., 0-5 amp., 0-10 amp., 1 no of each | 3 | 250 | 750 |
| 18. | Moving coil voltmeter 0-1 V. | | | |

| | | | | |
|-----|-----------------------------------------------------------------------------------------------|-------|------|------|
| | 0-5 V., 0-10 V. 1 No of each | 3 | 250 | 750 |
| 19. | Leclanchi cell complete | 3 | 100 | 300 |
| 20. | Resonance col. of steel tube with tuning forks and other accessories | 1 | 500 | 500 |
| 21. | Tuning forks set of different frequencies | 1 set | 1000 | 1000 |
| 22. | App. for determining coefficient of friction on a horizontal plane | 1 set | 1000 | 1000 |
| 23. | Apparatus for determining characteristics of P-N junction diode complete with all accessories | 1 set | 1500 | 1500 |
| 24. | Post office box dial type | 1 | 1200 | 1200 |
| 25. | Resistance box 0-10 ohm. 0-100 ohm. 2 nos. each | 4 | 400 | 1600 |
| 26. | Rheostat of different ohm. capacity | 8 | 250 | 2000 |
| 27. | Physical balance with weight box | 2 | 800 | 1600 |

| S.No. | Name of Equipment | No. | @ Rs. | Amt. in Rs. |
|-------|----------------------------------|-----|-------|-------------|
| 28. | Set of fractional weights | 10 | 20 | 200 |
| 29. | Fortin's barometer with mercury | 1 | 2500 | 2500 |
| 30. | Battery eliminator 6 V. & 3 amp. | 1 | 250 | 250 |
| 31. | Lab tables | 3 | 8000 | 24000 |
| 32. | Lab stools | 10 | 100 | 1000 |
| 33. | Anemometer cup type | 1 | 1000 | 1000 |
| 34. | Anemometer hand held | 1 | 1000 | 1000 |
| 35. | Suryamapi | 1 | 1500 | 1500 |
| 36. | Insulation meter | 1 | 1500 | 1500 |
| | Misc. | LS | | 5000 |

II. APPLIED CHEMISTRY LAB

| S.No. | Name of Equipment | No. | @ Rs. | Amt. in Rs. |
|-------|-----------------------------------------------------------------------------|-------|-------|-------------|
| 1. | Test tube stand | 15 | 10 | 150 |
| 2. | Funnel stand | 15 | 10 | 150 |
| 3. | Burette stand | 15 | 30 | 450 |
| 4. | Pipette stand | 15 | 10 | 150 |
| 5. | Chemical balances with analytical weights 1gm -200gms | 5 | 1500 | 7500 |
| 6. | Fractional weights set with rider | 5sets | 25 | 125 |
| 7. | Kipp's apparatus 1000 ml. polythen | 2 | 500 | 1000 |
| 8. | Reagents bottles | | | |
| | 250ml | 120 | 10 | 1200 |
| | 500ml | 5 | 15 | 75 |
| | 1000ml | 5 | 25 | 125 |
| 9. | Wide mouth bottle 250 ml | 15 | 15 | 225 |
| 10. | Winchester bottle 2.5 litre | 15 | 30 | 450 |
| 11. | Test tubes 1/4" x 6" | 75 | 1 | 75 |
| 12. | Boiling tube 1" x 6" hard glass | 24 | 10 | 240 |
| 13. | Pestle and mortar 10 cms | 2 | 30 | 60 |
| 14. | Watch glass 7.5 cms | 15 | 5 | 75 |
| 15. | Beakers | | | |
| | 100 ml. | 10 | 15 | 150 |
| | 250 ml. | 24 | 20 | 480 |
| | 400 ml. | 12 | 25 | 300 |
| | 1000 ml. | 5 | 30 | 150 |
| 16. | Weighing bottle 10 ml with lid | 15 | 10 | 150 |
| 17. | Wash bottles | 15 | 15 | 225 |
| 18. | Conical flask 250 ml. | 15 | 30 | 450 |
| 19. | Flat bottom flask 500 ml. | 6 | 40 | 240 |
| 20. | Flat bottom flask 250 ml. | 15 | 25 | 375 |
| 21. | Burette 50 ml. | 15 | 60 | 900 |
| 22. | Pipette 25 ml. | 15 | 20 | 300 |
| 23. | Measuring flask 250 ml. with stopper | 15 | 50 | 750 |
| 24. | Measuring cylinder of various sizes (250 ml, 500 ml, 1000 ml) 3 no. of each | 9 | LS | 250 |
| 25. | Bunsen's burner of brass | 15 | 50 | 750 |
| 26. | Gas plant petrol 10 to 20 burners automatic | 1 | 5000 | 5000 |
| 27. | Spirit lamp | 15 | 30 | 450 |
| 28. | Tripod stand | 15 | 10 | 150 |

| | | | |
|-------------------------------------------------------------------|--------|-------|-------|
| 29. Wire gauge 15 X 15 cm. with asbestos | 15 | 15 | 225 |
| 30. Test tube holder | 15 | 10 | 150 |
| 31. Porcelain plates | 15 | 20 | 300 |
| 32. Funnel 15 cm. | 15 | 16 | 240 |
| 33. Blow pipe & work tools with electric blower for glass blowing | 1 set | 10000 | 10000 |
| 34. Cork borers with sharpen | 2 set | 100 | 200 |
| 35. Cork pressure | 1 set | 250 | 250 |
| 36. Glass cutting knife | 1 | 75 | 75 |
| 37. Spatula hard & nickel/steel | 2 each | 50 | 100 |
| 38. Water tapes with gooseneck | 6 | 200 | 1200 |
| 39. Gas taps two way | 10 | 150 | 1500 |
| 40. Pinch cock & screw | 15 | 20 | 300 |
| 41. Distilled water units (electrical) | 1 | 5000 | 5000 |

| S.No. | Name of Equipment | No. | @ Rs. | Amt. in Rs. |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------|-------------|
| 42. | Distilled water units (solar) | 1 | 5000 | 5000 |
| 43. | Open balance 1000 gms./10 mg. | 1 | 600 | 600 |
| 44. | Platinum wire | 5 | 25 | 125 |
| 45. | Brush for cleaning various type | 40 | 10 | 400 |
| 46. | Jars 20 Lit. for keeping distilled water | 5 | 100 | 500 |
| 47. | Lab table 2 m. x 1.2 m. x 1 m. height with central sink and cup boards (Teak wood) with drawers and two built in almirah on each side with reagent racks, better tile top | 4 | 8000 | 32000 |
| 48. | Exhaust fans 18" | 4 | 2000 | 8000 |
| 49. | Side racks and selves for bench reagents made of teak wood for 24 bottles each set | 4 | 2000 | 8000 |
| 50. | Digital balance electronic | 1 | 10000 | 10000 |
| 51. | Hot plates 7-1/2", 3" dia controlled 2000 watts | 1 | 1000 | 1000 |
| 52. | Hot air oven thermostatically controlled with selves and rotary switches 350 x 350 x 25 high | 1 | 8000 | 8000 |
| 53. | pH Meter | 1 | 1000 | 1000 |
| 54. | Glass Electrode | 2 | | |
| 55. | Reference Electro | 2 | | |
| | Miscellaneous | LS | | 10000 |

APPLIED MECHANICS LAB

| Sl.No. | Name of Equipment | No. | Rate | Amount |
|--------|-------------------------------------------------|---------|------|--------|
| 1. | Polygon of Forces Apparatus | 1 | 700 | 700 |
| 2. | Universal Force Table | 1 | 1500 | 1500 |
| 3. | Principle of Moment Apparatus | | | |
| | Bell Crank lever | 1 | 500 | 500 |
| 4. | Combined Inclined plane & Friction apparatus | 1 | 900 | 900 |
| 5. | Simple wheel and axle | 1 | 800 | 800 |
| 6. | Differential wheel and axle | 1 | 1200 | 1200 |
| 7. | Double sleeve Pulley Block | 1 | 400 | 400 |
| 8. | Simple Screw Jack | 1 | 200 | 200 |
| 9. | System of pulleys (Any I, II, III) | 1 | 1200 | 1200 |
| 10. | Worm & Worm wheel | 1 | 1200 | 1200 |
| 11. | Apparatus for Reaction at support | 1 | 1000 | 1000 |
| 12. | Jib Crane | 1 | 500 | 500 |
| 13. | Jointed Roof Truss Apparatus | 1 | 500 | 500 |
| | Misc. | Lum Sum | | 2000 |

III. WORKSHOP PRACTICE

CARPENTRY SHOP

| S.No. | Name of Equipment | No. | @ Rs. | Amt. in Rs. |
|-------|-------------------------------------------|-------|-------|-------------|
| 1. | 60 cm. rule | 10 | 15 | 150 |
| 2. | Flexible steel rule 2 metre | 2 | 20 | 40 |
| 3. | T square 23 cm. steel | 10 | 20 | 200 |
| 4. | Bevel square 23 cm. steel | 2 | 30 | 60 |
| 5. | Marking knife 25 cm. steel | 10 | 30 | 300 |
| 6. | Marking gauge wooden & brass 25 cm. | 10 | 30 | 300 |
| 7. | Mortise gauge wooden & brass 25 cm. | 10 | 50 | 500 |
| 8. | Caliper inside, steel 20 cm. | 2 | 50 | 100 |
| 9. | Caliper outside, steel 20 cm. | 2 | 50 | 100 |
| 10. | Compass steel 20cm. | 2 | 40 | 80 |
| 11. | Divider steel 20 cm. | 2 | 40 | 80 |
| 12. | Plumb | 2 | 20 | 40 |
| 13. | Wooden bench vice steel 20 cm. | 10 | 200 | 2000 |
| 14. | Bench hold fast steel 30 cm. | 10 | 40 | 400 |
| 15. | Bar clamp 2 m. | 2 | 300 | 600 |
| 16. | G clamp of flat spring steel 20x30 cm. | 4 | 60 | 240 |
| 17. | Rip saw 40-45 cm. | 10 | 80 | 800 |
| 18. | Cross cut saw 40-45 cm. | 2 | 80 | 160 |
| 19. | Tennon saw 30-35 cm. | 10 | 50 | 500 |
| 20. | Dovetail saw 30-35 cm. | 2 | 60 | 120 |
| 21. | Compass saw 35 cm. | 4 | 60 | 240 |
| 22. | Key hole saw or pad saw 30-35 cm. | 2 | 25 | 50 |
| 23. | Bow saw | 2 | 25 | 50 |
| 24. | Frame saw | 2 | 25 | 50 |
| 25. | Chisel fish brand 1" to 1/8" | | | |
| | firmer | 3 set | 100 | 300 |
| | Dovetail | 3 set | 100 | 300 |
| | Mortise | 3 set | 100 | 300 |
| 26. | Gauge or Golchi 1" to 1/8" | 3 set | 150 | 450 |
| 27. | Wooden jack plane complete | 10 | 100 | 1000 |
| 28. | Wooden smoothing plane | 10 | 80 | 800 |
| 29. | Iron jack plane complete | 10 | 200 | 2000 |
| 30. | Iron rebate plane complete | 3 | 80 | 240 |
| 31. | Iron grooving plane complete | 3 | 120 | 360 |
| 32. | Iron compass plane complete | 3 | 200 | 600 |
| 33. | Wooden moulding plane complete | 3 | 200 | 600 |

| | | | | |
|-----|-------------------------------------------------|-------|-----|------|
| 34. | Bradawl | 3 | 150 | 450 |
| 35. | Gimlet drills set | 1 set | 150 | 150 |
| 36. | Center bit | 2 | 120 | 240 |
| 37. | Twist bit | 2 | 80 | 160 |
| 38. | Auger bit | 2 | 40 | 80 |
| 39. | Dovetail bit | 2 | 15 | 30 |
| 40. | Counter shank bit | 2 | 20 | 40 |
| 41. | Ratchet brace machine | 2 | 175 | 350 |
| 42. | Grand drill machine 1/4" | 2 | 200 | 400 |
| 43. | Wooden hand drill burmi | 5 | 200 | 1000 |
| 44. | Wooden mallet | 10 | 25 | 250 |
| 45. | Claw hammer | 3 | 30 | 90 |
| 46. | Carpenters hammer | 10 | 30 | 300 |
| 47. | Cutting tool for Universal wood working machine | 3 set | 800 | 2400 |
| 48. | Screw driver 18" & 15" | 6 | 50 | 300 |

| S.No. | Name of Equipment | No. | @ Rs. | Amt. in Rs. |
|-------|-------------------------------------|-----|-------|-------------|
| 49. | Adze 500 gm. | 10 | 50 | 500 |
| 50. | Pincer 175 mm. | 6 | 75 | 750 |
| 51. | Pliers 150 mm. | 4 | 90 | 360 |
| 52. | Oil stone 8" | 4 | 75 | 300 |
| 53. | Rasp file 12" | 4 | 100 | 400 |
| 54. | Half round file 12" | 4 | 80 | 320 |
| 55. | Round file 12" | 4 | 80 | 320 |
| 56. | Triangular file 5", 4" | 8 | 60 | 480 |
| 57. | Water stone | 4 | 20 | 80 |
| 58. | Carpentry work benches | 4 | 2000 | 8000 |
| 59. | Band saw machine complete | 1 | 30000 | 30000 |
| 60. | Circular saw machine | 1 | 15000 | 15000 |
| 61. | Double Ended Electric Bench grinder | 1 | 6000 | 6000 |
| 62. | Universal wood working machine | 1 | 15000 | 15000 |
| | misc. for foundation of machines | LS | | 10000 |

SMITHY SHOP

| | | | | |
|----|--------------------------------------|----|------|-------|
| 1. | Anvil 150 Kg. with stand | 5 | 2500 | 12500 |
| 2. | Swage block 50x30x8cm. & 45x45x10cm. | 2 | 1250 | 2500 |
| 3. | Hammers | | | |
| | Ball peen 0.8 Kg. (Approx.) | 10 | 150 | 1500 |
| | Cross peen 0.8 Kg. (Approx.) | 10 | 150 | 1500 |
| 4. | Beak iron 25 Kg. | 1 | 500 | 500 |
| 5. | Swages different types | 6 | 40 | 240 |

| | | | | |
|-----|-----------------------------------|---|------|-------|
| 6. | Fullers different types | 6 | 30 | 180 |
| 7. | Leg vice 15 cms. opening | 1 | 150 | 150 |
| 8. | Electric blower with motor | 1 | 5000 | 5000 |
| 9. | Furnace chimney with exhaust pipe | 5 | 5000 | 25000 |
| 10. | Sledge hammer - 5 Kg. | 2 | 200 | 400 |
| | Misc. tools | | LS | 2500 |

SHEET METAL, SOLDERING & BRAZING

| | | | | |
|-----|------------------------------------|---|-------|-------|
| 1. | Dividers - 15cm. | 5 | 60 | 300 |
| 2. | Trammel 1 m. | 1 | | |
| 3. | Angle protector | 5 | 60 | 300 |
| 4. | Try square 30 cm. | 5 | 40 | 200 |
| 5. | Centre punch | 5 | 20 | 100 |
| 6. | Steel rule 30 cm. , 60 cm. , | 5 | 25 | 125 |
| 7. | Sheet metal gauge | 1 | 120 | 120 |
| 8. | Straight snips 30 cm. | 2 | 250 | 500 |
| 9. | Curved snips 30 cm. | 2 | 300 | 600 |
| 10. | Bench shear cutter 40 cm. | 1 | 5000 | 5000 |
| 11. | Chisel 10 cm. | 5 | 100 | 500 |
| 12. | Hammer | 5 | 150 | 750 |
| 13. | Bench vice 13 cm. | 5 | 1000 | 5000 |
| 14. | Pliers | 5 | 50 | 250 |
| 15. | Nose pliers | 5 | 60 | 300 |
| 16. | Sheet metal anvil/stakes | 5 | 2000 | 10000 |
| 17. | Shearing machine 120 cm. | 1 | 2500 | 2500 |
| 18. | Solder electric | 2 | 500 | 1000 |
| 19. | Solder furnace type | 2 | 250 | 500 |
| 20. | Brazing equipments and accessories | 1 | 5000 | 5000 |
| 21. | Blow lamp | 2 | 250 | 500 |
| 22. | Sheet bending machine | 1 | 10000 | 10000 |
| | Misc. | | LS | 5000 |

FITTING SHOP

| S.No. | Name of Equipment | No. | @ Rs. | Amt. in Rs. |
|-------|-------------------------|-----|-------|-------------|
| 1. | Bench vice jaw 10 cm. | 10 | 300 | 3600 |
| 2. | Surface plate 45x45 cm. | 2 | 2000 | 4000 |
| 3. | V. Block 10x7x4 cm. | 5 | 350 | 1650 |
| 4. | Try square | 10 | 40 | 400 |
| 5. | Bevel protractor 30 cm. | 1 | 2100 | 2100 |
| 6. | Combination set | 1 | 2500 | 2500 |
| 7. | Divider | 5 | 60 | 300 |
| 8. | Centre punch | 5 | 20 | 100 |

| | | | | |
|-----|-----------------------------------------------|------|------|-------|
| 9. | Calipers (Different sizes) | 12 | 20 | 240 |
| 10. | Vernier calipers 30 cm. | 2 | 600 | 1200 |
| 11. | Micrometer 0-25, 25-50 m.m. | 4 | 500 | 2000 |
| 12. | Vernier depth gauge | 1 | 350 | 350 |
| 13. | Feeler gauge--15 blades | 1 | 30 | 30 |
| 14. | Radius gauge | 1 | 100 | 100 |
| 15. | Angle gauge | 1 | 100 | 100 |
| 16. | Thread gauge | 1 | 100 | 100 |
| 17. | Bench drilling machine 13 mm. | 1 | 5000 | 5000 |
| 18. | Double ended electric grinder | 1 | 4000 | 4000 |
| 19. | Drill set | 1set | 1000 | 1000 |
| 20. | Reamer set | 1set | 2000 | 2000 |
| 21. | Tap set | 1set | 2000 | 2000 |
| 22. | Adjustable wrenches (15 cm., 20cm. 30 cm.) | 1set | 500 | 500 |
| 23. | Allen key set | 1set | 350 | 350 |
| 24. | Spanners | 6 | 60 | 360 |
| 25. | Work benches | 6 | 2000 | 12000 |
| 26. | Power hacksaw | 1 | 4000 | 4000 |
| | Misc. Files, Die set, Hexa frames etc. | | LS | 10000 |

WELDING SHOP

| | | | | |
|----|-----------------------------------------------------------------------------|---|-------|-------|
| 1. | Electric welding set oil cooled | 1 | 10000 | 10000 |
| 2. | Industrial regulator type oil cooled arc welder | 1 | 12000 | 12000 |
| 3. | Air cooled spot welder 7.5 KVA | 1 | 15000 | 15000 |
| 4. | General accessories for air cooled spot welder of 7.5 KVA | | | 8000 |
| 5. | Gas welding set with gas cutting torch and complete with all accessories | 1 | 15000 | 15000 |
| 6. | Misc. work benches | | LS | 20000 |

PAINTING & POLISHING SHOP

| | | | | |
|----|----------------------------------------------------------|------|-------|-------|
| 1. | Air compressor complete with 2 HP motor | 1set | 12000 | 12000 |
| 2. | Spray gun with hose pipe | 1 | 1000 | 1000 |
| 3. | Stoving oven | 1 | 3000 | 3000 |
| 4. | Buffing machine with leather and cotton wheels | 1 | 4000 | 4000 |
| 5. | Electroplating Equipment for chromium Nickel plating. | 1 | 10000 | 10000 |
| | Misc. | | LS | 2000 |

PLUMBING SHOP

| S.No. | Name of Equipment | No. | @ Rs. | Amt. in Rs. |
|-------|----------------------------------------------------------------------------------------------------------|-------|-------|-------------|
| 1. | Pipe vice 5 cm. | 4 | 250 | 1000 |
| 2. | Chain wrenches | 5 | 250 | 1250 |
| 3. | Ring spanner Set | 5 | 125 | 625 |
| 4. | Wheel pipe cutter | 2 | 300 | 600 |
| 5. | Water pump pliers | 4 | 50 | 200 |
| 6. | Pipe die set 2" set | 2 set | 600 | 1200 |
| 7. | Pipe bending device | 1 | 5000 | 5000 |
| 8. | Work benches | 4 | 4000 | 16000 |
| 9. | Set of various types of plumbing fittings e.g. Bib cock, Cistern, Stop cock, Wheel volve, Gat volve etc. | | LS | 2000 |
| 10. | Misc. Hacksaw frame and others | | LS | 2000 |

FOUNDRY SHOP

| | | | | |
|-----|-----------------------------------|---------|--|------|
| 1. | Moulding boxes | 25 | | 6000 |
| 2. | Ladles | 5 | | 1000 |
| 3. | Tool kits | 10 sets | | 2500 |
| 4. | Quenching tanks water or oil | 2 | | 1000 |
| 5. | Permeability tester | 1 | | 1000 |
| 6. | Mould hardness tester | 1 | | 6000 |
| 7. | Sand tensile testing equipment | 1 | | 7500 |
| 8. | Portable grinders | 1 | | 3000 |
| 9. | Temperature recorders/controllers | LS | | 5000 |
| 10. | Pit furnace with Blower | 1 | | 5000 |

MACHINE SHOP

| | | | | |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------|--------|
| 1. | Lathe machine 4.5 feet "V" bed. Height of centers 8.5 inch. Dog chuck 8 inch complete 1 H.P. motor 440v, push button starter with coolant pump, tray and with standard accessories. | 2 | 25000 | 50000 |
| 2. | Shaper machine 12 inch stroke with 2 H.P. motor 440 volts push button starter with vice 6 inch (Swivel base) | 1 | 20000 | 200000 |

NOTE:-

The institutes running mechanical engg. course need not purchase these two items separately because they will have one complete machine shop for the course

PLASTIC PROCESSING LAB-I & II

| Sr.No. | Name of Equipment | No. | @ Rs. | Amt. in Rs. |
|--------|----------------------------------------------------------------------------------------|-------------|---------------|-------------|
| 1. | Hand injection moulding Machine With heaters and (15gm/20gm./25gm.) Temp. controllers. | 3 | 10000 | 30000 |
| 2. | Hand blow moulding machine (15gm./30gm.) | 2 nos. each | 10000 | 40000 |
| 3. | Semi-automatic moulding/ Blow moulding machine (15gm.) | 1 | 1.5lakhs | 1.5lakhs |
| 4. | Hand compression moulding Machine (20 ton) | 1 | 60000 | 60000 |
| 5. | Automatic compression Moulding machine- (30ton) | 1 | 3lakhs | 3lakhs |
| 6. | Vacuum forming m/c (smallest size) single chamber | 1 | 2lakhs | 2lakhs |
| 7. | Scrap grinding m/c (small) | 1 | 50000 | 50000 |
| 8. | PVC Welding m/c/hot welding Machine. | 2 | 20000 | 20000 |
| 9. | Different moulds for all Machines. | - | 20000/moulds. | |
| 10. | Extruder machine (one inch) | 1 | 10lakhs | 10lakhs |
| 11. | gravure printing m/c | 1 | 2lakhs | 2lakhs |
| 12. | Pad printing m/c | 1 | 50000 | 50000 |

PLASTIC TESTING LAB

| Sr.No. | Name of Equipment | No. | @ Rs. | Amt. in Rs. |
|--------|----------------------------------|----------|----------|-------------|
| 1. | Restivity test equipment | 1 | 70000 | 70000 |
| 2. | U.T.M m/c (2ton) | 1 | 1.5lakhs | 1.5lakhs |
| 3. | Impact testing machine | 1 | 40000 | 40000 |
| 4. | Hardness testing machine | 1 | 20000 | 20000 |
| 5. | film dart Impact testing machine | 1 | 25000 | 25000 |
| 6. | Melt flow machine | 1 | 2lakhs | 2lakhs |
| 7. | HDT machine | 1 | 1lakh | 1lakh |
| 8. | Software's as per requirements | one each | - | 5lakhs |

COMPUTER AIDED MOULD DESIGN LAB:

| Sr.No. | Name of Equipment | No. | @ Rs. | Amt. in Rs. |
|--------|------------------------------------------|-----|--------|------------------|
| 1. | Inventor software (auto desk-multi user) | 1 | 3lakhs | 3lakhs. (aprox.) |
| 2. | Mould creator | 1 | | |
| 3. | Mould flow software | 1 | | |

LIST OF LABORATORY EQUIPMENT(Energy Conservation)

| Sr. No | Particulars | Qty | Estimated Cost (Rs) |
|---------------|---------------------------------------------------------------------|------------|----------------------------|
| 1. | Multimeter | 1 | 17,000 |
| 2. | Power Analyzer | 1 | 20,000 |
| 3. | Luxmeter | 1 | 5,000 |
| 4. | Black Box (for checking lamp efficacy including stand and luxmeter) | 1 | 25,000 |
| 5. | Centrifugal pump, 1 kW | 1 | 15,000 |
| 6. | Variable Frequency drive | 2 | 50,000 |
| 7. | Water Flow meter | 1 | 10,000 |
| 8. | <i>Pressure Gauge</i> | 1 | 2,000 |
| 9. | Experimental Set up for Valve Throttling vs VFD | 1 | 50,000 |
| 10. | Compressor, 20 cfm, single-stage | 1 | 50,000 |
| 11. | Air leakage meter | 1 | 18,000 |
| 12. | Blower (2 HP) | 1 | 8,000 |

ANNEXURE - I

FIELD EXPOSURE - I

Plastic & Mould Technology students after First year exam. will undergo a two week Industrial Exposure, (in small scale units at least) arranged and supervised by the institute staff. They may try their hands on simple tools and machines and will incorporate following points in their reports.

1. Name & Address of the unit
2. Date of
 - i. Joining.
 - ii. Leaving.
3. Nature of Industry
 - i. Product.
 - ii. Services.
 - iii. Working Hrs.
4.
 - i. Names of the sections of the unit visited.
 - ii. Number of person engaged.
 - iii. Activities in the section.
 - iv. Name of tools/machines/instruments used.
simple sketch of tools & instruments.
 - v. Source of power.
5.
 - i. What is learnt. (Give on separate field)
 - ii. What interested him most. (Give details)

ANNEXURE - II
FIELD EXPOSURE - II

After IV exam. in the students of Plastic & Mould Technology will have a four week Industrial Training in units not less than small scale industries. It should preferably be arranged in manufacturing (producing moulds, plastic products or their parts), processing organizations. They will work and focus their attention on following points to incorporate them in their reports.

1. Name & Address of the unit
2. Date of
 - i. Joining.
 - ii. Leaving.
3. Nature of Industry
 - i. Product.
 - ii. Services.
 - iii. Working Hrs.
4. Sections of the unit visited and activities there in.
5. Details of machines/Tools & instruments used in working in the section of the unit visited.
6. Work procedure in the section visited.
7. Specifications of the product of the section and materials used.
8. Work of repair and maintenance cell.
9. Details of the shops

10. Name of checking and Inspecting Instruments and their details.
Quality controls measures taken.
11. Details of hydraulics/pneumatic/thermal units or appliances used if any.
12. Description of any breakdown and its restoring.
13. Use of computer
14. Visit of units store, Manner of keeping store items, Their receiving & distribution.
15. Safety measures on work place & working conditions in general - comfortable, convenient & hygienic.

STUDENT ACTIVITIES ON ENERGY CONSERVATION/ENERGY EFFICIENCY

1. Presentations of Case Studies
2. Debate competitions
3. Poster competitions
4. Industrial visits
5. Visual Aids

COURSE OUTCOMES

After studying this course, a student will be able to co-relate and apply fundamental key concepts of energy conservation and energy management in industry, commercial and residential areas. A student will be able to:

- Define principles and objectives of energy management and energy audit.
- Understand Energy Conservation Act 2001 and its features.
- Understand various forms & elements of energy.
- Identify electrical and thermal utilities. Understand their basic principle of operation and assess performance of various equipments.
- Identify areas of energy conservation and adopt conservation methods in various systems.
- Evaluate the techno economic feasibility of the energy conservation technique adopted.

INSTRUCTIONAL STRATEGY

Teachers are expected to lay considerable stress on understanding the basic concepts in energy conservation, principles and their applications. For this purpose, teachers are expected to give simple problems in the class room so as to develop necessary knowledge for comprehending the basic concepts and principles. As far as possible, the teaching of the subject must be supplemented by demonstrations and practical work in the laboratory. Visits to industries must be carried out. Expert from industry must be invited to deliver talks on energy conservation to students and faculty.

REFERENCE BOOKS

1. Guide book on General Aspects of Energy Management and Energy Audit by Bureau of Energy Efficiency, Government of India. Edition 2015
2. Guide book on Energy Efficiency in Electrical Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
3. Guide book on Energy Efficiency in Thermal Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
4. Handbook on Energy Audit & Environmental Management by Y P Abbi&Shashank Jain published by TERI. Latest Edition
5. **Important Links:**
 - (i) Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India. www.beeindia.gov.in.
 - (ii) Ministry of New and Renewable Energy (MNRE), Government of India. www.mnre.gov.in.
 - (iii) Uttar Pradesh New and Renewable Energy Agency (UPNEDA), Government of Uttar Pradesh. www.upneda.org.in.
 - (iv) Central Pollution Control Board (CPCB), Ministry of Environment, Forest and Climate Change, Government of India. www.cpcb.nic.in.
 - (v) Energy Efficiency Services Limited (EESL). www.eeslindia.org.
 - (vi) Electrical India, Magazine on power and electrical products industry. www.electricalindia.in.

RECOMMENDED BOOKS

1) ENVIRONMENT AND POLLUTION IN PLASTIC INDUSTRY:

1. Plastic Waste Management by Nabil Mustufa; Marcel Dekker
2. Chemistry of Waste Management by Clark
3. Elements of Polymer Degradation by Leo Rich and Stivala; McGraw Hill Company
4. Environmental Sanitation by Baljeet S Kapoor; S Chand and Company, New Delhi
5. Introduction to Environmental Engineering and Science by Gilbert M Masters; Prentice Hall of India, New Delhi
6. Recycling and Recovering of Plastics by Brandrup (Hanser Publications)

2) BASICS OF INFORMATION TECHNOLOGY:

1. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Computers Today by SK Basandara, Galgotia publication Pvt ltd. Daryaganj, New Delhi
3. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
4. A First Course in Computer 2003 Edition with CD by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
5. Mastering Windows 95, BPB Publication, New Delhi
6. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
7. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi

3) PLASTICS PROCESSING TECHNIQUES:

1. Basic Engineering Handbook by Michael L Berins
2. Plastic Processing Data Handbook by Rosato and Rosato
3. Process of plastic by A S ATHALYE
4. Plastic Materials, Plastic Processing, Plastic Mould Design Vol I & II By Dr. S. K. Nayak

4) DESIGN OF DIES AND MOULDS:

1. Injection Mould Design by R.C.W Pye; Longman Scientific and Technical Publication
2. Plastic Mould Engineering Hand Book by J. Harry Don Bose and Mayne I pribble, Van Nostrand Reinhold Company Publication
3. Injection Moulding Handbook by Dominick V Rosato and Donald V Rosato
4. Plastic Engineering Handbook by Joel Frados; Van Nostrand Reinhold Company Publication.
5. Plastic Engineering by RJ Crawford; Maxwell Macmillan International edition Publication
6. Injection Mould Design by R.C.W Pye; Longman Scientific and Technical Publication
7. Plastic Mould Engineering Hand Book by J. Harry Don Bose and Mayne I pribble, Van Nostrand Reinhold Company Publication
8. Injection Moulding Handbook by Dominick V Rosato and Donald V Rosato
9. Plastic Engineering Handbook by Joel Frados; Van Nostrand Reinhold Company Publication
10. Plastic Engineering by RJ Crawford; Maxwell Macmillan International editions Publication
11. S.P.I. Hand Book of Plastics by J. Frados.

5) ENGINEERING AND SPECIALITY POLYMERS, PLASTIC MATERIALS:

1. Polymer Science & Technology by Premamoy Ghosh
2. Polymer Blends and Alloys by Arends
3. Polymers Science & Technology by JR Fried
4. Plastics Materials by Brydson, PHI Publication
5. Engineering Polymers by Dyson, PHI Publication
6. Polymer Materials and Processing by Jean Michael Charrier.

6) PLASTIC TESTING AND QUALITY CONTROL:

1. Testing of Plastics by Roger Brown
2. Plastics – Materials and Processing by A brentstrong
3. Plastics Testing by Vishu Shah
4. Identification of Plastics by CIPET
5. Identification of Plastics by AS Athalye

7) ENGINEERING METROLOGY AND MEASUREMENTS:

1. Jain R.K., Engineering Metrology, Khanna Publishers.
2. Alan S. Morris, The Essence of Measurement, Prentice Hall of India.
3. Gupta S.C, Engineering Metrology, Dhanpat rai Publications.
4. Jayal A.K, Instrumentation and Mechanical Measurements, Galgotia Publications.
5. Beckwith T.G, and N. Lewis Buck, Mechanical Measurements, Addison Wesley.
6. Donald D Eckman, Industrial Instrumentation, Wiley Eastern.

8) MATERIALS AND METALLURGY:

1. Material Science by GBS Narang, Khanna Publishers, New Delhi.
2. Material Science and Metallurgy by RB Choudary, Khanna Publishers, New Delhi.

3. Material Science by RK Rajput; SK Kataria and Sons, Delhi.
4. Materials and Matallurgy by D.S. Nutt. SK Kataria and Sons, Delhi.

9) HYDRAULIC AND PNEUMATIC SYSTEMS:

1. Hydraulics and hydraulic machines by Sarao and Khosla.
2. Hydraulics and Hydraulic machine by D.R. Malhotra.
3. Fluid Power and Tribology by Anil Agarwal and ML Bhatia, Scientific Publishers (India), Jodhpur – 342 001.
4. Hydraulics & Fluid Mechanics by Dr. Jagdish Lal; Metropolitan Book Co. Pvt., Ltd.
5. Hydraulics by R.S Khurmi.
6. Hydraulics: Fluid Mechanics and Fluid Machines by S. Ramamurthan; Dhanpat Rai & Sons, Delhi.

QUESTIONNAIRE

INSTITUTE OF RESEARCH, DEVELOPMENT AND TRAINING U.P.KANPUR -208002

SUBJECT: Questionnaire for ascertaining the job potential and activities of diploma holder in Plastic Mould Technology...

PURPOSE: New development of Three Year Diploma curriculum in Plastic Mould Technology.

- ❖ NOTE: (1). Please answers the questions to the points given in the questionnaire.
(2). Any other point or suggestion not covered in this questionnaire may be written on a separate paper and enclosed with the questionnaire.

1. Name of the organisation: _____

2. Name & Designation of the officer _____
Filling the questionnaire _____

3. Name of the Department/section _____

4. Important functions of the _____
Department/section _____

5. Number of diploma holder employees _____
under your charge in the area of _____
Plastic Mould Technology..

6. Please give names of latest equipments/machines handled by a
Diploma holder in Plastic Mould Technology..

| | | |
|----|----|----|
| 1. | 2. | 3. |
| 4. | 5. | 6. |

7. What proficiencies are expected from a diploma holder in
Plastic Mould Technology..

| | | |
|----|----|----|
| 1. | 2. | 3. |
| 4. | 5. | 6. |

8. Mention the approximate percentage of the following desired in

Diploma teaching.

- 1. Theoretical knowledge -----%
- 2. Practical knowledge -----%
- 3. Skill Development -----%

9. Do you think “on the job training” / Industrial training should form a part of curriculum. (Yes/ No)

if yes then

- (a) Duration of training: -----
- (b) Mode of training
 - 1. Spread over different years
 - 2. after completion of course
 - 3. Any other mode

10. What mode of recruitment is followed by your organisation?

- 1. Academic merit
- 2. Written test
- 3. Group discussion
- 4. Interview
- 5. on the job test.

11. Mention the capabilities/ Qualities looked for while recruiting diploma holder in Plastic Mould Technology..

- (a) Technical knowledge -----
- (b) Practical skill -----
- (c) Etiquettes and behaviour -----
- (d) Aptitude -----
- (e) Health habit and social background -----
- (f) Institution where trained -----

12. Does your organisation have any system for the survey of domestic articles of different countries/States. Yes/No

13. Does your organisation conduct field survey to know users views regarding. Yes/No

- 1. Domestic Articles for different age groups and sex.
- 2. Effect of climatic conditions
- 3. Any other

If yes; Please give brief account of each.-----

