# Curriculum

Three Year (Six Semesters) Diploma Course In

# PRINTING TECHNOLOGY

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Semester System

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Prepared by:

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Curriculum Development Cell

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

**To be**

**Approved and Implemented by B.T.E.**

**U.P.**



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## PREFACE

An important issue generally debated amongst the planners and educators world over is how technical education can contribute to sustainable development of the societies struggling hard to come in the same bracket as that of the developed nations. The rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In India, a shift has taken place from the forgettable years of closed economy to knowledge based and open economy in the last few decades. In order to cope with the challenges of handling new technologies, materials and methods, we have to develop human resources having appropriate professional knowledge, skills and attitude. Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Now it is time to consolidate and infuse quality aspect through developing human resources, in the delivery system. Polytechnics play an important role in meeting the requirements of trained technical manpower for industries and field organizations.

In order to meet the requirements of future technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of diploma programmes. The curricula for diploma programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of diploma programme.

The real success of the diploma programme depends upon its effective implementation. How ever best the curriculum document is designed, if that is not implemented properly, the output will not be as expected. In addition to acquisition of appropriate physical resources, the availability of motivated, competent and qualified faculty is essential for effective implementation of the curricula.

It is expected of the polytechnics to carry out job market research on a continuous basis to identify the new skill requirements, reduce or remove outdated and redundant courses, develop innovative methods of course offering and thereby infuse the much needed dynamism in the system.

K. Ram
Director
I.R.D.T. Kanpur


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Ravindra Kumar

Dr. A.P. Singh
Research Assistant
Coordinator

I.R.D.T.

## 1. SALIENT FEATURES OF DIPLOMA PROGRAMME IN PRINTING TECHNOLOGY

1) Name of the Programme : Diploma Programme in Printing Technology

2) Duration of the Programme : Three years (Six Semesters)

3) Entry Qualification : Matriculation or equivalent NSQF Level as Prescribed by State Board of Technical Education,UP

4) Intake : 60 (or as prescribed by the Board)

5) Pattern of the Programme : Semester Pattern

6) NSQF Level : Level - 5

7) Ratio between theory and : 47 : 53 (Approx.)

*Practice*

8) Industrial Training:

Four weeks of industrial training is included after IV semester during summer vacation. Total marks allotted to industrial training will be 50.

9) Ecology and Environment :

As per Govt. of India directives, a subject on Environmental Studies has been incorporated in the curriculum.

10) Energy Conservation:

A subject on Energy Conservation has been incorporated in the curriculum.

11) Entrepreneurship Development:

A full subject on Industrial Management and Entrepreneurship Development has been incorporated in thecurriculum.

12) Student Centred Activities:

A provision of 3-6 periods per week has been made for organizing Student Centred Activities for overall personality development of students. Such activities will comprise of co–curricular activities such as expert lectures, self study, games, hobby classes like photography, painting, singing etc. seminars, declamation contests, educational field visits, NCC, NSS and other cultural activities, disaster management and safetyetc.

13) Project work

A project work has been included in the curriculum to enable the student get familiarize with the practicesand procedures being followed in the industries and provide an opportunity to work on some live projectsin the industry.



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## 2. EMPLOYMENT OPPORTUNITIES FOR DIPLOMA HOLDERS IN PRINTING TECHNOLOGY

The following are the major employment opportunities for diploma holders in PRINTING TECHNOLOGY:

1. Packaging Industries.
2. Government Presses.
3. Security Presses.
4. Currency Presses.
5. Advertisement Agencies.
6. Government Mints.
7. Publication Sector.
8. Proof Reading Sector.
9. Defense Sector.
10. Banking Sector.
11. Outsourcing Agencies.
12. Newspaper Organisations.
13. Design Studios.
14. Education & Research Sector.
15. Teaching Professionals in different colleges & Universities.
16. Textile Market.
17. Pharmaceutical & Health Care.
18. Software Industries.
19. Service Provider Industries.
20. Free Lancer.


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## 3. LEARNING OUTCOMES OF DIPLOMA PROGRAMME IN PRINTING TECHNOLGY

After undergoing this programme, students will be able to:

| | |
|---|---|
| 1. | Understanding of the fundamentals of printing technology, including printing processes, ink types, and paper properties. |
| 2. | Knowledge of printing industry safety procedures and guidelines. |
| 3. | Familiarity with the design and prepress process for printed materials. |
| 4. | Ability to operate and maintain various types of printing presses, including letterpress, offset, silk screen, flexographic, gravure, and digital. |
| 5. | Understanding of color theory and color management in printing. |
| 6. | Familiarity with printing substrates, including paper, plastic, and metal. |
| 7. | Ability to troubleshoot printing issues and optimize print quality. |
| 8. | Familiarity with finishing processes, such as cutting, folding, and binding. |
| 9. | Knowledge of the various printing market segments, such as packaging, commercial printing, and publishing. |
| 10. | Ability to estimate print costs and provide quotes for printing jobs. |
| 11. | Understanding of the environmental impact of printing and knowledge of sustainable printing practices. |
| 12. | Knowledge of digital printing technologies, including variable data printing and web-to-print. |
| 13. | Familiarity with printing software, such as Adobe Creative Suite, and prepress software, such as illustrator, InDesign etc. |
| 14. | Ability to operate and maintain post-press equipment, such as cutting machine and die-cutters. |
| 15. | Understanding of the principles of typography and layout design. |
| 16. | Interpret factory acts and laws. |
| 17. | Ability to communicate effectively with clients, coworkers, and vendors. |
| 18. | Understanding of quality control processes in printing. |
| 19. | Ability to analyze customer needs and recommend appropriate printing solutions. |



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| | |
|---|---|
| 20. | Familiarity with printing industry trends and technological advancements. |
| 21. | Understanding of print production workflows and process optimization. |
| 22. | Knowledge of color calibration and profiling techniques. |
| 23. | Familiarity with packaging design and printing processes. |
| 24. | Ability to manage multiple printing projects simultaneously. |
| 25. | Understanding of the role of print in marketing and communication. |
| 26. | Use computer and IT tools for creating document, making spread sheet and Making presentation. |
| 27. | Ability to troubleshoot and repair printing equipment. |
| 28. | Familiarity with different types of inks and their properties. |
| 29. | Maintain and repair printing equipment to ensure smooth and uninterrupted production. |
| 30. | Understanding of the importance of branding in print design. |
| 31. | Knowledge of the printing sales process and customer relationship management. |
| 32. | Understanding of the role of printing in e-commerce and online retail. |
| 33. | Ability to work effectively in a team environment. |
| 34. | Familiarity with international printing standards and requirements. |
| 35. | Knowledge of industry-specific regulations and guidelines, such as those governing food packaging. |
| 36. | Understanding of the impact of digital media on print production. |
| 37. | Ability to manage inventory and materials for print production. |
| 38. | Complete finishing processes, such as cutting, folding, and binding. |
| 39. | Operate and maintain digital printing technologies, including variable data printing and web-to-print. |
| 40. | Understand the impact of digital media on print production to adapt to changing technological trends. |
| 41. | Knowledge of intellectual property laws and copyright requirements in print production. |


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**4.** DERIVING CURRICULUM AREAS FROM LEARNING OUTCOMES OF THE PROGRAMME

The following curriculum areas/subjects have been derived from learning outcomes:

| S. N. | Learning Outcomes | Curriculum Areas/Subjects |
|---|---|---|
| 1. | Prepare & interpret drawing of engineering components. | – Engineering Drawing-I |
| 2. | Learn the mechanical and electrical components, understand electrical terms. | -Basic Engineering |
| 3. | Study about designing factors of different printed products and typographical elements. | - Graphic Design and Typography |
| 4. | Brief explanation about lithographic, gravure, screen and digital printing. | - Printing Process -I |
| 5. | Understand the machine parts and types of maintenance. | Machine Maintenance |
| 6. | Understand the basics concepts of all printing process, and brief knowledge about letter press and flexography printing. | – Printing Process -II |
| 7. | Use different materials and identify the photographic emulsion, subtracts and ink. | – Printing Science |
| 8. | Understanding about original, colour elements and designing of various display materials. | – Printing Design |
| 9. | All types of image carrier used in relif printing processes. | – Image Carrier Technology-I |
| 10. | Study about lay out & page impostion scheme by prepress department | – Process Planning & Film Assembly |
| 11. | Understanding the fundamental of graphic reproduction, light sensitive film processing line negative making and half tone screening. | – Graphic Reproduction Technology |
| 12. | To learn about different composing system, Text & image setting by different latest software, file storing system, RIP the file. | – Text & image Setting |
| 13. | Study image carriers use in offset, gravure flexo, screen printing process. | – Image Carrier Technology -II |
| 14. | Use different binding materials tools, equipments, Machines, binding operations & sewing & prepare different end papers for hand band books | – Binding & Finishing Technology |



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| | | |
|---|---|---|
| 15. | Studying about gravure process and how to use for printing large volumes of magazine, catalogues and packaging. | – Gravure Process And Technology |
| 16. | Understanding the basic principal of colour separation, colour correction techniques and quality control tools. | – Color Separation Technology |
| 17. | Understand the basics as well as advance concepts of flexographic process, components and its impact on printing process. | – Flexography Process And Technology |
| 18. | How to package the different typs of products. | – Packaging Technology |
| 19. | To learn about book format & designing of cover , text by latest software, production of book by different process. | – Book Design & Print production |
| 20. | Understand & selection of digital printing process and understand digital printing fundamentals & modern printing advancement. | – Modern Printing technology |
| 21. | To understand the calculations of the costing and estimating of the business and tender process in Govt. sectors. | – Printing Costing & Estimating |
| 22. | Use appropriate practices for conservation of energy and prevention of environment Pollution. | – Environmental Studies<br>– Energy Conservation |
| 23. | Interpret factory acts and laws. | – Industrial Management and Entrepreneurship Development |
| 24. | Communicate effectively in English in oraland written form with others. | – Communication Skills<br>– Student Centred Activities (SCA) |
| 25. | Manage resources effectively at workplace. | – Industrial Management and Entrepreneurship Development |
| 26. | Plan and execute given task/project as a team Member or leader. | – Industrial Engineering and Safety |
| 27. | Prepare detailed project proposal and report. | – Project Work |
| 28. | Use computer and IT tools for creating document, making spread sheet and making Presentation. | – Basics of Information Technology |
| 29. | Solve real life problems by application of acquired knowledge and skills. | – Project Work<br>– Repair and Maintenance |
| 30. | Handle the customers effectively. | – Industrial Management and Entrepreneurship Development |
| 31. | Apply basic principles of Mathematics and Science to solve engineering problems. | – Applied Mathematics<br>– Applied Physics<br>– Applied Chemistry |
| 32. | Apply inventory control techniques to reduce | – Industrial Engineering and Safety |


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## 5. ABSTRACT OF CURRICULUM AREAS

### a) General Studies

1. Communication Skills
2. Environmental Studies
3. Energy Conservation

**b)** Applied Sciences

4. Applied Mathematics
5. Applied Physics
6. Applied Chemistry

**c)** Basic Courses in Engineering/Technology

7. Engineering Drawing
8. Machine Maintenance
9. General Engineering
10. Basics of Information Technology

**d)** Applied Courses in Engineering/Technology

11. Graphic Design and Typography
12. Printing Process -I
13. Printing Process -II
14. Printing Science
15. Printing Design
16. Image Carrier Technology-I
17. Graphic Reproduction Technology
18. Industrial Management and Entrepreneurship Development
19. Text & image Setting
20. Sheet Fed Offset Technology
21. Image Carrier Technology -II
22. Binding & Finishing Technology
23. Gravure Process and Technology
24. Color Separation Technology
25. Web Offset Technology
26. Process Planning & Film assembly
27. Printing Costing & Estimating
28. Modern Printing technology
29. Book Design & Print production


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30. Packaging Technology
31. Flexography Process and Technology
32. Process Planning & Film assembly

**e)** Industrial Training/Project

33. Project Work
34. Industrial Training

## 6 GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 30 as it involves a lot ofsubjectivity in the evaluation. The marks may be distributed as follows:

i. 10 Marks for general behaviour and discipline
(by HODs in consultation with all the teachers of the department)

ii. 5 Marks for attendance as per following:
(by HODs in consultation with all the teachers of the department)

| | | |
|---|---|---|
| a) | 75 - 80% | 2 Marks |
| b) | 80 - 85% | 4 Marks |
| c) | Above 85% | 5 Marks |

iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/ NSS activities as perfollowing:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)

| | | | |
|---|---|---|---|
| a) | 15 | - | State/National Level participation |
| b) | 10 | - | Participation in two of above activities |
| c) | 5 | - | Inter-Polytechnic level participation |

Note: There should be no marks for attendance in the internal sessional of different subjects.

## 7. STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN PRINTING TECHNOLOGY

**FIRST SEMESTER**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P/drg | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 1.1 | *Communication skills -I | 6 | - | 3 | 4 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 1.2 | *Applied Mathematics-I | 6 | - | - | 4 | 20 | - | 20 | 50 | 2.5 | - | - | 50 | 70 |
| 1.3 | *Applied Physics -I | 6 | - | 2 | 5 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 1.4 | *Applied Chemistry | 6 | - | 2 | 5 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 1.5 | *Engineering Drawing-I | - | - | 8 | 2 | - | 40 | 40 | 60 | 3 | - | - | 60 | 100 |
| 1.6 | Printing Process -I | 4 | - | 4 | 5 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| # Students Centred Activities | | - | - | 1 | 1 | - | 30 | 30 | - | - | - | - | - | 30 |
| **Total** | | **28** | | **20** | **26** | **105** | **125** | **230** | **310** | **-** | **110** | **-** | **420** | **650** |

* Common with other diploma programmes.

# Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self-study etc

**SECOND SEMESTER**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P/drg | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 2.1 | *Applied Mathematics -II | 5 | - | - | 4 | 20 | - | 20 | 50 | 2.5 | - | - | 50 | 70 |
| 2.2 | *Applied Physics -II | 5 | - | 2 | 5 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 2.3 | Basic Engineering | 4 | - | 4 | 5 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 2.4 | Graphic Design and Typography | 5 | - | 4 | 6 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 2.5 | Printing Process -II | 5 | - | 4 | 6 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 2.6 | Machine Maintenance | 4 | - | 4 | 2 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| #Student Centered Activities (SCA) | | - | - | 2 | 1 | - | 30 | 30 | - | - | - | - | - | 30 |
| **Total** | | **28** | **-** | **20** | **29** | **140** | **140** | **280** | **300** | | **220** | **-** | **520** | **800** |

# Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self-study etc.



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**THIRD SEMESTER**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P/drg | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 3.1 | *Environmental Studies | 3 | - | 2 | *3* | 20 | *10* | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 3.2 | *Applied Mathematics -III | *5* | - | - | *4* | *20* | - | 20 | 50 | 2.5 | - | - | 50 | 70 |
| 3.3 | Printing Science | 5 | - | 3 | *5* | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 3.4 | Printing Design | *4* | - | 4 | *5* | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 3.5 | Image Carrier Technology-I | *4* | - | 3 | *5* | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 3.6 | *Basics of information technology | - | - | 6 | *2* | - | 20 | 20 | - | 2.5 | 50 | 3 | 50 | 70 |
| 3.7 | Graphic Reproduction Technology | *4* | - | 4 | *4* | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| #Student Centered Activities (SCA) | | - | - | 1 | *1* | - | 30 | 30 | - | - | - | - | - | 30 |
| **Total** | | **25** | **-** | **23** | **29** | **140** | **160** | **300** | **300** | **-** | **270** | **-** | **570** | **870** |

# Student Centered Activities will comprise of co-curricular activities like extension lectures, self-study, games, hobby clubs e.g. Photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.



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**FOURTH SEMESTER**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P/drg | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 4.1 | Communication Skills -II | 4 | - | 2 | 4 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 4.2 | Text & image Setting | 4 | - | 4 | *5* | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 4.3 | Sheet Fed Offset Technology | 4 | - | 4 | *5* | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 4.4 | Image Carrier Technology - II | 4 | - | 4 | *4* | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 4.5 | Binding & Finishing Technology | 5 | - | 4 | *5* | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 4.6 | Gravure Process And Technology | 4 | - | 4 | *4* | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| #Student Centered Activities (SCA) | | | | 1 | *1* | - | 30 | 30 | - | - | - | - | - | 30 |
| **Total** | | **25** | | **23** | **28** | **145** | **165** | **310** | **300** | | **270** | | **570** | **880** |

* Common with other diploma programmes

- **4 weeks Field Exposure (Industrial Training) will be organised after 4th Semester exam.** # Student Centered Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g.photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.



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**FIFTH SEMESTER**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P/drg | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| | Industrial Training | - | - | - | 2 | - | - | - | - | - | 50 | - | 50 | 50 |
| 5.1 | Color Separation Technology | 4 | - | 4 | 4 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 5.2 | Web Offset Technology | 5 | - | 4 | 5 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 5.3 | Process Planning & Film assembly | 4 | - | 4 | 4 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 5.4 | Flexography Process And Technology | 5 | - | 5 | 5 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 5.5 | Universal Human Values | 2 | - | 1 | 3 | - | 20 | 20 | - | - | 30 | 3 | 30 | 50 |
| 5.6 | Packaging Technology | 4 | - | 4 | 4 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| # Student Centered Activities (SCA) | | - | - | 2 | 2 | - | 30 | 30 | - | - | - | - | - | 30 |
| **Total** | | **24** | | **24** | **29** | **125** | **175** | **300** | **250** | | **330** | | **580** | **880** |

* Common with other diploma programme

\# Student Centered Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.



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**SIXTH SEMESTER**

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P/drg | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 6.1 | Book Design & Print production | 6 | - | 6 | 5 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 6.2 | Modern Printing technology | 6 | - | 4 | 4 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 6.3 | Energy Conservation | 3 | - | 2 | 4 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 6.4 | Printing Costing & Estimating | 6 | - | - | 5 | 25 | - | 25 | 75 | 2.5 | - | - | 75 | 100 |
| 6.5 | Industrial Management & Entrepreneurship development | 5 | - | - | 4 | 20 | - | 20 | 50 | 2.5 | - | - | 50 | 70 |
| 6.6 | Project Work | - | - | 8 | 5 | - | 50 | 50 | - | - | 100 | 3 | 100 | 150 |
| #Student Centered Activities (SCA) | | | | 2 | 2 | | 50 | 50 | | | | | | 30 |
| **Total** | | **26** | | **22** | **29** | **115** | **140** | **255** | **275** | | **220** | | **495** | **750** |

# Student Centered Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc



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STUDY AND EVALUATION SCHEME FOR LATERAL AND ITI PASSED STUDENTS DIPLOMA COURSE IN PRINTING TECHNOLOGY (SIX SEMESTER)

THIRD SEMESTER

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P/drg | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 3.1 | *Environmental Studies | 3 | - | 2 | 3 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 3.2 | *Applied Mathematics -III | 5 | - | - | 4 | 20 | - | 20 | 50 | 2.5 | - | - | 50 | 70 |
| 3.3 | Printing Science | 5 | - | 3 | 5 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 3.4 | Printing Design | 4 | - | 4 | 5 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 3.5 | Image Carrier Technology-I | 4 | - | 3 | 5 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 3.6 | *Basics of information technology | - | - | 6 | 2 | - | 20 | 20 | - | 2.5 | 50 | 3 | 50 | 70 |
| 3.7 | Graphic Reproduction Technology | 4 | - | 4 | 4 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| #Student Centered Activities (SCA) | | - | - | 1 | 1 | - | 30 | 30 | - | - | - | - | - | 30 |
| **Total** | | **25** | **-** | **23** | **29** | **140** | **160** | **300** | **300** | **-** | **270** | **-** | **570** | **870** |

# Student Centered Activities will comprise of co-curricular activities like extension lectures, self-study, games, hobby clubs e.g. Photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

A. COMPULSORY SUBJECT OF I Semester PRINTING TECHNOLOGY TO BE TAUGHT IN III Semester TO ITI PASSED STUDENTS OF TRADES ARE AS FOLLOWS:

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P/drg | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 1.1 | *Communication skills -I | 6 | - | 3 | 4 | - | - | - | 50 | 2.5 | 20 | 3 | 70 | 70 |
| 1.2 | *Applied Mathematics-I | 6 | - | - | 4 | - | - | - | 50 | 2.5 | - | - | 50 | 50 |
| 1.3 | *Applied Physics -I | 6 | - | 2 | 5 | - | - | - | 50 | 2.5 | 20 | 3 | 70 | 70 |
| 1.4 | *Applied Chemistry | 6 | - | 2 | 5 | - | - | - | 50 | 2.5 | 20 | 3 | 70 | 70 |
| **Total** | | **24** | | **07** | **14** | **-** | **-** | **-** | **200** | **-** | **60** | **-** | **260** | **260** |

NOTE:- (1) (*) It is compulsory to appear & to pass in examination From III Semester To VI Semester, But marks will not be included for division and percentage of obtained marks.
(2) (*) Four Semester (Two Years) of Extra Time will be given after diploma curriculum period (If Required) to pass the above paper (1.1 To 1.4 and 2.1 to 2.3) examination (As Per G. O. No. 2221/16-Pra.Shi.3-2009 Dated 28-08-2009) & Revised G.O. No. 2704/16-Pra.Shi.-3- 2013-46(8)/2002 Dated 09-01-2013 and G.O. No. 9/2018/2182/Solaha-3-2017-46(08)/2020 Dated 16.01.2018.

FOURTH SEMESTER

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P/drg | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 4.1 | Communication Skills -II | 4 | - | 2 | 4 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 4.2 | Text & image Setting | 4 | - | 4 | 5 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 4.3 | Sheet Fed Offset Technology | 4 | - | 4 | 5 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 4.4 | Image Carrier Technology - II | 4 | - | 4 | 4 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 4.5 | Binding & Finishing Technology | 5 | - | 4 | 5 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 4.6 | Gravure Process And Technology | 4 | - | 4 | 4 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| #Student Centered Activities (SCA) | | | | 1 | 1 | - | 30 | 30 | - | - | - | - | - | 30 |
| **Total** | | **25** | | **23** | **28** | **145** | **165** | **310** | **300** | | **270** | | **570** | **880** |

* Common with other diploma programmes

- 4 weeks Field Exposure (Industrial Training) will be organised after 4th Semester exam. # Student Centered Activities will comprise of cocurricular activities like extension lectures, self study, games, hobby clubs e.g.photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

B. COMPULSORY SUBJECT OF I Semester PRINTING TECHNOLOGY TO BE TAUGHT IN III Semester TO ITI PASSED STUDENTS OF TRADES ARE AS FOLLOWS:

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P/drg | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 2.1 | *Applied Mathematics -II | 5 | - | - | 4 | - | - | - | 50 | 2.5 | - | - | 50 | 50 |
| 2.2 | *Applied Physics -II | 5 | - | 2 | 5 | - | - | - | 50 | 2.5 | 20 | 3 | 70 | 70 |
| 2.3 | Basic Engineering | 4 | - | 4 | 5 | - | - | - | 50 | 2.5 | 50 | 3 | 100 | 100 |
| **Total** | | **15** | **-** | **06** | **14** | **-** | **-** | **-** | **150** | | **70** | **-** | **220** | **220** |

Note : :-(1) (*) It is compulsory to appear & to pass in examination From III Semester To VI Semester, But marks will not be included for division and percentage of obtained marks.
(2) (*) Four Semester (Two Years) of Extra Time will be given after diploma curriculum period (If Required) to pass the above paper (1.1 To 1.4 and 2.1 to 2.3) examination (As Per G. O. No. 2221/16-Pra. Shi.-3-2009 Dated 28-08-2009) & Revised G.O. No. 2704/16-Pra.Shi.-3- 2013-46(8)/2002 Dated 09-01-2013 and G.O. No. 9/2018/2182/Solaha-3-2017-46(08)/2020 Dated 16.01.2018.
(3) Each period will be 50 minutes duration.
(4) Each session will be of 16 weeks.
(5) Effective teaching will be at least 14 weeks.
(6) Remaining periods will be utilised for revision etc.

FIFTHSEMESTER

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P/drg | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| | Industrial Training | - | - | - | 2 | - | - | - | - | - | 50 | - | 50 | 50 |
| 5.1 | Color Separation Technology | 4 | - | 4 | 4 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 5.2 | Web Offset Technology | 5 | - | 4 | 5 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 5.3 | Process Planning & Film assembly | 4 | - | 4 | 4 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 5.4 | Flexography Process And Technology | 5 | - | 5 | 5 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 5.5 | Universal Human Values | 2 | - | 1 | 3 | - | 20 | 20 | - | - | 30 | 3 | 30 | 50 |
| 5.6 | Packaging Technology | 4 | - | 4 | 4 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| # Student Centered Activities (SCA) | | - | - | 2 | 2 | - | 30 | 30 | - | - | - | - | - | 30 |
| **Total** | | **24** | | **24** | **29** | **125** | **175** | **300** | **250** | | **330** | | **580** | **880** |

* Common with other diploma programme

\# Student Centered Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

SIXTHSEMESTER

| Sr. No. | SUBJECTS | STUDY SCHEME Periods/Week | | | Credits | MARKS IN EVALUATION SCHEME | | | | | | | | Total Marks of Internal & External |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL ASSESSMENT | | | EXTERNAL ASSESSMENT | | | | | |
| | | L | T | P/drg | | Th | Pr | Tot | Th | Hrs | Pr | Hrs | Tot | |
| 6.1 | Book Design & Print production | 6 | - | 6 | 5 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 6.2 | Modern Printing technology | 6 | - | 4 | 4 | 25 | 25 | 50 | 50 | 2.5 | 50 | 3 | 100 | 150 |
| 6.3 | Energy Conservation | 3 | - | 2 | 4 | 20 | 10 | 30 | 50 | 2.5 | 20 | 3 | 70 | 100 |
| 6.4 | Printing Costing & Estimating | 6 | - | - | 5 | 25 | - | 25 | 75 | 2.5 | - | - | 75 | 100 |
| 6.5 | Industrial Management & Entrepreneurship development | 5 | - | - | 4 | 20 | - | 20 | 50 | 2.5 | - | - | 50 | 70 |
| 6.6 | Project Work | - | - | 8 | 5 | - | 50 | 50 | - | - | 100 | 3 | 100 | 150 |
| #Student Centered Activities (SCA) | | | | 2 | 2 | | 30 | 30 | | | | | | 30 |
| **Total** | | **26** | | **22** | **29** | **115** | **140** | **255** | **275** | | **220** | | **495** | **750** |

# Student Centered Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc

## 1.1 COMMUNICATION SKILLS – I

| L | T | P |
|---|---|---|
| 6 | - | 3 |

**RATIONALE**

Knowledge of English Language plays an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill.

**LEARNING OUTCOMES**

After undergoing the subject, the students will be able to:

.

- Understand the importance of effective communication
- Describe the process of communication
- Communicate effectively in different contexts
- Identify parts of speech
- Write correct sentences using appropriate vocabulary
- Reproduce and match words and sentences in a paragraph
- Write various types of paragraphs, notices for different purposes and composition on picture with appropriate format
- Read unseen texts with comprehension

.

**DETAILED CONTENTS**

1 Basics of Communication (13 periods)

- 1.1 Definition and process of communication
- 1.2 Types of communication - formal and informal, oral and written, verbal and non-verbal
- 1.3 Communications barriers and how to overcome them
- 1.4 Barriers to Communication, Tools of Communication

2 Application of Grammar (18 periods)

- 2.1 Parts of Speech (Noun, verb, adjective, adverb) and modals
- 2.2 Sentences and its types
- 2.3 Tenses
- 2.4 Active and Passive Voice
- 2.5 Punctuation
- 2.6 Direct and Indirect Speech



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3 Reading Skill (10 periods)

Unseen passage for comprehension (one word substitution, prefixes, suffixes, antonyms, synonyms etc. based upon the passage to be covered under this topic)

4 Writing Skill (15 periods)

4.1 Picture composition
4.2 Writing paragraph
4.3 Notice writing

## LIST OF PRACTICALS

**Note:** Teaching Learning Process should be focused on the use of the language in writing reports and making presentations.
Topics such as Effective listening, effective note taking, group discussions and regular presentations by the students need to be taught in a project oriented manner where the learning happens as a by-product.

**Listening and Speaking Exercises**

1. Self and peer introduction
2. Newspaper reading
3. Just a minute Session-Extempore
4. Greeting and starting a conversation
5. Leave taking
6. Thanking
7. Wishing well
8. Talking about likes and dislikes
9. Group Discussion
10. Listening Exercises.

## INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centred activities in class room and actively participate in listening exercises.

## MEANS OF ASSESSMENT

– Assignments and quiz/class tests, mid-semester and end-semester written tests
– Actual practical work, exercises and viva-voce


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– Presentation and viva-voce

**RECOMMENDED BOOKS**


1. Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; DhanpatRai Publications, New Delhi.
3. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
4. Excellent General English-R.B.Varshnay, R.K. Bansal, Mittal Book Depot, Malhotra
5. The Functional aspects of Communication Skills – Dr. P. Prsad, S.K. Katria & Sons, New Delhi
6. Q. Skills for success – Level & Margaret Books, Oxford University Press.
7. e-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR.


**Websites for Reference:**

1. http://www.mindtools.com/ page 8.html – 99k
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 13 | 24 |
| 2 | 18 | 32 |
| 3 | 10 | 16 |
| 4 | 15 | 28 |
| **Total** | **56** | **100** |

## 1.2 APPLIED MATHEMATICS - I

| L | T | P |
|---|---|---|
| 6 | - | - |

**RATIONALE**

Contents of this course provide fundamental base for understanding elementary mathematics and their uses in solving engineering problems. Contents of this course will enable students to use basic mathematical function like logarithms, partial fractions, matrices and basic 2D, curves in solving various engineering problems of all fields.

**LEARNING OUTCOMES**

After undergoing this course, the students will be able to:

- Apply Binomial theorem to solve engineering problems
- Apply determinants properties and Crammer's rule to solve engineering problems
- Apply dot & cross product of vectors to find the solution of engineering problems
- Use complex numbers in various engineering problems
- Apply differential calculus and higher order to solve engineering problems
- Find velocity, acceleration, errors and approximation in engineering problems with application of derivatives.

**DETAILED CONTENTS**

1. Algebra -I (12 Periods)

   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 (12 Periods)

   2.1 Vector algebra: Dot and Cross product, Scaler and vector triple product.

   2.2 Complex number.
   Complex numbers, Representation, Modulus and amplitude Demoivre theorem, its application in solving algebraic equations, Mod. Function and its properties.

3. Trigonometry (10 Periods)


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3.1 Relation between sides and angles of a triangle: Statement of various formulae showing relationship between sides and angle of a triangle.

3.2 Inverse circular functions: Simple case only

4. Differential Calculus - I (18 Periods)

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, Trigonometric functions, exponential function, Function of a function, Logarithmic differentiation, Differentiation of Inverse trigonometric function, Differentiation of implicit functions.

5. Differential Calculus - II (18 Periods)

5.1 Higher order derivatives, Leibnitz theorem (without proof). Simple applications.

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

**INSTRUCTONAL STRATEGY**

The basic instructional strategy to teach basic mathematics, Binomial theorem, trigonometry, differential equations etc. should be conceptual with real world applications of relevant branch. More numerical and theory examples can be used for clear understanding of the content**.**

**MEANS OF ASSESSMENT**

- Assignments and Quiz/Class Tests
- Mid-term and End-term Written Tests
- Model/Prototype Making

**RECOMMENDED BOOKS**

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
3 Applied Mathematics-I by Chauhan and Chauhan, Krishna Publications, Meerut**.**



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## SUGGESTED DISTRIBUTION OF MARKS

| Topic | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 12 | 20 |
| 2. | 12 | 20 |
| 3. | 10 | 12 |
| 4 | 18 | 24 |
| 5 | 18 | 24 |
| **Total** | **70** | **100** |


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## 1.3 APPLIED PHYSICS – I

| L | T | P |
|---|---|---|
| 6 | - | 2 |

**RATIONALE**

Applied physics includes the study of a diversified topics related to the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this course content.

**Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to learn and appreciate these concepts and principles. In all contents, SI units should be followed.**

**LEARNING OUTCOMES**

After undergoing this course, the students must be able to:

- Identify the use of S.I. system of measurement with accuracy and how it is used in engineering.
- Represent physical quantities as scalars and vectors, applying the physical laws and concepts of linear and circular motion in everyday life.
- Solve difficult problems (walking of man, horse and cart problem, flying of bird/ aircraft, etc.).
- Analyse and design banking of roads/railway tracks and apply conservation of momentum principle to Explain rocket propulsion, recoil of gun etc.
- Derive work, power and energy relationship and solve problems about work and power.
- Define work, energy and power and their units.
- Describe conservation of energy and its applications.
- Understand the concept of rotational motion of a rigid body and its applications.
- Apply the physical laws and concepts of gravity, its variation with longitude and latitude and its uses in space satellite etc.
- Understand the concept of elasticity, surface tension, pressure and the laws governing movement of fluids.
- Express physical work in term of heat and temperature; Measure temperature in various processes on different scales (Celsius, Kelvin, Fahrenheit etc.)
- Distinguish between conduction, convection and radiation, identify the different methods for reducing heat losses.
- Understand the laws of thermodynamics, Carnot cycle and their applications.


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## DETAILED CONTENTS

1. Units and Dimensions (10 Periods)

1.1 Need of Measurement in engineering and science, unit of a physical quantities - fundamental and derived units, systems of units (FPS, CGS and SI units).
1.2 Dimensions and dimensional formulae of physical quantities.
1.3 Principle of homogeneity of dimensions.
1.4 Dimensional equations and their applications, conversion of numerical values of physical quantities from one system of units into another, checking the correctness of physical equations and deriving relations among various physical quantities.
1.5 Limitations of dimensional analysis.
1.6 Error in measurement, accuracy and precision of instruments, random and systematic errors, absolute error, relative error, and percentage error, Estimation of probable errors in the results of measurement (combination of errors in addition, subtraction, multiplication, division and powers), rules for representing significant figures in calculation.
1.7 Application of units and dimensions in measuring length, diameter, circumference, volume, surface area etc. of metallic and non-metallic blocks, wires, pipes etc (at least two each).

2. Force and Motion (10 periods)

2.1 Scalar and vector quantities – examples, representation of vector, types of vectors.
2.2 Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only), Scalar and Vector Product.
2.3 Resolution of Vectors and its application to lawn roller.
2.4 Force, Momentum, Statement and Derivation of Conservation of linear momentum, its applications such as recoil of gun.
2.5 Impulse and its Applications.
2.6 Circular motion (Uniform and Non-uniform), definition of angular displacement, angular velocity, angular acceleration, frequency, time period.
2.7 Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical)
2.8 Central force, Expression and Applications of Centripetal and centrifugal forces with examples such as banking of roads and bending of cyclist, Principle of centrifuge.
2.9 Application of various forces in lifts, cranes, large steam engines and turbines.

3. Work, Power and Energy (10 periods)


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3.1 Work: and its units, examples of zero work, positive work and negative work, conservative and non-conservative force.

3.2 Friction: modern concept, types, laws of limiting friction, Coefficient of friction and its Engineering Applications.

3.3 Work done in moving an object on horizontal and inclined plane for rough and plane surfaces with its applications.

3.4 Energy and its units: Kinetic energy and potential energy with examples and their derivation, work energy theorem.

3.5 Principle of conservation of mechanical energy for freely falling bodies, examples of transformation of energy.

3.6 Power and its units, calculation of power in numerical problems.

3.7 Application of Friction in brake system of moving vehicles, bicycle, scooter, car trains etc.

4 Rotational Motion (10 periods)

4.1 Concept of translatory and rotatory motions with examples.

4.2 Definition of torque with examples.

4.3 Angular momentum, Conservation of angular momentum (quantitative) and its examples.

4.4 Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid) (Formulae only), Concept of Fly wheel.

4.5 Rotational kinetic energy, rolling of sphere on the slant plane.

4.6 Comparison of linear motion and rotational motion.

4.7 Application of rotational motions in transport vehicles, and machines.

5 Motion of planets and satellites (08 periods)

5.1 Gravitational force, Kepler's law of planetary motion.

5.2 Acceleration due gravity and its variation.

5.3 Gravitational Potential and Gravitational potential energy.

5.4 Motion of satellite, orbital velocity and time period of satellite, Total energy and Binding energy of a satellite, Escape energy and escape velocity.

5.5 Types of satellites, Geo-stationary satellite, semi-synchronous, polar satellite (concept only) and their uses in science and technology.

5.6 Concept of Black Holes.

6. Properties of Matter (12 periods)

6.1 Elasticity: definition of stress and strain, different types of moduli of elasticity, Hooke's law, significance of stress strain curve.



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6.2 Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications.

6.3 Surface tension: concept, its units, angle of contact, Capillary action and determination of surface tension from capillary rise method, applications of surface tension, effect of temperature and impurity on surface tension.

6.4 Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems.

6.5 Concept of fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem and their applications.

7. Heat and Thermodynamics (10 periods)

7.1 Difference between heat and temperature.

7.2 Modes of transfer of heat (Conduction, convection and radiation with examples).

7.3 Different scales of temperature and their relationship.

7.4 Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them.

7.5 Heat conduction in a metal rod, Temperature gradient, Concept of Co-efficient of thermal conductivity, Uses and effects of Heat conduction in Daily life.

7.6 Isothermal and Adiabatic process.

7.7 Zeroth, First and second law of thermodynamics, Heat engine (concept only), Carnot cycle.

7.8 Application of various systems of thermometry in refrigeration and air-conditioning etc.

**LIST OF PRACTICALS (to perform minimum six experiments)**

1 To find radius of wire and its volume and the maximum permissible error in these quantities by using both Vernier callipers and screw gauge.
2 To find the value of acceleration due to gravity on the surface of earth by using a simple pendulum.
3 To determine the Radius of curvature of (i) convex mirror, (ii) concave mirror by spherometer.
4 To verify parallelogram law of forces.
5 To study conservation of energy of a ball or cylinder rolling down an inclined plane.
6 To find the Moment of Inertia of a flywheel about its axis of rotation.
7 To determine the atmospheric pressure at a place using Fortin's Barometer.
8 To determine the viscosity of glycerine by Stoke's method.
9 To determine the coefficient of linear expansion of a metal rod.
10 To determine force constant of spring using Hooks law.

**INSTRUCTIONAL STATREGY**

Teacher may use various teaching aids like live models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field


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applications before teaching the basics to develop proper understanding of the physical phenomenon. Use of demonstration and animations can make the subject interesting and may develop scientific temper in the students. Teacher must plan a tour of Science Park/planetarium available in nearby areas in order to enhance the interest in this course.

**MEANS OF ASSEMENTS**

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Model Making,
- Actual Lab & Practical Work,
- Viva Voce

**RECOMMENDED BOOKS**


1 Text Book of Physics for Class XI (Part-I, Part-II); N.C.E.R.T., Delhi
2 Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3 Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
4 B.Sc.Practical Physics by C L Arora, S. Chand Publication..
5 Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
6 Engineering Physics by DK Bhhatacharya & Poonam Tandan; Oxford University Press, New Delhi
7 Modern Engineering Physics by SL Gupta, Sanjeev Gupta, Dhanpat Rai Publications
8 V. Rajendran,physics-I, Tata McGraw-Hill raw Hill publication, New Delhi
9 Arthur Beiser, Applied Physics, Tata McGraw-Hill raw Hill publication, New Delhi
10 Physics Volume 1, 5th edition, Haliday Resnick and Krane, Wiley publication


**TOPIC WISE DISTRIBUTION OF PERIODS AND MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 10 | 15 |
| 2 | 10 | 15 |
| 3 | 10 | 15 |
| 4 | 10 | 15 |
| 5 | 08 | 10 |
| 6 | 12 | 16 |
| 7 | 10 | 14 |
| **Total** | **70** | **100** |

## 1.4 APPLIED CHEMISTRY

| L | T | P |
|---|---|---|
| 6 | - | 2 |

**RATIONALE**

The use of various chemicals and chemical products in diverse technical and engineering fields have repeatedly proved the importance of Applied Chemistry, which enhances its role to a new peak. On the other hand, ever increasing use of such materials will compel engineers, technocrats to acquire essential applied chemistry knowledge in order to select engineering materials, which not only suit them but also provide more environmental compatibility. This situation demands principles of Applied Chemistry in diploma-engineering courses. Principles of Applied Chemistry will enable budding engineers and technocrats to develop scientific temper and appreciate physical, chemical and engineering properties of materials. Hence the subject of Applied Chemistry.

**LEARNING OUTCOMES**

After undergoing this subject, the student will be able to:

- Classify various substances based on state of aggregation.
- Substantiate the laws and principles on which structure of atom is established.
- Explain and predict properties of substances.
- Explain sources of water and various characteristics of water (quantitatively).
- Explain cause and factors which can adversely affecting natural water quality and remedial measures available for water purification.
- Think critically, develop and adapt water conservation techniques.
- Explain corrosion of metal and their preventive measures.
- Explain chemical nature and causes of corrosion.
- Apply correct and efficient methods of corrosion prevention.
- Explain chemistry of fuels and their relative advantages.
- Select most efficient fuel for the engine and engineering applications.
- Suggest how to subside air pollution caused by the use of fossil fuels.
- Explain the chemistry of various polymers and plastics.
- Verify suitability and select polymer/rubber/plastic materials for engineering applications.

**DETAILED CONTENTS**

1. Atomic Structure, Periodic Table and Chemical Bonding (14 periods)

    1.1 Fundamental particles- mass and charges of electrons, protons and neutrons with names of the scientists who discovered these fundamental particles.


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1.2 Bohr's model of atom and successes and limitations of atomic theory (qualitative treatment only).

1.3 Atomic number, atomic mass number isotopes and isobars.

1.4 Definition of orbit and orbitals, shapes of s and p orbitals only, quantum numbers and their significance.

1.5 Aufbau's principle, Pauli's exclusion principle and Hund's rule electronic configuration of elements with atomic number (Z) = 30 only. (Electronic configurations of elements with atomic number greater than 30 are excluded).

1.6 Modern periodic law and periodic table, groups and periods, classification of elements into s, p, d and f blocks (periodicity in properties - excluded).

1.7 Chemical bonding and cause of bonding and types such as ionic bond in NaCl sigma (σ) and pi (π) covalent bonds in $H_2$, HCl, $Cl_2$, elementary idea of hybridization in $BeCl_2$, $BF_3$, $CH_4$, $NH_3$ and $H_2O$, VSEPR, Molecular orbital Theory.

1.8 States of Matter: Solid, Liquid & Gas, Metallic bonding- explanation with the help of electron gas (sea) model.

2. Fuels and Lubricants (18 periods)

2.1 Definition of fuel, classification of fuels, characteristics of good fuel, relative merits of gaseous, liquid and solid fuels.

2.2 Calorific value-higher calorific value, lower calorific value, determination of calorific value of solid or liquid fuel using Bomb calorimeter and numerical examples.

2.3 Coal - types of coal and proximate analysis of coal.

2.4 Fuel rating – Octane number and Cetane number, fuel-structural influence on Octane and Cetane numbers.

2.5 Gaseous fuels – chemical composition, calorific value and applications of natural gas (CNG), LPG, producer gas, water gas and biogas.

2.6 Elementary ideal on – hydrogen as future fuels, nuclear fuels.

2.7 Lubricants: Definition and properties, mechanism, industrial application and its function in bearings.

2.8 Synthetic lubricants and cutting fluids.

3. Water (14 periods)

3.1 Demonstration of water resources on Earth using pie chart.

3.2 Classification of water – soft water and hard water, action of soap on hard water, types of hardness, causes of hardness, units of hardness – mg per liter ($mgL^{-1}$) and part per million (ppm) and simple numerical, pH and buffer solutions and their applications.

3.3 Disadvantages caused by the use of hard water in domestic and boiler feed water. Primming and foaming and caustic embrittlement in boilers.



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3.4 Removal of hardness -Permutit process and Ion-exchange process.

3.5 Physico-Chemical methods for Water Quality Testing.

a) Determination of pH using pH meter, total dissolved solids (TDS)

b) Testing and Estimation of- alkalinity, indicator their types and application total hardness by EDTA method and O'Hener's Method. (Chemical reaction of EDTA method are excluded).

c) Understanding of Indian Water Quality standards as per WHO.

3.6 Natural water sterilization by chlorine and UV radiation and reverse osmosis.

3.7 Municipality waste water treatment. Definition of B.O.D and C.O.D.

4. Electrochemistry (4 periods)

Redox Reaction, Electrode Potential, Nernst equation, Electrochemical cell (Galvanic and Electrobytes); Nernst equation.

5. Corrosion and its Control (10 periods)

5.1 Definition of corrosion and factors affecting corrosion rate.

5.2 Theories of

a) Dry (chemical) corrosion- Pilling Bedworth rule.

b) Wet corrosion in acidic atmosphere by hydrogen evolution mechanism.

5.3 Definition of passivity and galvanic series.

5.4 Corrosion control:

a) Metal coatings – Cathodic protection, Cementation on Base Metal Steel – Application of Metal Zn (Sherardizing),Cr (Chromizing) and Al (Calorizing), Sacrificial protection and impressed current voltage.

b) Inorganic coatings – Anodizing and phosphating.

c) Organic coatings - use of paints varnishes and enamels.

d) Internal corrosion preventive measures- alloying (with reference to passivating, neutralizing and inhibition) and heat treatment (quenching, annealing).

6. Organic compounds, Polymers and Plastics (10 periods)

6.1 Classification of organic compounds and IUPAC Nomenclature.

6.2 Definition of polymer, monomer and degree of polymerization.

6.3 Brief introduction to addition and condensation polymers with suitable examples (PE, PS, PVC, Teflon, Nylon -66 and Bakelite).

6.4 Definition of plastics, thermo plastics and thermo setting plastics with suitable examples, distinctions between thermo and thermo setting plastics.

6.5 Applications of polymers in industry and daily life.



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## LIST OF PRACTICALS

1. Estimation of total hardness of water using standard EDTA solution.
2. Estimation of total alkalinity of given water sample by titrating it against standard sulfuric acid solution.
3. Proximate analysis of solid fuel).
4. Estimation of temporary hardness of water sample by O' Hener's Method.
5. Determination of flash and fire point of given lubricating oil using Able's flash point apparatus.

## INSTRUCTIONAL STRATEGY

Teachers may take help of various models and charts while imparting instructions to make the concept clear. More emphasis should be laid on discussing and explaining practical applications of various chemical process and reactions. In addition, students should be encouraged or motivated to study those processes in more details, which may find practical application in their future professional career.

## MEANS OF ASSEMENTS

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Model Making,
- Actual Lab & Practical Work,
- Viva Voce

## RECOMMENDED BOOKS


1. Chemistry in Engineering by J.C. Kuricose & J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C. Jain & Monika Jain, Dhanapat Rai Publishing Company, New Delhi.
3. Eagle's Applied Chemistry - I by S. C. Ahuja & G. H. Hugar, Eagle Prakashan, Jalandhar.
4. Engineering Chemistry – A Text Book by H. K. Chopra & A. Parmar, Narosa Publishing House, New Delhi.
5. Applied Chemistry - I by Dr. P. K Vij & Shiksha Vij, Lords Publications, Jalandhar.
6. Engineering Chemistry by Dr. Himanshu Pandey, Goel Publishing House, Meerut, India





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## SUGGESTED DISTRIBUTION OF MARKS

| Topics | Time Allotted (hrs) | Marks Allotted (%) |
|---|---|---|
| 1. | 14 | 20 |
| 2. | 18 | 24 |
| 3. | 14 | 20 |
| 4. | 4 | 6 |
| 5. | 10 | 15 |
| 6. | 10 | 15 |
| **Total** | **70** | **100** |


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## 1.5 ENGINEERING DRAWING - I

| L | T | P |
|---|---|---|
| - | - | 8 |

**RATIONALE**

Drawing is the language of engineers and technicians. Reading and interpreting engineering drawing is their day to day responsibility. The subject is aimed at developing basic graphic skills in the students so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. The emphasis, while imparting instructions, should be to develop conceptual skills in the students following BIS SP 46 – 1988.

**Note:**

i) First angle projection is to be followed.
ii) Minimum of 18 sheets to be prepared and at least 2 sheets on AutoCAD.
iii) Instructions relevant to various drawings may be given along with appropriate. demonstrations, before assigning drawing practice to students.

**LEARNING OUTCOMES**

After undergoing the subject, the students will be able to:

- Identify and use of different grades of pencils and other drafting instruments which are used in engineering field.
- Draw free hand sketches of various kinds of objects.
- Utilize various types of lines used in engineering drawing.
- Read and apply different dimensioning methods on drawing of objects.
- Use different types of scales and their utilization in reading and reproducing drawings of objects and maps.
- Draw 2 - dimensional view of different objects viewed from different angles (orthographic views).
- Draw and interpret complete inner hidden details of an object which are otherwise not visible in normal view.
- To make projections of Solid.
- Generate isometric (3D) drawing from different 2D (orthographic) views/sketches.
- Identify conventions for different engineering materials, symbols, sections of regular objects and general fittings used in Civil and Electrical household appliances.
- Use basic commands of AutoCAD.


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## DETAILED CONTENTS

1. Introduction to engineering drawing (03 sheets)

    1.1 Introduction to drawing instruments, materials, layout and sizes of drawing sheets and drawing boards.
    1.2 Different types of lines in engineering drawing as per BIS specifications.
    1.3 Practice of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagonal, pentagon with the help of drawing instruments.
    1.4 Free hand and instrumental lettering (Alphabet and numerals) – upper case (Capital Letter), single stroke, vertical and inclined at 75 degree, series of 5,8,12 mm of free hand and instrumental lettering of height 25 to 35 mm in the ratio of 7:4

2. Dimensioning Technique (01 sheet)

    2.1 Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions).
    2.2 Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sunk holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches.

3. Scales (02 sheets)

    3.1 Scales –their needs and importance (theoretical instructions), type of scales, definition of R.F. and length of scale.
    3.2 Drawing of plain and diagonal scales.

4. Orthographic Projections (06 sheets)

    4.1 Theory of orthographic projections (Elaborate theoretical instructions).
    4.2 Projection of Points in different quadrant.
    4.3 Projection of Straight Line ($1^{st}$ and $3^{rd}$ angle).
        4.3.1. Line parallel to both the planes
        4.3.2. Line perpendicular to any one of the reference plane
        4.3.3. Line inclined to any one of the reference plane.
    4.4 Projection of Plane – Different lamina like square, rectangular, triangular and circle inclined to one plane, parallel and perpendicular to another plane in $1^{st}$ angle only.
    4.5 Three views of orthographic projection of different objects. (At least one sheet in $3^{rd}$ angle).
    4.6 Identification of surfaces.


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5 Projection of Solid (02 sheets)

5.1. Definition and salient features of Solid.
5.2. Types of Solid (Polyhedron and Solid of revolution).
5.3 To make projections, sources, Top view, Front view and Side view of various types of Solid.

6. Sections (02 sheets)

6.1 Importance and salient features.
6.2 Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.
6.3 Convention sectional representation of various materials, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections.
6.4 Orthographic sectional views of different objects.

7. Isometric Views (02 sheets)

7.1 Fundamentals of isometric projections and isometric scale.
7.2 Isometric views of combination of regular solids like cylinder, cone, cube and prism.

8. Common Symbols and Conventions used in Engineering (02 sheets)

8.1 Civil Engineering sanitary fitting symbols.
8.2 Electrical fitting symbols for domestic interior installations.

*9. Introduction to AutoCAD (02 sheets)

Basic introduction and operational instructions of various commands in AutoCAD. At least two sheets on AutoCAD of cube, cuboid, cone, pyramid, truncated cone and pyramid, sphere and combination of above solids.

* **Auto CAD drawing will be evaluated internally by sessional marks and not by final theory paper.**

**INSTRUCTIONAL STRATEGY**

Teacher should show model of realia of the component/part whose drawing is to be made. Emphasis should be given on cleanliness, dimensioning and layout of sheet. Focus should be on proper selection of drawing instruments and their proper use. The institute should procure AutoCAD or other engineering graphics software for practice in engineering drawings. Teachers should undergo training in AutoCAD/Engineering Graphic. Separate labs for practice on AutoCAD should be established.


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**MEANS OF ASSESSMENT**

- Sketches
- Drawing
- Use of software

**RECOMMENDED BOOKS**


1. A Text Book of Engineering Drawing by Surjit Singh; Dhanpat Rai & Co., Delhi
2. Engineering Drawing by PS Gill; SK Kataria & Sons, New Delhi
3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt; Charotar Publishing House Pvt. Ltd., Anand
4. Engineering Drawing I & II by JS Layall; Eagle Parkashan, Jalandhar
5. Engineering Drawing I by DK Goel, GBD Publication.





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## 1.6 PRINTING PROCESS-1

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

**RATIONALE**

This is a core subject of printing technology. It is essential for students to learn about the basics of various printing process and printing machines.

**LEARNING OUTCOMES**

After undergoing the subject, the students will be able to:

- Different printing Process and their Modern uses.
- Carry out various printing process.
- Classify various types of printing substrates.
- Explain properties and applications of printing plates.
- Select suitable material to be used for various printing applications.

**DETAILED CONTENTS**

1. **INTRODUCTION TO PRINTING TECHNOLOGY:** (18 Periods)

1.1 History, Ingredients of Printing (image carriers, printing inks, printing substrates).
1.2 Different printing process and their Modern uses.
1.3 Suitability and limitations of each printing process for various jobs and purposes.
1.4 Outline of printing production process with basic ideas of Current practices in the areas of prepress in press and post press operations.
1.5 Introduction to housekeeping.

2. **LETTERPRESS PRINTING TECHNOLOGY**: (20 Periods)

2.1 Introduction to Machine room equipments and materials.
2.2 Classification, functions and uses of letterpress machines.
2.3 Introduction to basic mechanical and operational feature of letter press platen machine, Impression and ink transfer methods. Impression and ink transfer methods in letterpress machines.
2.4 Introduction to Premake-ready and Make-ready operations.
2.5 Introduction to Running defects, their causes and remedies.

3. **FLEXOGRAPHY PRINTING TECHNIQUES**: (18 Periods)

1.1. Introduction to Flexographic Printing and its uses in Printing Industry.
1.2. Basic principle of flexographic printing.
1.3. Types of substrates used in flexographic printing.

**LIST OF PRACTICALS**


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1. Introduction to the printing process department.
2. Demonstration and proper use of various tools and equipments.
3. Sample collection of various printing papers/substrates.
4. Simple imposition exercise up to 8 pages upright and oblong.
5. Locking up of the matter and dressing, picking of impression surface.
6. Handling, make-ready and operation of printing machines
7. Printing and proofing of various small jobs.
8. Sample collection of various printed materials.
9. Demonstration of flexography printing.

**MEANS OF ASSEESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voice

**INSTRUCTIONAL STRATEGY**

While imparting instructions, teacher should show various types of printing materials to the students. Students should be asked to collect samples of various materials available in the market. Visits to industry should be planned to demonstrate use of various types of materials or Printing Process in the industry.


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**RECOMMENDED BOOKS**

1. Letter press printing part I-II, C.S. Misra, Anupam Prakashan, Prayagraj.

2. Akshar Mudran Shastra, C.S. Misra, Anupam Prakashan, Prayagraj.

3. Printing Processes, V.S. Krishnamurthy, Chennai.

4. What the printer should know about ink- Dr. Nelson Ra Eldced- GATF Press.

5. What the printer should know about paper - Lawrance A Wilson - GATF Press.

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 18 | 32 |
| 2. | 20 | 36 |
| 3. | 18 | 32 |
| Total | 56 | 100 |



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## 2.1 APPLIED MATHEMATICS - II

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

**RATIONALE**

Basic elements of integral calculus, differential calculus, numerical methods, differential m equations included in this course will play a vital role in understanding engineering problem mathematically. This will also develop analytical as well as conceptual abilities among students.

**LEARNING OUTCOMES**

After undergoing this course, the students will be able to:

- Calculate simple integration by methods of integration.
- Evaluate the area under curves, surface by using definite integrals.
- Calculate the area and volume under a curve along areas.
- Solve the engineering problems with numerical methods.
- Understand the geometric shapes used in engineering problems by co-ordinate geometry.

**DETAILED CONTENTS**

1. Integral Calculus - I (20 Periods)

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.
1.5 Integration of special function.

2. Integral Calculus - II: (20 Periods)

2.1 Meaning and properties of definite integrals, Evaluation of definite integrals.
2.2 Application : Length of simple curves, Finding areas bounded by 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. Numerical solutions of algebraic equations; Bisections method, Regula-Falsi method, Newton-Raphson's method (without proof), Numerical solutions of simultaneous equations; Gauss elimination method (without proof).

3. Co-ordinate Geometry (2 Dimension) (18 Periods)

3.1 Circle



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

4. Co-ordinate Geometry (3 Dimension) (12 Periods)

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 (without proof).

**INSTRUCTONAL STRATEGY**

Basic elements of Differential Calculus, Integral Calculus and differential equations can be taught conceptually along with real engineering applications in which particular algorithm and theory can be applied. Numerical examples will be helpful in understanding the content of the subject.

**MEANS OF ASSESSMENT**

- Assignments and Quiz/Class Tests
- Mid-term and End-term Written Tests
- Model/Prototype Making

**RECOMMENDED BOOKS**


1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
3 Applied Mathematics-II by Chauhan and Chauhan, Krishna Publications, Meerut.


**SUGGESTED DISTRIBUTION OF MARKS**

| Topic | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 20 | 28 |



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| | | |
|---|---|---|
| 2. | 20 | 28 |
| 3. | 18 | 24 |
| 4 | 12 | 20 |
| **Total** | **70** | **100** |

## 2.2 APPLIED PHYSICS – II

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

**RATIONALE**

Applied physics includes the study of a diversified topics related to the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this course content.



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**Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to learn and appreciate these concepts and principles. In all contents, SI units should be followed.**

## LEARNING OUTCOMES

After undergoing this subject, the student will be able to;

- Define wave motion its types (Transverse and Longitudinal), Periodic and Simple Harmonic Motion, solve simple problems.
- Define the terms: frequency, amplitude, wavelength, velocity of a wave.
- Explain various Engineering, Medical and Industrial applications of Ultrasonics.
- Apply acoustics principles to various types of buildings to get best sound effect
- Explain diffraction, interference, polarization.
- Define capacitance and its unit. They will be able to explain the function of capacitors in simple circuits, solve simple problems using C=Q/V.
- Explain the role of free electrons in insulators, conductors and semiconductors, qualitatively the terms: potential, potential difference, electromotive force.
- Explain the concept of electric current, resistance and its measurement.
- List the effects of an electric current and their common applications, State and apply Ohm's law, calculate the equivalent resistance of a variety of resistor combinations, determine the energy consumed by an appliance, distinguish between AC and DC electricity.
- Explain Biot-Savart Law, Ampere's law, Lorenz Force.
- State the laws of electromagnetic induction, describe the effect on a current-carrying conductor when placed in a magnetic field.
- Explain operation of moving coil galvanometer, simple DC motor.
- Apply the knowledge of diodes in rectifiers, adapters IC's and various electronic circuits. Apply the concept of light amplification in designing of various LASER based instruments and optical sources.
- Explain total internal reflection and apply this concept for optical fibre and its uses in Medical field and Communication.

## DETAILED CONTENTS

1. Wave motion and its applications (12 periods)
   - 1.1 Wave motion, transverse and longitudinal wave motion with examples, sound and light waves, relationship among wave velocity, frequency and wave length and its application.
   - 1.2 Wave equation y = r sin wt, phase, phase difference, principle of superposition of waves.
   - 1.3 Simple Harmonic Motion (SHM): definition and characteristic, expression for displacement, velocity, acceleration, time period, frequency in S.H.M., Energy of a body executing S. H. M., simple pendulum, concept of simple harmonic progressive wave.
   - 1.4 Free, Damped and forced oscillations, Resonance with examples, Q-factor.
   - 1.5 Definition of pitch, loudness, quality and intensity of sound waves, intensity level, Echo and reverberation, Sabine formula for reverberation time(without


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derivation), coefficient of absorption of sound, methods to control reverberation time and their applications, Acoustics of building defects and remedy.

1.6 Ultrasonic –production, detection, properties and applications in engineering and medical applications.

2. Wave Optics (6 periods)

2.1 Dual nature of light, wave theory of light, laws of reflection and refraction, Snell's law, Power of lens, magnification.

2.2 Two-Source Interference, Double-Slit interference, Interference due to thin films, Fresnel's biprism.

2.3 use of interference making highly efficient solar panel.

2.4 diffraction, Single Slit diffraction, Intensity calculation etc.

2.5 Polarization of electromagnetic waves, polarizing sheets, polarizing by Reflection (Brewser's law), Malus law, use of Polaroid's.

3. Electrostatics (12 periods)

3.1 Concept of charge, Coulombs law, Electric field of point charges, Electric lines of force and their properties, Electric flux, Electric potential and potential difference.

3.2 Gauss law of electrostatics: Application of Gauss law to find electric field intensity of straight charged conductor, plane charged sheet and charged sphere.

3.3 Capacitor and its working principle, Capacitance and its units. Capacitance of parallel plate capacitor. Series and parallel combination of capacitors (numerical), charging and discharging of a capacitor.

3.4 Dielectric and its effect on capacitance, dielectric break down.

3.5 Application of electrostatics in electrostatic precipitation of microbes and moisture separation from air and gases in industry for pollution control (Brief explanation only).

4. Current Electricity (12 periods)

4.1 Electric Current, Resistance, Specific Resistance, Conductance, Specific Conductance, Series and Parallel combination of Resistances. Factors affecting Resistance, Colour coding of carbon Resistances, Ohm's law. Superconductivity.

4.2 Kirchhoff's laws, Wheatstone bridge and its applications (meter bridge and slide wire bridge).

4.3 Concept of terminal potential difference and Electro motive force (EMF), potentiometer.

4.4 Heating effect of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms of energy

4.5 Examples of application of DC circuits in various electrical and electronics equipment such as C.R.O, T.V., Audio-Video System, Computers etc.

5. Magneto Statics and Electromagnetism (12 periods)

5.1 Magnetic poles, force on a moving charge, circulating charges, force on a current carrying wire, Hall effect, torque on a current loop.



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5.2 Magnetic field due to moving charge (Biot-Savart Law), due to current (Biot-Savart Law), parallel currents, field of a solenoid, Ampere's law.

5.3 Faraday's law, Lenz' law, motional emf, induced electric fields.

5.4 Magnetic dipole and force on a magnetic dipole in a non-uniform field, Magnetization, Gauss' law for magnetism.

5.5 Types of magnetic materials. Dia, para and ferromagnetic materials with their properties.

5.6 Application of electromagnetism in ac/dc motors and generators.

6. Semiconductor physics (8 periods)

6.1 Types of materials (insulator, semi-conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction diode and its V-I characteristics.

6.2 Diode as rectifier – half wave and full wave rectifier (centre taped).

6.3 Semiconductor transistor, pnp and npn (concepts only).

6.4 Application of semiconductor diodes (Zener, LED) and that of transistor as amplifier and oscillator.

7. Modern Physics (8 Periods)

7.1 Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; laser and its characteristics, population inversion, Types of lasers; Ruby and He-Ne lasers, engineering and medical applications of lasers.

7.2 Fibre optics: Total internal reflection and its applications, Critical angle and conditions for total internal reflection, introduction to optical fibers, light propagation, types, acceptance angle and numerical aperture, types and applications of optical fibre in communication.

7.3 Introduction to nanotechnology, nanoparticles and Nano materials,

**LIST OF PRACTICALS** (To perform minimum six experiments)

1. To determine the velocity of sound with the help of resonance tube.
2. To find the focal length of convex lens by displacement method.
3. To find the refractive index of the material of given prism using spectrometer.
4. To find the wavelength of sodium light using Fresnel's biprism.
5. To verify laws of resistances in series and parallel combination.
6. To verify ohm's laws by drawing a graph between voltage and current.
7. To measure very low resistance and very high resistances using Slide Wire bridge
8. Conversion of Galvanometer into an Ammeter and Voltmeter of given range.
9. To draw hysteresis curve of a ferromagnetic material.
10. To draw characteristics of a pn junction diode and determine knee and break down voltages.
11. To find wave length of the laser beam.
12. To find numerical aperture of an optical fiber.

**INSTRUCTIONAL STATREGY**



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Teacher may use various teaching aids like live models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics to develop proper understanding of the physical phenomenon. Use of demonstration and animations can make the subject interesting and may develop scientific temper in the students. Teacher must plan a tour of Science Park/planetarium available in nearby areas in order to enhance the interest in this course.

**MEANS OF ASSESSMENT**

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Model Making,
- Actual Lab & Practical Work,
- Viva-Voice

**RECOMMENDED BOOKS**


1. Text Book of Physics (Part-I, Part-II); N.C.E.R.T., Delhi
2. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3. A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi
4. Practical Physics, by C. L. Arora, S Chand publications
5. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
6. Modern Engineering Physics by SL Gupta, Sanjeev Gupta, Dhanpat Rai Publications.
7. Physics Volume 2, 5th edition, Haliday Resnick and Krane, Wiley publication
8. Fundamentals of Physics by Haliday, Resnick & Walker 7th edition, Wiley publication


**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 12 | 18 |
| 2 | 6 | 8 |
| 3 | 12 | 18 |
| 4 | 12 | 16 |
| 5 | 12 | 16 |
| 6 | 8 | 12 |
| 7 | 8 | 12 |
| **Total** | **70** | **100** |

## 2.3 BASIC ENGINEERING

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

**RATIONALE**

Modern printing equipments and machines incorporate all the engineering disciplines, like electrical, mechanical, electronics and computers. The print technician who has to handle some of the high-tech equipment in supervising the work of the operation of these machines, should be fully aware of the principles of these engineering disciplines. He should also be able to identify the problems and faults likely to occur during the operation of these printing machines. Hence, the technicians working in the printing industry are required to know the electrical, electronic and mechanical engineering devices inputs and uses.

**LEARNING OUTCOMES**

- Knowledge and uses of mechanical components.
- To Measure the parts height width.
- Types of lubricant used and their quality.
- Uses of hydraulics and pneumatics.
- Understand electrical terms and laws
- Understand the electrical supply and phases
- Understand electronics uses in printing


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## DETAILED CONTENTS

1. Mechanical Engineering (10 Periods)

1.1 Mechanical components: Links, nuts , bolts, screw, studs, key, rivets, pin, cotters, levers, shafts, couplings, clutches, brakes, belts bearings, pulleys, gears, cams, chains, sprockets.

1.2 Measuring devices: calipers, Vernier's, screw gauges, micrometers, feeler gauges, dial gauges, Durometers.

1.3 Manufacturing processes: Soldering, welding, riveting processes, metal forming processes, foundry, forging and forming. Metal shaping processes, machining processes.

1.4 Lubricant and lubricating devices: Viscosity, types of lubricants, principles, characteristics, and applications. Lubrication system.

2 Hydraulics and Pneumatics (08 Periods)

2.1 Hydraulics: Principles, hydraulics in printing.
2.2 Pneumatics: basic principles of compressors. Vacuum pumps. Pneumatics in printing.

3. ELECTRICAL SYSTEMS (08 Periods)

3.1 Electrical Terms and definitions: electric current and voltage, ohm's law, resistance law ,conductor, resistor and insulator. Horse power, watt, KWh and their relationship with current, voltage and resistance. D.C. and A.C.,KVA, KW and KVA powers. power factor, its magnitude, nature significance.

3.2 Electrical sources ( cell, battery and supply ): Electrical loads (resistance capacitance and inductance) and their behavior in D.C. supply. Electrical circuit and concept of open circuit, closed circuit and short circuit. series, parallel and series-parallel connection of cells, resistors and capacitors, their purpose and equivalent valves.

4. ELECTRICAL ENGINEERING (20 Periods)

4.1 A. C. Circuits: Single phase supply its frequency, instantaneous value, RMS value and form factor. behaviors of pure resistance, inductance and capacitance in A.C. supply. Impedance, current power factor and power in single phase RLC series and parallel circuits.

4.2 Three Phase Supply: Star and delta conversions. Line current, line voltage, phase current, phase voltage and power relations in star and delta connections.

4.3 Energy Conversion Principles: Conversions of electrical energy into heat and light. heater, bulb and tube light and their current, voltage and power.


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4.4 Magnetic field of a current carrying conductor and right hand thumb rule. Magnetic field of a solenoid and helix rule. Magnetic circuit, MMF, Flux, reluctance, magnetizing force, magnetic saturation. Electromagnet and its polarity . electron magnetic force, its magnitude and direction by Fleming's left hand rule. Electromagnetic induction, dynamically induced e.m.f., Fleming's right hand rule and lens's law. Self and mutually induced e.m.f. and self and mutual inductances. Concepts of single phase and three phase generation.

4.5 Electrical machines in printing: Basic construction, working, e.m.f. equation and concept of step up and step down transformer, operation of a transformer, tapped transformer, auto transformer, and voltage stabilizers. current, voltage and KVA rating of transformer.

4.6 Basic construction, working characteristics and applications of squirrel cage and Slip-ring type three phase induction motors and Capacitor type single phase induction motors, shaded pole motors and universal motors. speed control of single phase and three phase motors.

4.7 Main parts (contactor, push button stations, over load relay and time relay) of a starter with their purpose in the starter circuit. Circuit connection with motor and working of DOL, star-delta, auto transformer and motor resistance starters.

4.8 Electrical wiring and maintenance: Type of wiring, concept of wiring circuits and wiring, Introduction to main switch, D.B., switch board, wiring accessories, fuse and earthing. Wiring tools, testing of installation. I.E. Rules for wiring installations and Safety precautions.

5. ELECTRONICS ENGINEERING (10 Periods)

5.1 Semi-Conductor Devices: P-type and N-type Semiconductors and P-N junction diode, Zener diode, BJT and JFET transistors. MOS device SCR and Photo devices.

5.2 Electronic Circuit Operations: Rectification and half wave and full wave rectifiers, Zener voltage regulator, amplification, oscillation, modulation and detection progress and their purpose. Basic logic gates and basic flip flops.

5.3 Electronic in Printing: Application of electronics in Press control, speed control, colour registration, web control, safety and measuring devices.

**LIST OF PRACTICALS**

1. Study of various mechanical components, nuts, bolts, hubs, screws, couplings. pulleys, bearings, brakes and clutches
2. To Study the operation and use various measuring devices : calipers, micrometers, screw gauge, feeler gauges and dial gauges.
3. To study soldering, welding and riveting processes. Relationship of viscosity and temperature.
4. To Study air compressors.
5. To Measure current, voltage and power in single phase AC circuit and to find power factor of the circuit.


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6. To fix single phase energy meter, main switch/MCB and D.B. on a wooden board, to make their connections to supply a load and to take the observations of energy meter or energy consumption.
7. To do wiring of a lamp, a tube light, a fan and a five ampere socket controlled at one switch board.
8. To connect star-delta starter with three phase induction motor, start and run the motor and also to reverse the direction of rotation.

**MEANS OF ASSESMENT**

- Assignments and quiz/class test
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voice

**INSTRUCTIONAL STRATEGY**

While imparting instructions, teacher should show various types of engineering materials to the students. Students should be asked to observe various parts available in the machine and market. Visits to industry should be planned to demonstrate use of various types of basic engineering useful in printing.

**RECOMMENDED BOOKS**

1. Basic electrical engineering by c.l. wadhwa
2. Abc of electrical engineering by b.l. thareja
3. Electronic devices and circuit theory by louis nashelsky and robert boylestad
4. Principals of power system by v.k. Mehta


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## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 10 | 20 |
| 2. | 08 | 15 |
| 3. | 08 | 15 |
| 4. | 20 | 35 |
| 5. | 10 | 15 |
| **Total** | **56** | **100** |


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## 2.4 GRAPHIC DESIGN & TYPOGRAPHY

| | L | T | P |
|---|---|---|---|
| **RATIONALE** | **5** | **-** | **4** |

Printing production is based on proper designing and typographic planning. Introduction of Graphic Design & Typography subject is essential to impart basic knowledge and skills in graphic design principles, layouts, typographic principles and methods etc. This subject is essential as prerequisite for studying printing design and letter assembly subjects in the Diploma Curriculum.

**LEARNING OUTCOMES**

After undergoing this subject, the student will be able to;

- Demonstrate an understanding of the design process of book, newspaper, magazine, leaflets, pamphlets, booklets, folders, catalogues, brochure, labels, cartons, etc.
- Design is all around us - from food packaging and logos to billboard posters - design is a daily part of our lives, enticing us to buy a product or helping with an everyday task like using an app on your phone.
- Develop a thorough understanding of the form and function of typography and methodologies for successfully communicating ideas, narratives, concepts and identities through various media.
- Combine typographical elements and the other visual elements.
- Gather typographical elements with graphic design products.
- Understanding to prepare a layout as well as types of page structure and dummy preparation.
- Brief description about typefaces and different typesetting methods.
- Designing of different types of display materials.
- Understanding about proofing and proof reading procedure.

## DETAILED CONTENTS

**Graphic Design**

1. Printed Products (10 Periods)

1.1 Introduction to format and design factors for printed products, photography and illustrations.



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1.2 Embellishment: Leaflets, Pamphlets, Booklets, Folders, Catalogues, Brochures, Manuals, Books, Magazines and Newspapers, Business-forms and Commercial Stationery, Labels, Cartons, point of sale - Display Materials, etc.

2. Graphic Design Principles, Visual Ingredients and Layouts: (20 Periods)

2.1 Graphic Design Principles: Balance, Geometrical and Optical Centers, White Space, Optical Space, Harmony, Contrast, Unity, Proportion, Rhythm, Emphasis, Simplicity, etc.

2.2 Visual ingredients: Point, Line, Shape, Mass, Size, Scale, Colour, Tone, Texture, Pattern, etc.

2.3 Preparation of the Layout - analysis of briefs, Stages and House Style.

2.4 Page Structures, arrangement of Illustrations and Text matter.

2.5 Dummy: Its uses and preparation.

**Typography**

3. Introduction to Printing Type and Composing Techniques. (20 Periods)

3.1 Selecting type face suitable to the subject or purpose. Relationship between Type Face and Printing Processes, between Type Face and Paper Surfaces. Legibility and Readability.

3.2 Typographic specifications for different classes of work.

3.3 Art work preparation for different classes of work in relation to different Printing processes, Paper, Ink, etc.

4. Typesetting Techniques: (20 Periods)

4.1 Typesetting Materials, Tools and Equipment Required, Principles of Setting Text, Display, Tables and Tabular Setting by Latest Software.

4.2 Different methods of Typesetting: Introduction to Hand setting and Mechanical setting, Photo setting, Digital setting.

4.3 Proof reading: Proof reader and Copy holder, Proof Reading marks, Kinds of Proofs, Proof Reading procedure - correction and page make up.


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**LIST OF PRACTICALS**

1. GRAPHIC DESIGN

1.1 Collection of Specimens of printed products and their study.

1.2 Layout preparation for simple title pages of the book, text pages, letterheads, visiting cards, invitation cards, envelopes, greeting cards, certificates, pamphlets and leaflets.

1.3 Designing of Monograms & Trade marks.

1.4 Designing of Book Cover and Book Jackets.

2. TYPOGRAPHY

2.1 Collection of specimens of typefaces related to main groups of type design.

2.2 Drawing of lay of the type cases for Hindi and English.

2.3 Create headlines and captions (Reading line, Multiline, Leading type size)

2.4 Letterhead setting in English and Hindi.

2.5 Visiting card, invitation card setting in English and Hindi.

2.6 Proofing proof reading and correcting typeset matter.

2.7 Interpretation of copy and preparation of rough and finished layouts for typographic setting.

**MEANS OF ASSESSMENT**

- Assignments and quiz/class tests,
- Mid and end-term written tests,
- Actual practical performance,
- Viva-voce.

**INSTRUCTIONAL STRATEGY**

Graphic Design and Typography is a graphical and typographical designing subject. Teacher should show various types designed printed materials to the students. Students should be asked to collect samples of various printed material available in the market.



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**RECOMMENDED BOOKS**

1. Art & Production, N.N. Sarkar, Sagar Publication, New Delhi.

2. A Hand Book of Typography, Kailas, Anupam Prakashan, Prayagraj.

3. Theory & Practical of composition, A.C. Goel, Saroj Prakashan, Prayagraj.

4. Adhunik Sanyojan Shastra, C.S. Misra, Anupam prakashan, Allahabad.

5. Elements & Design & Typography, B.D. Mendiratta, Asian Books Private Limited, New Delhi.

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 10 | 10 |
| 2 | 20 | 30 |
| 3 | 20 | 30 |
| 4 | 20 | 30 |
| **Total** | **70** | **100** |



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## 2.5 PRINTING PROCESSES-II

**L T P**
**5 - 4**

**RATIONALE**

It is a core subject of printing technology. It is essential for students to learn about the basics of various printing processes, and printing machines.

**LEARNING OUTCOMES**

After undergoing the subject, the students will be able to:

- Different printing Processes and their Modern uses.
- Carry out various printing processes.
- Classify various types of printing substrates.
- Explain properties and applications of printing plates.
- Select suitable material to be used for various printing applications.

**DETAILED CONTENTS**

1. **LITHOGRAPHIC PRINTING.** (25 Periods)

1.1 Origin and development of lithography.
1.2 Characteristics, suitability and limitations of lithography.
1.3 Principles of lithography and their application to image formation.
1.4 Image carriers for Lithographic Printing.
1.5 Lithographic presses: Kinds, basic mechanical features and uses.
1.6 Offset Printing machine room tools, materials and accessories.
1.7 Pre make ready and make ready operations for printing Single colour text and line illustrations on sheet fed offset machines.
1.8 Running defects, causes and their remedies.

2. **GRAVURE PRINTING.** (15 Periods)

2.1 Outline of Gravure Printing Process.
2.2 Gravure Image Carriers use in industry.
2.3 Basic mechanical and operational features of various gravure printing machines: uses, advantages and limitations of gravure printing press. (Packaging Press, Label Press, Publication Press).

3. **SCREEN PRINTING.** (20 Periods)

3.1 Introduction to screen printing, Definition, History, Market.
3.2 Screen Printing inks - Types, Properties and ink drying method.
3.3 Introduction to manual printing, printing on semi-automatic machines, printing on automatic machines, care and storage of screens.


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3.4 Outline of Screen Printing Process.

4. **DIGITAL PRINTING :** (10 Periods)

4.1 Basic knowledge of digital printing.
4.2 Use of digital printing.
4.3 Advantage and limitations of digital printing.

**LIST OF PRACTICALS**

1. Handling and maintenance of sheet Fed Offset Machine.

2. Pre-make ready (Prepress operations) & Make ready on sheet fed offset machine.

3. Printing half sheet work (4 pages) text jobs on sheet fed offset machine.

4. Printing sheet work (8 pages) text jobs on sheet fed machine.

5. Printing single colour line illustration jobs on sheet fed machine.

6. Printing two-colour registration jobs on sheet fed machine.

7. Sample collection of paper/substrate.

8. Sample collection of printed materials.

**MEANS OF ASSEESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voce

**INSTRUCTIONAL STRATEGY**

While imparting instructions, teacher should show various types of printing materials to the students. Students should be asked to collect samples of various materials available in the market. Visits to industry should be planned to demonstrate use of various types of materials or Printing Processes in the industry.


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**RECOMMENDED BOOKS**

1. Technology of offset printing, C.S. Misra, Anupam prakashan, Prayagraj.

2. Offset Mudran Shastra, C.S. Misra, Anupam prakashan, Prayagraj.

3. Commercial Screen Printing, Bhamare, Adorn Publication Naupada, Thane.

4. Complete Screen Printing, K.K. Agrawal, Dehati Pustak Bhandar, Delhi.

5. Machine Printing, Focal Press, London.

6. Vyavsayik Screen Printing, Bhamare, Adorn Publication Naupada, Thane.

7. Screen Process Printing -By John Stephens, Blue Print, An imprint of Hapman and Hall, London.

8. Modern Gravure Technology - By Harry B. Smith, Pira International, U.K.

9. Printing technology by Adam Faux , Reiber.

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 25 | 35 |
| 2. | 15 | 20 |
| 3. | 20 | 25 |
| 4. | 10 | 20 |
| **Total** | **70** | **100** |



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## 2.6 MACHINE MAINTENANCE

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

**RATIONAL**

Machine Maintenance: Printing supervisors, owners of printing presses and so on, have to study about the Maintenance of printing machines. The study of a machine maintenance will give them proper guidance about to how the maximum utilization of the machines can be done and do away with waste of time and money.
In an extremely competitive market, periodical maintenance is very necessary for smooth functioning of the machine and their parts.

**LEARNING OUTCOMES**

After undergoing the subject, the student will be able to:

- Differentiate between Preventive maintenance and Breakdown Maintenance.
- Explanation of AC and DC Motors.
- Relationship between Machine Depreciation and Maintenance.
- To understanding of repair and reconditioning of parts.
- To understand Cams, pulleys and Shafts etc.

**DETAILED CONTENTS**

**1. Maintenance procedures (14 periods)**

1.1 Need and importance of maintenance - Definition, types, Maintenance policies, preventive maintenance, schedule maintenance, break down maintenance.

1.2 Identification & rectification of faults. Maintaining different types of Letterpress, Offset, Gravure & Flexo Machine.

1.3 Cylinder bearing supports - eccentric bushes - removal and fixing of bushes - changing of oil seals maintenance of bushes and bearings.

2. **Lubrication (12 periods)**

2.1 Lubricants, Greases and oils grades, their types and Characteristics, lubricating methods - Central lubrication with return oil, Manual lubricating.

**3. Drive and Control Systems (12 periods)**

3.1 Transmission systems such as AC and DC motors, belt, chain, gear, cranks, connecting rods, Paul and ratchet mechanisms, Hydraulic, Pneumatic, Electrical, Electronic and mechanical controls.


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**4. Erecting and Testing (10 periods)**

4.1 Equipment needed for erection - selection of location and environmental conditions- erection procedure for various prepress printing and finishing equipment's and machinery loading and transport of raw materials and printed product with respect to layout design commissioning.

**5. Repairs and Reconditioning (8 periods)**

5.1 Principles of reconditioning -repair methods for various parts - Roller electroplating, and rerubberising - ebonite coating, dampaning and inking systems - paper transport systems, paper sensor, and feeder head.

**LIST OF PRATICALS**

1. Maintenance of gear, belt, chain, pulley.
2. Maintenance of cams, grippers on offset printing machine.
3. Maintenance of inking roller system.
4. Maintenance of cylinders.
5. Lubrication of gear, chain, bearing and other moving parts.
6. Maintenance of feeding unit of the machine.
7. Maintenance of delivery unit of the machine.

**MEANS OF ASSEESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce

**INSTRUCTIONAL STRATEGY**

While importing instructions, teacher should show various parts of the machine to the students. student should be asked to observe various parts of machine, maintenance schedule used in printing industry . Visit in industry should be planned to demonstrate use of various types of basic maintenance.


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**RECOMMENDED BOOKS**

1. Electrical Engg. By B.L. Thareja Part I & II.
2. Theory of Machines By Khurmi & Gupta S.Chand Publisher New Delhi.

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 14 | 26 |
| 2 | 12 | 22 |
| 3 | 12 | 22 |
| 4 | 10 | 18 |
| 5 | 8 | 12 |
| **Total** | **56** | **100** |


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## 3.1 ENVIRONMENTAL STUDIES

| L | T | P |
|---|---|---|
| 3 | - | 2 |

**RATIONALE**

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the ecosystem and controlling pollution by various control measures. He should also be aware of environmental laws related to the control of pollution. He should know how to manage the waste. Energy conservation is the need of hour. He should know the concept of energy management and its conservation.

**LEARNING OUTCOMES**

After undergoing the subject, the student will be able to:

- Comprehend the importance of ecosystem and sustainable.
- Demonstrate interdisciplinary nature of environmental issues.
- Identify different types of environmental pollution and control measures.
- Take corrective measures for the abatement of pollution.
- Explain environmental legislation acts.
- Define energy management, energy conservation and energy efficiency.
- Demonstrate positive attitude towards judicious use of energy and environmental protection.
- Practice energy efficient techniques in day-to-day life and industrial processes.
- Adopt cleaner productive technologies.
- Identify the role of non-conventional energy resources in environmental protection.
- Analyse the impact of human activities on the environment.

**DETAILED CONTENTS**

- Introduction (04 Periods)

  Basics of ecology, eco system- concept, and sustainable development, Resources renewable and nonrenewable.

- Air Pollution (04 Periods)

  Source of air pollution. Effect of air pollution on human health, economy, plant, animals. Air pollution control methods.

- Water Pollution (08 Periods)

  Impurities in water, Cause of water pollution, Source of water pollution. Effect ofwater pollution on human health, Concept of dissolved $O_2$, BOD, COD. Prevention of water pollution- Water treatment processes, Sewage treatment. Water quality standard.


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1. Soil Pollution (06 Periods)

1.1 Sources of soil pollution.
1.2 Types of Solid waste- House hold, Hospital, From Agriculture, Biomedical, Animal and human, excreta, sediments and E-waste.
1.3 Effect of Solid waste.
1.4 Disposal of Solid Waste- Solid Waste Management.

2. Noise pollution (06 Periods)

Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, Different method of minimize noise pollution.

3. Environmental Legislation (08 Periods)

Introduction to Water (Prevention and Control of Pollution) Act 1974, Introduction to Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board and National Green Tribunal (NGT), Environmental Impact Assessment (EIA).

4. Impact of Energy Usage on Environment (06 Periods)

Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain. Eco-friendly Material, Recycling of Material, Concept of Green Buildings.

**LIST OF PRACTICALS**

1. Determination of pH of drinking water.
2. Determination of TDS in drinking water.
3. Determination of TSS in drinking water.
4. Determination of hardness in drinking water.
5. Determination of oil & grease in drinking water.
6. Determination of alkalinity in drinking water.
7. Determination of acidity in drinking water.
8. Determination of organic/inorganic solid in drinking water.
9. Determination of pH of soil.
10. Determination of N&P (Nitrogen & Phosphorus) of soil.
11. To measure the noise level in classroom and industry.
12. To segregate the various types of solid waste in a locality.
13. To study the waste management plan of different solid waste
14. To study the effect of melting of floating ice in water due to global warming.


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## INSTRUCTIONAL STRATEGY

In addition to theoretical instructions, different activities pertaining to Environmental Studies like expert lectures, seminars, visits to green house, effluent treatment plant of any industry, rain water harvesting plant etc. may also be organized.

## MEANS OF ASSESSMENT

- Assignments and quiz/class tests,
- Mid-term and end-term written tests

## RECOMMENDED BOOKS


1. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
2. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
3. Environmental Pollution by Dr. RK Khitoliya; S Chand Publishing, New Delhi
4. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.
5. Engineering Chemistry by Jain and Jain; Dhanpat Rai and Co. (P) Ltd. Delhi.
6. Environmental Studies by ErachBharucha; University Press (India) Private Ltd., Hyderabad.
7. Environmental Engineering and Management by Suresh K Dhamija; S K Katariaand Sons, NewDelhi.
8. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.


**Websites for Reference:** http://swayam.gov.in

## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 04 | 10 |
| 2 | 04 | 10 |
| 3 | 08 | 20 |
| 4 | 06 | 14 |
| 5 | 06 | 14 |
| 6 | 08 | 20 |
| **7** | 06 | 12 |
| **Total** | **42** | **100** |



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## 3.2 APPLIED MATHEMATICS –III

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

**RATIONALE**

Contents of this course provide understanding of some elementary and advanced mathematics algorithms and their applications of solving engineering problems. Content of this course will enable students to use some advanced techniques like Beta-Gamma function, Fourier series, Laplace transform and probability distributions in solving complex engineering problems.

**LEARNING OUTCOMES**

After undergoing this course, the students will be able to:

- Understand matrix operations and uses of matrix in different problems.
- Apply elementary row and column operations in finding inverse of a matrix.
- Find Eigen values, Eigen vectors of a matrix and their different properties.
- Understand degree/order of differential equations and their solution techniques.
- Use differential equations in engineering problems of different areas.
- Find Fourier series expansion of a function.
- Apply Laplace transform and their applications in solving engineering problems.
- Understand concept of probability distribution and their applications.

**DETAILED CONTENTS**

1. Matrices (16 Periods)

1.1 Algebra of Matrices

Addition, Multiplication of matrices, Null matrix and a unit matrix, Square matrix, Symmetric, Skew symmetric, Hermitian, Skew hermition, 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

Linear dependence/independence of vectors, Definition and computation of 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



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Definition and evaluation of eigenvalues and eigenvectors 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 (15 Periods)

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, Euler's 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 (15 Periods)

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 separable, equations reducible to separable forms, Homogeneous equations, equations 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= $e^{ax}$, Sinax, Cosax, $X^n$, $e^{ax}$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 (12 Periods)

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 (12 Periods)



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5.1 Probability: Introduction, Addition and Multiplication theorem and simple problem.

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

**INSTRUCTONAL STRATEGY**

The content of this course is to be taught on conceptual basis with plenty of real world examples. The basic elements of Laplace transform, differential equations and applications of differential equations can be taught with engineering applications of relevant branch.

**MEANS OF ASSESSMENT**

- Assignments and Quiz/Class Tests
- Mid-term and End-term Written Tests
- Model/Prototype Making

**RECOMMENDED BOOKS**


1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
3 Applied Mathematics-III by Chauhan and Chauhan, Krishna Publications, Meerut.
4. E-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.


**SUGGESTED DISTRIBUTION OF MARKS**

| Topic | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 16 | 24 |
| 2. | 15 | 20 |
| 3. | 15 | 20 |
| 4 | 12 | 18 |
| 5 | 12 | 18 |
| **Total** | **70** | **100** |

## 3.3 PRINTING SCIENCE

| L | T | P |
|---|---|---|
| 5 | - | 3 |

**RATIONALE**

The Student will learn the scientific approach to the different printing materials. He will also learn about the testing of materials for quality control. The subject will make the student to learn about the chemical reactions involved in the various stages of Reproduction Photography, Surface Preparation, Press work etc.

**LEARNING OUTCOMES**

After undergoing the subject, the student will be able to:

- Basic knowledge of different materials.
- Basic knowledge of photographic emulsion.
- Knowledge of different substrates.
- Knowledge of different inks.
- Knowledge of different ink drying method.
- Knowledge of different kinds of testing methods.

**DETAILED CONTENTENT**

1. Materials used for Image Carriers: (14 Periods)

1.1 Relief Process: Type metal alloys, different plates; photopolymer plates, Duplicate plates: stereo and electro.
1.2 Planography: Zinc, aluminum, anodized aluminum, bimetallic and tri metallic plates, presensitized plates, photopolymer plates, paper based plates.
1.3 Intaglio: Metals used for gravure cylinders.
1.4 Materials used for other processes. e.g. Flexography, Screen.

2 Photographic Materials : (10 Periods)

2.1 Basic ingredients of emulsion and their functions.
2.2 Emulsion process, control of sensitometric qualities and sensitometric properties, emulsion structure.
2.3 Developer's constituents and their functions.
2.4 Chemicals used for after treatment.
2.5 Introduction to non-silver material.

3 Polymers : (10 Periods)

3.1 Monomers and Polymers.
3.2 Homo-polymers and Co-polymers.
3.3 Types of polymerization reactions: Addition polymerization and condensation polymerization.


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3.4 Types of Polymers: Plastics, rubber and Fibers.
3.5 Composition and characteristic properties of the polymers: Printing ink resin and vehicles, adhesives, film base, cellulose and gelatin.

4 Colloids : (08 Periods)

4.1 Characteristics.
4.2 Methods of preparation and properties.
4.3 Application in printing industry.

5 Substrates: (12 Periods)

5.1 Fibrous and non-fibrous raw materials used in paper and board manufacture.
5.2 Surface treatment related to ultimate use.
5.3 Varieties of papers and boards: Characteristics, classification, identification etc.
5.4 Dimensional stability of paper: Effect of humidity on paper.
5.5 Other substrates: Metal foil, plastic, poly, pet, BOPP, CPP, etc.

6 Printing Inks: (12 Periods)

6.1 Constituents of printing ink, general characteristics and requirements of printing inks for various printing processes.
6.2 Basic drying methods and their suitability for printing processes.
6.3 Different inks : heat set, quick set inks, metallic inks, flexography and gravure ink etc, their suitability to different applications.
6.4 Digital inks ; solvent type and powder type.

7 Raw Material testing method – (04 Periods)

7.1 GSM, Tensile strength, bursting strength, folding strength, stiffness test (Grain direction and cross direction), Cobb test, etc.

**LIST OF PRACTICALS**

1. Grain direction test by different methods.
2. To find out GSM of different substrates.
3. Water Absorbency test.
4. Opacity test.
5. PH test.
6. Tensile Strength test.
7. Bursting Strength test.


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**MEANS OF ASSEESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voce

**INSTRUCTIONAL STRATEGY**

Printing science subject is the scientific approach to the different printing materials. Teacher should show the different test of material for quality control. Student should learn about the different reactions involved in the various stages of photography, surface preparation.

**RECOMMENDED BOOKS**


1. Printing inks and papers, C.S. Misra, Anupam Prakashan, Allahabad.
2. Mudran Syahiyan Tatha Kagaj, C.S. Misra, Anupam Prakashan, Allahabad.
3. Materials in printing process by L.C. Young
4. The complete technology book on Printing inks,NIIR Board.
5. Materials Science, Dr. M. Arumugam .
6. Science and technology of Printing Materials , by Prakash Setty


**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods ) | Marks Allotted (%) |
|---|---|---|
| 1. | 14 | 20 |
| 2. | 10 | 12 |
| 3. | 10 | 12 |
| 4.. | 08 | 10 |
| 5. | 12 | 20 |
| 6. | 12 | 20 |
| 7. | 04 | 06 |
| **Total** | **70** | **100** |



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## 3.4 PRINTING DESIGN

| | L | T | P |
|---|---|---|---|
| **RATIONALE** | **4** | **-** | **4** |

Every printed product is designed before it is printed. The print technician should have a clear perspective of the design principles involved in designing a printed product. The objective of this subject will be to introduce the study of design as a decision making discipline which controls all the aspects of the printing production.

**LEARNING OUTCOMES**

After undergoing this subject, the student will be able to;

- Create and understanding different types of graphics used for printing reproduction.
- Understanding about colour and its aspects.
- Understanding parts of books, dummy preparation and casting off.
- Understanding about display materials and its designing procedure.
- Study of newspaper design, page formatting challenges.
- Study of magazine design and formatting procedure.
- Study of packaging materials and package design, materials and market aspects.

**DETAILED CONTENTS**

1. Illustrative Elements: (06 Periods)
    a) Types of originals for illustration and their reproduction: Line and continuous tone copies in colour and black and white.
    b) Requirements of Art work or originals for reproduction; treatment of photographs.
    c) Black and white Photographs: High Contrast and Medium Contrast.
    d) Improving quality of Photographic Prints; Masking, Scaling, Cropping, Retouching and use of Air-Brush.

2. Colour Elements: (06 Periods)
    a) Colour theory: terms used to describe colour; warm and cold colours; hue, shade and tint.
    b) Colour wheel: terms used to describe relationship between colours - monochromatic, complementary, analogues, split complimentary.


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c) Selection of colours for two, three or four colour jobs.

d) Attributes and emotional appeal for colours.

e) Choice and effective use of colours; colour harmony, colour contrast, and colour values.

3. Book Design: (10 Periods)

a) Parts of a Book and Dummies.

b) Format and page design to suit different classes of books, book jacket and binding styles.

c) Illustrations their suitability, positions, captions and legends.

d) Casting off copy. Principles of copy fitting, copy fitting tables.

e) Margins: Importance of margins, determining margins to suit various styles of binding.

4. Display Design: (10 Periods)

a) Principles of display. Factors affecting display setting.

b) The effective use of white space. The shape and the size of the space.

c) Type face combinations and their suitability.

d) Use of borders, rules and other decorative materials. Use of initials and grids.

5. Newspaper Design: (08 Periods)

a) Newspaper format; Parts of a newspaper.

b) Principles of newspaper design.

c) Treatment and arrangements of body matter and headings.

6. Magazine Design: (06 Periods)

a) Parts of a magazine and their arrangements for Cover page.

b) Contents pages and sequences of magazine pages.

7. Design for Packaging: (10 Periods)

a) Introduction to packaging, Kinds of printed packages, Introduction to Packages, designing economic importance, advantages, selling aspects.

b) The advertising agency: Its functions, procedures and services.

c) Necessity of free-lance artists, designers and photographers.



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**LIST OF PRACTICALS**

1. Designing of Colour Theory and Colour Wheel.
2. Designing of pages for poetry books and kids books.
3. Designing of Labels.
4. Designing of single and two colour posters.
5. Preparation of layouts and Dummies for the book.
6. Designing of leaflets, booklets, brochures.
7. Designing layout for sale display materials.
8. Preparation of layout and paste ups for advertisement in newspapers and magazines.
9. Designing of newspaper pages.
10. Designing of magazine pages.
11. Preparation of dummies for the production of newspaper and magazine.
12. Designing for packaging materials.

**MEANS OF ASSESSMENT**

- Assignments and quiz/class tests,
- mid and end-term written tests,
- actual practical performance,
- Viva-voce.

**INSTRUCTIONAL STRATEGY**

Printing Design is a designing subject. Teacher should show various types of designed printed materials (book cover & jacket, poster, banner, newspaper, magazine, packaging materials, etc.) to the students. Students should be asked to collect samples of various printed material available in the market for better understanding about colour elements and designing procedure.

**RECOMMENDED BOOKS**


1. Art & Production, N.N. Sarkar, Sagar Publication, New Delhi.
2. Walkar, Magazine Design, Blue print, London.
3. Marting Duglas, Books Design, Blue print, London.
4. Silver G., Graphic Layout & Design , VNR, USA.
5. Elements & Design & Typography, B.D. Mendiratta, Asian Books Private Limited, New Delhi.

## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Hrs) | Marks Allotted (%) |
|---|---|---|
| 1 | 06 | 10 |
| 2 | 06 | 10 |
| 3 | 10 | 20 |
| 4 | 10 | 20 |
| 5 | 08 | 15 |
| 6 | 06 | 10 |
| 7 | 10 | 15 |
| **Total** | **56** | **100** |


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## 3.5 IMAGE CARRIERS TECHNOLOGY-I

| | L | T | P |
|---|---|---|---|
| **RATIONAL** | **4** | **-** | **3** |

It is a technology subject. It gives the knowledge of different printing surface preparation, techniques like photo engraving, offset plates, gravure cylinders etc. With this information one can control the operation of the equipment / production of printing surfaces, etc.

### LEARNINIG OUTCOMES

After undergoing this subject, the student able to

- Basic knowledge of image carrier.
- Knowledge of metal and nonmetal substrate used as image carrier.
- Knowledge of photographic emulsion – photographic intermediates and offset plates.
- Knowledge of Removal and addition work, causes and remedies.

### DETAILED CONTENT

1. Introduction: (10 Periods)

1.1 Introduction to Image Carrier for different printing processes.

1.2 Details of Image Carrier for Flexo, gravure, offset, silk screen and digital process, its suitability and limitations.

2. Photo Engraving: (14 Periods)

2.1 Metallic and non-metallic image carrier for photoengraving.

2.2 Photo resists: Kinds, characteristics, requirements, dark and continuing reactions.

2.3 Photographic intermediates (Negative/ Positives): Kinds, characteristics, and requirements.

3. Electroplating For Gravure Cylinder Making Process (06 Periods)

4. Off Set Plate Making: (20 Periods)

4.1 Introduction to Offset plate processes. Materials for offset plates-merits, limitation and suitability.


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4.2 Offset Platemaking, materials equipment and accessories.

4.3 Plate Grains, Graining and anodizing.

4.4 Introduction to various plate making process (surface, deep etch, wipe on, PS Plate, Paper Plate, etc.

4.5 Removal and addition work on plate.
4.6 Plate troubles and their remedies.

5. Introduction to CTP, Types of CTP and its working. (06 Periods)

**LIST OF PRACTICALS**

1. Use of different photo resists for image forming on metal

2. Preparing relief plates line work

3. Preparing deep etch plates (2 Nos.).

4. Preparing stereo plate.

5. Preparing Surface plate process (4 Nos.).

6. Preparing paper plates for table top offset machines.

7. Preparing Wipe on plate (2 Nos.)

**MEANS OF ASSEESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voce

**INSTRUCTIONAL STRATEGY**

Image carrier technology –I improve the knowledge of different types of image carrier's use in relief printing process. Students study the different types of materials use as image carriers. Such as metal and non-metals.


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**REFERENCE BOOKS**


1. GATEHOUSE & ROPER, FILM ASSEMBLEY & PLAT MAKING, GATF,USA.
2. OFFSET PLAT MAKING, GATF, USA.
3. MERTLE & OTHERS, PHOTOMECHANICS & PRINTING, VNR, USA.
4. KARCH & BUBER, GRAPHIC ARTS PROCEDURES, AMERICAN TECHNICAL SOCIETY, CHICAGO, USA.
5. OFFSET PLATE MAKING(DEEP-ETCH), AIFMP, NEW DELHI.
6. OFFSET PLATE MAKING(ALBUMIN PROCESS), AIFMP, NEW DELHI.
7. FORMULARY, AIFMP, NEW DELHI.


**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Hrs) | Marks Allotted (%) |
|---|---|---|
| 1 | 10 | 20 |
| 2 | 14 | 25 |
| 3 | 6 | 10 |
| 4 | 20 | 35 |
| 5 | 6 | 10 |
| **Total** | **56** | **100** |



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## 3.6 BASICS OF INFORMATION TECHNOLOGY

| L | T | P |
|---|---|---|
| - | - | 6 |

**RATIONALE**

Information technology has great influence on all aspects of life. Primary purpose of using computer is to make the life easier. Almost all work places and living environment are being computerized. The subject introduces the fundamentals of computer system for using various hardware and software components. 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 using MS Office/Open Office/Libre 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:**

**Explanation of Introductory part should be demonstrated with practical work. Following topics may be explained in the laboratory along with the practical exercises. There will not be any theory examination.**

**LEARNING OUTCOMES**

After undergoing the subject, the students will be able to:

- Identify Computer Hardware Components, Network Components and Peripherals.
- Explain the role of an Operating System.
- Install System and Application Software.
- Explain the function of the system components including Processor, Motherboard and Input-output devices.
- Use Word Processing Software to prepare document.
- Use Spreadsheet Software to create workbooks and automate calculation.
- Use Presentation Software to create interactive presentation.
- Perform fundamental tasks common to most application software including print, scan, save, edit, cut, copy, paste, format, spell and grammar check.
- Find and evaluate information on the Web.
- Install Antivirus.
- Safeguard against Online Frauds, threats and crimes.
- Use online office tools(Google suits)


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## TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION

1. Introduction to Computers and Peripherals.

   Components of Computer, Types of Computer, CPU, RAM, ROM, Hard disk, USB, Flash drive, CD, DVD, Blue ray, Keyboard, Mouse, Monitor, LCD, Printer, Plotter, Scanner, Modem, Sound Cards, Speakers, CMOS battery, Sharing of Printers.

2. Operation System and Application Software

   System Software, Application Software, Virtualization Software, Utility Software, MS Office/Open Office/Libre office, Working with window, Desktop components, Menu bars, creating shortcut of program. Installation of Application software, Antivirus and Drivers.

3. Word Processing, Spreadsheet and Presentation

   Usage and creation of word document, spreadsheets and presentation, Google Suits (Google drive, google sheet, google doc. Google presentation)

4. Internet

   Basics of Networking – LAN, WAN, Wi-Fi technologies, Concept of IP Addrsses, DNS, Search Engines, e-mail, Browsing and cyber laws.

## LIST OF PRACTICAL EXERCISES

1. Identify various components, peripherals of computer and list their functions.
2. Installation of various application software and peripheral drivers
3. Installation of operating system (windows/linux/others)
4. Creation and Management (Rename, delete, search of file and folders)
5. Installation of Antivirus and remove viruses
6. Scanning and printing documents
7. Browsing, Downloading, Information using Internet
8. E-Mail ID creation, comparing, sending and receiving e-mail. Attaching a file with e-mail message.

.9. Word Processing (MS Office/Open Office)

a) 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

b) Page set up:

- Setting margins, tab setting, ruler, indenting

c) Editing a document:

- Entering text, cut, copy, paste using tool- bars

d) Formatting a document:



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- 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, line spacing
- Use of headers, footers: Inserting footnote, end note, use of comments, auto text
- Inserting date, time, special symbols, importing graphic images, drawing tools

e) 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

f) Using Tools like:

- Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelops and lables
- Using shapes and drawing toolbar,
- Working with more than one window .

10. Spread Sheet Processing (MS Office/Open Office/Libre Office)

a) Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, save worksheet, switching between different spread sheets

b) Menu commands:
Create, format charts, organise, manage data, solving problem by analysing data. Programming with Excel Work Sheet, getting information while working

c) 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

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

d) Creating a chart:
Working with chart types, changing data in chart, formatting a chart, use chart to analyse data

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

e) Retrieve data with query:
Create a pivot table, customizing a pivot table. Statistical analysis of data

f) Exchange data with other application:
Embedding objects, linking to other applications, import, export document.


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11. PowerPoint Presentation (MS Office/Open Office/Libre office)

a) Introduction to PowerPoint

- How to start PowerPoint
- Working environment: concept of toolbars, slide layout & templates.
- Opening a new/existing presentation
- Different views for viewing slides in a presentation: normal, slide sorter.

b) Addition, deletion and saving of slides

c) Insertion of multimedia elements

- Adding text boxes
- Adding/importing pictures
- Adding movies and sound
- Adding tables and charts etc.
- Adding organizational chart
- Editing objects
- Working with Clip Art

d) Formatting slides

- Using slide master
- Text formatting
- Changing slide layout
- Changing slide colour scheme
- Changing background
- Applying design template

12. Google Suits

Using Google drive, Google shut, Google docs, Google slides.

**INSTRUCTIONAL STRATEGY**

Since this subject is practice oriented, the teacher should demonstrate the capabilities of computers to students while doing practical exercises. The students should be made familiar with computer parts, peripherals, connections and proficient in making use of MS



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Office/Open Office/Libre office/Google Suit in addition to working on internet. The student should be made capable of working on computers independently.

**MEANS OF ASSESSMENT**

- Class Tests/Quiz
- Software Installation and Use
- Viva-Voce
- Presentation

**RECOMMENDED BOOKS**


1. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Information Technology for Management by Henery Lucas, Tata McGraw Hills, New Delhi
3. Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
4. Computers Today by SK Basandara, Galgotia publication Pvt Ltd. Daryaganj, New Delhi.
5. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
6. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
8. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
9. On Your Marks - Net…Set…Go… Surviving in an e-world by Anushka Wirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
10. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar


Online Resources

1. www. tutorialspoint..com
2. www.sf.net
3. Gsuite.google.com
4. Spoken-tutorial.org
5. Swayam.gov.in



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## 3.7 GRAPHIC REPRODUCTION TECHNOLOGY

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

**RATIONALE**

Graphic Reproduction Technology is an important area of Printing Technology. It is essential to impart basic knowledge and skills in process photography, photo-mechanical processes for preparing surfaces for different printing processes, etc. This subject is essential as prerequisite for studying Reproduction Photography and Printing Surfaces in the Diploma Curriculum.

**LEARNING OUTCOMES**

After undergoing this subject, the student will be able to;

- Understand the fundamental of Graphic Reproduction.
- Study of various type of originals suitable for printing reproduction.
- Learning of process room equipments and their functions.
- Study of photographic film and processing chemicals and their function in graphic reproduction.
- Hands on knowledge of camera operation and line negative making.
- Know the exposure of contact photography in field of reproduction.
- Understand halftone screening, types of screen and their use.
- Provide basic understanding of dot formation and exposure control system.

**DETAILED CONTENTS**

1. Introduction and outline of Graphic Reproduction: (06 Periods)

1.1 Introduction, functions and outline of graphic reproduction.

1.2 Originals for reproduction: Classification of originals (Line, Halftone, Continuous Tone), their characteristics and suitability for reproduction.

1.3 Introduction to reproduction photography and photo-mechanical processes.

2. Equipment and Accessories: (08 Periods)

2.1 Process Camera; basic parts, kinds and functions of modern process cameras, their merits and limitations.



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2.2 Process lens: Introduction, structure and requirements, care and handling. Lens aperture, diaphragm- their functions.

2.3 Illuminants used for reproduction photography, kinds of modern illuminants- their merits and limitations. Units of illumination, relative intensity and exposure calculations.

2.4 Lateral reversal: Optical and straight line reversal.

3. Photographic Films and Processing Chemicals : (10 Periods)

3.1 Introduction and Structure of a photographic film emulsions, kinds of photographic films used for reproduction photography - their characteristics and uses.

3.2 Characteristics curve and gamma curve of photographic film.

3.3 Latent Image Theory, reciprocity failure, intermittence effect.

3.4 Processing chemicals : developer, kinds, ingredients used in developers and their functions, stop bath, fixer, reducer and intensifiers.

4. Line Negative Making : (12 Periods)

1.1 Handling of Process Camera, Copy preparation for reproduction (Scaling, cropping), Basic line exposure, factor governing exposure. light integrator.

1.2 Camera Procedures for line negative making from black & white, coloured line originals.

1.3 Dark room procedures for processing an exposed film for line negative making; development and factors governing development; stop bath; fixing and after treatments.

1.4 Evaluation of line negatives. Defects in line negative and their remedies.

5. Contact Photography : (06 Periods)

5.1 Equipment and accessories in contact photography.

5.2 Determining the correct exposure and preparation of positives from line negative and Vice-Versa.

5.3 Application of contact photography in reproduction.

6. Halftone Reproduction : (14 Periods)

6.1 Introduction and necessity of screen in reproduction processes.

6.2 Different type of halftone screens viz., Glass ruled and vignette contact screen, Screen angle and Screen Resolution, special purpose screens, Screen Ruling, screen angles.

6.3 Theories of Halftone dot formation, Selection of screening, screen distance. Moiré

pattern & Rosette pattern, AM Screening & FM Screening.

6.4 Halftone negative making, requirements of Halftone negative for different printing processes.

6.5 Halftone exposure systems, determining the correct exposure, hard and soft dots, spreads and chokes, supplementary exposure: flash exposure, bump exposure.

6.6 Camera Procedures and dark room processing for Halftone negative making.

6.7 Evaluation of Halftone negatives, Halftone failure and remedies.

**LIST OF PRACTICALS**

Introduction to different process room equipment, study of their different parts & working.

1. Preparation of processing chemicals.
2. Line negative making in same/ reduced /enlarged size.
3. Retouching and correction of faulty line negatives.
4. Line negatives from coloured line originals.
5. After treatments: reducers, intensifiers, chemicals reversal.
6. Halftone negative making. Calculation of screen distance, principle of dot formation Use of V ratio and inverse system.
7. Camera procedures, screen distance calculation & dark room processing for halftone negative making.
8. Evaluation of halftone negatives; Halftone failure and remedies.
9. Preparation of negatives / positives by contact photography.

**MEANS OF ASSESSMENT**

- Assignments and quiz/class tests.
- Mid-term and end-term written tests.
- Actual Practical Performance.
- Small projects.
- Progress chart, Attendance and punctuality
- Viva-voce.



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**INSTRUCTIONAL STRATEGY**

While imparting instructions, teacher should show various types of originals for reproduction, halftone screen, illuminants, line negative / positive, halftone negative / positive and small clips of film making, process camera operation and film processor. Students should be asked to collect samples of various type of original, line & halftone negative/positive available in market.

**RECOMMENDED BOOKS**


1. Line Photography, Karl Davis Robinson, AIFMP, New Delhi.
2. Halftone Photography, Erwin Jaffe, AIFMP, New Delhi.
3. Graphic Arts Photography: Colour, GATF.
4. The Handbook of Modern Halftone Photography, Perfect Graphic Arts.
5. Halftone Photography, GATF, USA.
6. Graphic Reproduction Photo Graphic Focal Press London.


**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods | Marks Allotted (%) |
|---|---|---|
| 1 | 06 | 10 |
| 2 | 08 | 12 |
| 3 | 10 | 15 |
| 4 | 12 | 25 |
| 5 | 06 | 10 |
| 6 | 14 | 28 |
| **Total** | **56** | **100** |




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## 4.1 COMMUNICATION SKILLS – II

| L | T | P |
|---|---|---|
| 4 | - | 2 |

**RATIONALE**

Knowledge of English Language plays an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill.

**LEARNING OUTCOMES**

After undergoing the subject, the students will be able to:

- Frame correct sentences with illustrations
- Comprehend the language correctly
- Interpret the language correctly
- Use given material in new situations.
- Correspond effectively using various types of writings like letters, memos etc.
- Communicate effectively in English with appropriate body language making use of correct and appropriate vocabulary and grammar in an organised set up and social context.

**DETAILED CONTENTS**

1. Functional Grammar (16 periods)

    1.1 Prepositions
    1.2 Framing Questions
    1.3 Conjunctions
    1.4 Tenses

2 Reading (16 periods)

    2.1 Unseen Passage for Comprehension (Vocabulary enhancement - Prefixes, Suffixes, one word substitution, Synonym and Antonym) based upon the passage should be covered under this topic.

3 Writing Skill (24 periods)

    3.1. Correspondence


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a) Business Letters- Floating Quotations, Placing Orders, Complaint Letters.
b) Official Letters- Letters to Government and other Offices

3.2. Memos, Circular, Office Orders
3.3. Agenda & Minutes of Meeting
3.4. Report Writing

**LIST OF PRACTICALS**

**COMMUNICATION SKILLS – II**

**Note:** Teaching Learning Process should be focused on the use of the language in writing reports and making presentations.
Topics such as Effective listening, effective note taking, group discussions and regular presentations by the students need to be taught in a project oriented manner where the learning happens as a byproduct.

**Speaking and Listening Skills**

1. Debate
2. Telephonic Conversation: general etiquette for making and receiving calls
3. Offering- Responding to offers.
4. Requesting – Responding to requests
5. Congratulating
6. Exploring sympathy and condolences
7. Asking Questions- Polite Responses
8. Apologizing, forgiving
9. Complaining
10. Warning
11. Asking and giving information
12. Getting and giving permission
13. Asking for and giving opinions

**INSTRUCTIONAL STRATEGY**

Students should be encouraged to participate in role play and other student-centred activities in class rooms and actively participate in listening exercises

**MEANS OF ASSESSMENT**

- Assignments and quiz/class tests


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- Mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

**RECOMMENDED BOOKS**


1. Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2 Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.
3 High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
4. e-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.


**Websites for Reference:**

1. http://www.mindtools.com/ page 8.html – 99k
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 16 | 28 |
| 2 | 16 | 28 |
| 3 | 24 | 44 |
| **Total** | **56** | **100** |

## 4.2 TEXT & IMAGE SETTING

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

### RATIONAL

Every printed product consists of text portion and illustrations, with the former occupying a predominant portion. Knowledge of text setting methods and equipment used for setting text, which is broadly termed 'Letter Assembly' is therefore very essential.

The aim of this subject is to study letter assembly as an important part of print production techniques, to enable the students to make judgement about the aspect of printing, particularly in relation to the requirements of designing the printed products.

This will cover development of typesetting method, preparation for typesetting, typesetting inputs and outputs, page assembly, proofing, imposition and planning.

The aim is to further develop the students understanding and knowledge of letter assembly equipment, particularly in the areas of on line integrated system, image generation system, editing and corrections, electronic page assembly, digital storage and outputs.

### LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Knowledge of Mechanical Typesetting techniques.
- Knowledge of Digital Typesetting systems.
- Knowledge of typographic measurement system.
- Knowledge of Digital imaging.

### DETAILED CONTENTS

1. Typesetting Techniques : (10 Periods)

1.1 Introduction to Mechanical typesetting - Merits & Limitations.

1.2 Digital type setting Systems – Different software using in digital type setting, Merits & Limitations.

2. Typographic Measurement System : (10 Periods)

2.1 Units of Measurement, Point system, Units.

2.2 Computerized Measurement by different latest system.

3. Image Setting Systems: (16 Periods)

3.1 Suitability & limitations of different image setting systems.

3.2 Basic components of modern image setter and their functions



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3.3 Input devices - work station, high end scanners, Digital Pen, FTP.
3.4 Storage systems- Latest auto backup devices.

3.5 Output Devices- Image Setter, large format inkjet printer, film processor.

4. Digital Type setting and Imaging : (10 Periods)

4.1 Role and functions of computer in type setting, image editing, page assembling and imposition.
4.2 Various latest DTP software and their functions, merits and limitations of DTP.

4.3 Hardware and Software requirements for inputting and outputting.

4.4 Role of internet and server for digital imaging system.

5. Production Routine: (10 Periods)
5.1 Steps in Text Processing, Scanning operations for illustrations outputting and quality control.

5.2 Editing corrections and page make up for commercial jobs.

5.3 Latest proofing methods and proof reading marks.

5.4 Online processing, RIP (Raster Image Processor)

**LIST OF PRACTICALS**

1. Hand Composition

2. Display work as per layout

3. Demonstration on Mechanical Typesetting Machines.

4. Page make up & proofing. Different proof reading techniques.

5. Setting of text, table and tabular setting on Desk Top Publishing system.

6. Desk Top Publishing

7. Study of DTP configuration.

8. Setting text matters, margins, interline, font selection on DTP system.

9. Creation of visiting cards, letter head, envelop, invitation card, greeting cards, bill / vouchers, banners and posters.


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10. Care and handling of DTP system.

11. Acquiring of data / image for digital printing.

12. RIP process.

**MEANS OF ASSEESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voce

**INSTRUCTIONAL STRATEGY**

While imparting instructions, teacher should show various types of printed products and their process to applying for printing. Students should be asked to collect samples of various paper samples and card sheets available in the market.

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 10 | 10 |
| 2 | 10 | 20 |
| 3 | 16 | 20 |
| 4 | 10 | 30 |
| 5 | 10 | 20 |
| **Total** | **56** | **100** |

## 4.3 SHEET FED OFFSET TECHNOLOGY



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**L T P**

**RATIONALE** **4 - 4**

This is a technology subject. Technicians working in printing industry are required to deal with different printing machines of various processes. These machines have different operational units. The diploma holders are required to have a good knowledge of these machines. This subject deals with the all printing machines of sheet fed offset printing process and their operational units.

**LEARNING OUTCOME**

After undergoing this course, the students will be able to:

- Explain about the sheet fed printing machines single colour and multicolor job .
- Know About the different kind of feeding system
- Explain the printing cylinders and structures and grade of blanket.
- Know about the inking system and Dampening system with Diagram and details.
- Know about the operational features of Delivery system.
- How to Ready machine for a Printing job.
- Know About the Running defects on Machine during productions
- Gain Knowledge of hybrid machines and finishing processes.

**DETAILED CONTENTS**

**1. Offset Printing Machine:** (10 Periods)

1.1 Sheet- fed offset printing machines; Basic principle, configuration, three cylinder, five cylinder, classification, Sizes, speed, suitability of single colour, multicolor, and perfecting machine, their mechanical and operational features.

1.2 Sheet feeding systems; types, single sheet feeder, stream feeder, sheet controls, sheet insertion devices

**2. Printing cylinders;** (08 Periods)

2.1 Plate, blanket and impression cylinders, setting, cylinder bearers, gauge rings, mounting of plate and rubber blanket on cylinders.

2.2 Rubber blanket; kinds, grades, structure, properties, care and storage.

**3. Inking system and Dampening system** (10 Periods)



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3.1 Inking system; Different types, care & maintenance.

3.2 Dampening system; types, fountain solution and its purpose, different elements of conventional system.

**4. Delivery system** (08 Periods)

4.1 Delivery system; types, slide way delivery to extended delivery, elements of delivery system, setting and operational features. Pile logistics system (Conveyor System)

4.2 Pre Make-ready, Make -ready and printing of single colour and multi colour jobs, make-ready book, colour sequence, colour mixing and matching.

**5. Running Defects:** (05 periods)

5.1 Picking, fluffing, show through, ghosting, Hickies, trapping, Mis register, Doubling, Set off, Glazing, Static electricity, catch up, dampner marks, Scuffing.

**6. Automation Hybrid machines** : (05 Periods)

6.1 Press console, non- stop sheet feeder, Automatic plate mounting, automatic blanket washer, non- stop delivery, waste diverter, sheeter, numbering, imprinting, perforation, creasing, embossing, varnishing, in-printing hologram.

**7. Registration**: (05 Periods)

7.1 Manual registration, Automatic registration, registration devices, sensors

**8. Heat Set Printing** : (05 Periods)

8.1 Hot air, IR lamp, UV lamp, heat set inks, suitable substrates for heat set printing.

**LIST OF PRACTICALS**

1. Introduction to tools, equipment and material used in press work lab.
2. Introduction to detailed technical specification of some important machines.
3. Adjustment of plate on plate cylinder and fitting of rubber blanket on blanket cylinder.
4. Preparation of fountain solution.
5. Setting of inking and dampening rollers, lubrication of machine.
6. Make-ready and printing of single colour and multicolour jobs.
7. Analysis of printing quality
8. Ink rollers wash up, dampners cleaning and storage of plates.



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**MEANS OF ASSEESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voce

**INSTRUCTIONAL STRATEGY**

While imparting instruction teacher should show the web offset machine with detailed technical specification of different types of machines also differentiate the printed jobs. Student should be ask for adjustment of plate on plate cylinder and fitting of rubber blanket on blanket cylinder, Preparation of fountain solution. Setting of inking and dampening rollers, lubrication of machine.

**RECOMMENDED BOOKS**


1. Technology of offset printing, C.S. Misra Anupam Prakashan Allahabad-India.
2. Durrant, W.R., Machine Printing, Focal Press, London.
3. Sheet fed Technology, A.K.Baral.


**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 10 | 15 |
| 2. | 8 | 15 |
| 3. | 10 | 15 |
| 4. | 8 | 15 |
| 5. | 5 | 10 |
| 6. | 5 | 10 |
| 7 | 5 | 10 |
| 8 | 5 | 10 |
| **Total** | **56** | **100** |



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## 4.4 MAGE CARRIER TECHNOLOGY- II

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

### RATIONALE

It is a technology subject. It gives the knowledge of different printing surface preparation, techniques like photo engraving, offset plates, gravure cylinders etc. With this information one can control the operation of the equipment and production of printing surfaces, etc.

### LEARNING OUTCOMES

After undergoing this course students will be able to

- Detail knowledge of relief image carriers
- Image carrier used in planography
- Different types of quality control aids
- Computer to plate system
- Different types of plate used in CTP
- Gravure and polymer image carriers

### DETAILED CONTENTS

1. Relief Plate Making Processes (10 Periods)

1.1 Relief plates for letterpress, flexography and letterset, merits, limitations, suitability, materials, equipment and methods.

1.2 Pre-costing, Post-costing for flexography plated.

2. Offset Plate Processes (14 Periods)

2.1 P.S. Plate Process.
2.2 Multi-metal plate process.
2.3 Photopolymer plates.
2.4 Paper Plate
2.5 Letterset Plates

3. Quality control aids (08 Periods)

3.1 The star Target, Dot gain scale, Sensitivity guide, colour control bar, green bar, plate punching, Densitometers, trouble shooting.


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4. CTP System (08 Periods)

4.1 Introduction of CTP system
4.2 Types of CTP system
4.3 Working of CTP system

5. Gravure Surface Preparation (08 Periods)

5.1 Conventional Processes of Gravure Cylinder preparation
5.2 Electronic and laser beam engraving- Principles, equipment, materials and methods 5.3 P.S. Photopolymer plates for gravure cylinders (Introductory).

6. Screen printing surface Preparation (08 Periods)

6.1 Screen fabrics: Kinds, Characteristics and suitability.
6.2 Screen preparation materials, accessories and methods.
6.3 Modern techniques of screen preparation.

**LIST OF PRACTICALS**

1. Preparation of negative and positive working PS plates.
2. Preparation of photopolymer relief plates (Demonstration).
3. Flexographic Platemaking (Demonstration)
4. Gravure Cylinder making (Demonstration)
5. Electronic Engraving (Demonstration)
6. Polymer plates for Offset (Demonstration)
7. Preparation of image carrier for screen printing by different Process.
8. Use of Pre-registration Devices.

**MEANS OF ASSEESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voce


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## INSTRUCTIONAL STRATEGY

While imparting instruction teacher should show various types of offset plate which modify different process. Which metal use offset plate gravure cylinder and flexography printing process.

## REFERENCE BOOKS


1. GATEHOUSE & ROPER, FILM ASSEMBLEY & PLATE MAKING, GATF,USA.
2. OFFSET PLATE MAKING, GATF, USA.
3. MERTLE & OTHERS, PHOTOMECHANICS & PRINTING, VNR, USA.
4. KARCH & BUBER, GRAPHIC ARTS PROCEDURES, AMERICAN TECHNICAL SOCIETY, CHICAGO, USA.
5. MACHINE PRINTING, FOCAL PRESS, LONDON.


## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted |
|---|---|---|
| 1. | 10 | 06 |
| 2. | 14 | 16 |
| 3. | 08 | 06 |
| 4. | 08 | 06 |
| 5. | 08 | 10 |
| 6. | 08 | 06 |
| Total | 56 | 50 |



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## 4.5 BINDING & FINISHING TECHNOLOGY

**L T P**
**5 - 4**

### RATIONAL

This is a core subject. After printing is complete, the printed sheets are required to be put in a proper shape such as books, magazine, register, etc. For this, knowledge of various methods and techniques of binding and finishing is very essential.

### LEARNING OUTCOMES

After undergoing this course students will be able to

- Basic knowledge of binding tools and equipment and ware house.
- Knowledge of binding materials.
- Knowledge of different securing methods
- Know about the role of end papers.
- Knowledge of forwarding operations.
- Knowledge of finishing operations and edge decoration.
- Knowledge of different binding machines.
- How to repair and rebinding of books.

### DETAILED CONTENTS

1. Binding Operations and Warehouse: **(10 Periods)**

1.1 Definition of binding, different kind of binding, basic tools & equipment used in binding.

1.2 Binding Operations: Jogging, knocking, counting, folding, gathering, collating, stitching, sewing, cutting and trimming operations, Treatment of plates and maps, tipping and guarding.

1.3 Conventional paper sizes and International paper sizes, Sub-divisions of paper.

1.4 Unprinted paper warehouse and printed paper warehouse, storing, temperature, humidity etc.

2. Binding materials **(06 Periods)**

2.1 Paper, boards, adhesive, binding cloths rexine, leather and other materials.

3. Securing Operations: **(08 Periods)**



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3.1 Different kinds of wire stitching : side, center and saddle stitching.

3.2 Different kinds of sewing: Sewing with thread only, sewing on tapes, sewing on cords (flexible & sawn-in sewing), sewing two sections on, overcasting, saddle sewing and side sewing.

3.3 End papers: requirements of end paper, purpose & functions of end paper, kinds of end paper: self, single, double, made end paper, cloth joint end paper, zig-zag end paper and cloth joint zig-zag end paper.

4. Forwarding Operations: **(08 Periods)**

4.1 In - board and out - board forwarding: removing the swelling at the back, fixing the end paper, fraying out the slips, gluing the back, trimming, rounding and backing, back lining etc., Book Binding : styles of book binding,**.**

5. Finishing operations : **(08 Periods)**

5.1 Miscellaneous Operations : Cutting, Trimming, Creasing, Numbering, Perforating, Embossing, Thermography etc.

5.2 Edge decoration, colouring, marbling, tinting and guiding, goffering or tooling the edges, Book mark, Bode mark, handmade and machine made head & tail bands.

5.3 Decorating the cover of the book with the finishing tools, blind blocking, gold blocking, foiling, heating, testing and pressing, cleaning, inlaying, lacing and bands open-up and pressing.

6. Covering Operations: **(06 Periods)**

6.1 Measuring and cutting to size and shape, applying adhesive and turning-in, pressing, setting the groove or joints, setting the head, setting the band, polishing, pressing and pasting down.

7. Automation in bindery: **(10 Periods)**

7.1 Cutting machine, folding machine, bundling machine, gathering machine, wire stitching machine, thread stitching and looping machine, perfect binding machine, three- knife book trimmers, book back gluing machine, rounding and backing machine, back-lining machine, case- making machine, back forming machine, casing - in machine, pressing machine, gold foil stamping machine.

8. Publishers' Binding: **(08 Periods)**

8.1 Jogging, counting, folding, bundling, attaching plate and end papers, gathering, sewing, nipping, spine gluing, trimming, spring back, edge decoration, rounding and backing,


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lining, Alternative forwarding techniques, board cutting and cloth cutting, case making, cover decoration, casing-in, pressing, inspection, dispatch.

9. Repair and rebinding of books: **(06 Periods)**

Pulling a book, removing old groove by trimming the book, applying the glue on loose leaf, overcasting, strengthening out of vellum leaves, pressing.

**LIST OF PRACTICALS**

1. Study of tools and machinery, their uses and care in handing.
2. Materials and supplies essential for a book binding department.
3. Jogging, counting and folding.
4. Side and saddle - Odd and even number stitching.
5. Preparation of Tear-off pad/Writing pad with gild corners.
6. Preparation of different types of End papers.
7. Styles of binding: Quarter- bound cut flush (Library sewing), Quarter- bound turned in (Library Sewing), Quarter- bound turned in (Sawn-in-sewing).
8. Manifold book (Carbon duplicate book)
9. One letter index book Styles of binding Quarter-bound turned- in with squares (Flexible sewing), Quarter-bound turned-in with squares (Two-on sewing), Case binding (Overcast sewing), Publisher binding (Library sewing).
10. Half-bound (conventional method): Calico and marble with gilding, spine preparing and spine decorating with ink, leather paring and gilding the spine, photo- album with colour strings.
11. Rebinding and case making.
12. Exercise on sewing machine, stitching m/c, single clamp perfect binding m/c, cutting & trimming m/c, looping machine etc.
13. Mechanical and loose leaf binding machines used.
14. Printing and decorating cover- stamping with ink, with foil, blind.
15. Finishing processes: Operation of ruling machine, operation of blocking machine, numbering machines: hand numbering and type-high numbering machine, operations care and


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maintenance. Planning a job for hand numbering, finishing leather, calico cover with gold foil embossing, hand tooling and blind tooling methods, bronzing, varnishing and other surface treatments.

**MEANS OF ASSEESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voce

**INSTRUCTIONAL STRATEGY**

Student should learn how the printed or unprinted sheets are required to be put in a proper shape such as books, magazine, register, etc. Teacher should elaborate the different binding & finishing operations as well as different types of machines involved in the binding & finishing department.

**REFERENCE BOOKS**


1. Martin, A.G., Finishing Process in Printing, Focal, 1972.
2. Johnson, A.W., Manual of Book Binding, Thames and Hudson.
3. Alex J. Vaughan, Modern Book binding
5. Doeglas Cockerell, Bookbinding and the Care of Books.
6. Introduction to printing and finishing- by Hugh M. Spiers.


**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods ) | Marks Allotted (%) |
|---|---|---|
| 1. | 10 | 14 |
| 2. | 06 | 10 |
| 3. | 08 | 12 |
| 4.. | 08 | 12 |
| 5. | 08 | 06 |
| 6. | 06 | 12 |
| 7. | 10 | 14 |
| 8. | 08 | 12 |
| 9. | 06 | 08 |
| **Total** | **70** | **100** |



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## 4.6 GRAVURE PROCESS AND TECHNOLOGY

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

**RATIONALE**

This is a subject of gravure process and technology. Technicians working in printing industry are required to deal with different printing machines of various job. These machines have different operational unit. The diploma holders are required good knowledge of these machines. This subject deals with the printing machines of all the process and their operational units.

**LEARNING OUTCOMES**

After undergoing this course, the students will be able to:

6 Basics knowledge of gravure press.

7 Future developments of gravure printing and their products.

8 Gravure image carrier technology and there preparation.

9 Gravure machine configuration, job setting process there scope.

10 Gravure printing machine running defects and there remedies.

11 Classified various types ink and solvent use in gravure printing.

12 Overall technical knowledge about packaging and products**.**

**DETAILED CONTENTS**

1. History of Gravure (08 Periods)

1.1 Invention of Intaglio/ gravure, Chemical Etching, Popularity of engraving.

1.2 Cylinder printing, Impression cylinder, First rotary gravure press, advanced in engraving.

2 Gravure products and markets (08 Periods)

2.1 Publication gravure, Gravure magazine printing, other commercial gravure printing, gravure packaging and converting.

2.2 Gravure flexible packaging, Gravure labels and wrapper, other gravure printed products.

3 GRAVURE CYLINDERS ENGRAVING (08 Periods)

3.1 Conventional etch, Direct transfer method, chemical engraving method and equipment, Cell configurations.



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3.2 Merits and limitations of chemical etching, photo and digital proofs for gravure.

3.3 Soft copy proofs, Overlay proofs, Single sheet proofing system, direct digital proof.

3.4 Gravure press proofs, Register control on proofs presses, cylinder correction method.

4 THE GRAVURE PRESS AND ITS COMPONENTS & PRINTING DEFECT (08 Periods)

4.1 A Generic printing press, packaging gravure press, offset gravure and flexo gravure.

4.2 Printing defects, Line, Stick, Scum, Image blind, cell filling, mottling, adhesion problem, setoff,

5 THE GRAVURE DOCTOR BLADE (08 Periods)

5.1 The doctor blade assembly, Doctor Blade wear, Doctor Blade materials

5.2 Doctor blade holder configurations, Blade setting procedures, Blade edge configurations.

5.3 Preparing blade for use, Make ready and trouble- shooting, Doctor Blade problems

6 THE GRAVURE IMPRESSION ROLLER (08 Periods)

6.1 Functions of the impression roller, Roller coverings, Roller pressure, Effects on web.

6.2 Cylinder diameter, Conductivity for esa, Roller design and configurations, Roller setting, Impressions mechanism.

6.3Impressions rollers problems, Impressions rollers effects on web tension, Electrostatic assist.

7 GRAVURE INK DRYERS (08 Periods)

7.1 The need for ink dryers, Solvent removal, Drying water base inks, Dryers functioning.

7.2 Heat sources, other drying methods, Environmental considerations, Accountability for solvents.

**LIST OF PRACTICAL**

1. Introduction make ready of gravure press.
2. Cylinder loading and unloading gravure press.
3. Doctor Blade setting procedures,
4. Web loading and unloading on gravure printing machine.
5. Color matching and mixing gravure press.
6. Make ready and proofing gravure press.


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**MEANS OF ASSEESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voce

**INSTRUCTIONAL STRATEGY**

While imparting instructions, teacher should show gravure printing machine and various packaging materials print in gravure printing machine to the student. Student should be asked gravure printing machine configuration and various parts. Visits to industry should be planned to demonstrate use of various types of gravure printing processes in the industry.

**REFERCENCE BOOKS**

1 ASIA PACIFIC BUSINESS PRESS
2 NIIR BOARD OF CONSULTANTS AND ENGINEERS

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods ) | Marks Allotted (%) |
|---|---|---|
| 1 | 8 | 15 |
| 2 | 8 | 15 |
| 3 | 8 | 12 |
| 4 | 8 | 12 |
| 5 | 8 | 16 |
| 6 | 8 | 15 |
| 7 | 8 | 15 |
| **Total** | **56** | **100** |


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## 5.1 COLOUR SEPARATION TECHNOLOGY

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

**RATIONALE**

A smart way to achieve high-quality color separations that result in precise, clear screen prints is to develop and repeat a color separation procedure. Identify the issues that may face while performing colour separation procedure depending on the process that choose to go with and eliminate them. To give the students a general understanding of the fundamentals of digital image processing and to introduce them to analytical tools which are currently used in digital image processing.

**LEARNING OUTCOMES**

After undergoing this subject, the student will be able to;

- Understand the basic of light, electromagnetic spectrum, perception, properties, temperature of colour, measurement of colour, different colour synthesis.
- Understanding the basic principle of colour separation and colour correction techniques - manual and photographic.
- Understanding of gray balance, UCR & GCR.
- Understanding of digital camera - basic part and operations.
- Study of photo editing software.
- Understanding the working of electronic colour scanner.
- Knowledge of quality control aids.
- Knowledge of densitometer and photo spectrometer.
- Knowledge of proofing.

## DETAILED CONTENTS

1. Light and Colour : (06 Periods)

1.1 The electromagnetic spectrum and the visible spectrum.

1.2 Light and Color: Seeing and measuring colors, Principles of color, Color as a wave length, The human perception of color.

1.3 The properties of colour: hue, saturation and brightness, colour space, colpur temperature.



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1.4 Color reproduction principles: Additive color theory and Subtractive color theory.

2. Colour Separation & Colour Correction: (14 Periods)

2.1 Basic principles of colour separation, filters, filter factors & filter ratio, its absorption & transmission qualities.

2.2 Methods of colour separation: direct colour separation and indirect colour separation.

2.3 Exposure control system, Evaluation of colour separations.

2.4 Necessity of colour correction, Principles of colour & tonal correction.

2.5 Manual correction procedure through dye retouching, staging & dot etching, Photographic correction procedure i.e. Photographic Masking, quality control mask.

2.6 Gray balance, UCR & GCR.

2.7 Duotone negative making, Rescreening of halftone prints, Line & halftone combination work, Preparation of halftone tints, Dropout negative-making.

3. Digital Reproduction Techniques: (12 Periods)

3.1 Digital camera - Basics elements/parts of digital camera: The camera body, optics, image recording sensors, view finder, image storage, batteries, buttons and controls, flash, accessory and computer transfer interface.

3.2 Image capturing techniques using Digital camera, Scanner and photo CD.

3.3 Study of photo editing software, role and importance in digital image correction, manipulation, sharpening and total adjustments.

4. Electronic Colour Scanner : (10 Periods)

4.1 Principle of scanning, Principles of colour.

4.2 Electronic colour scanner : Principle of scanning, Working principle and functions of a colour scanner, Different types of Scanner i.e., PMT based and CCD based.

4.3 Electronic colour separation technique: scanner programming, scanner operation and evaluation of separations through scanner.

5. Quality control tools : (08 Periods)

5.1 Registration marks, register punch, star target, gray scale, dot gain scale, step wedge, colour control patches, exposure meter.



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5.2 Densitometer: Basic components & it's working principles.

5.3 Spectrophotometer: Basic components & it's working principles.

6. Proofing: (06 Periods)

6.1 Photographic Proofing.

6.2 Electrostatic- Laser Proofing.

6.3 Thermal Proofing.

6.4 Inkjet Proofing.

**LIST OF PRACTICALS**

1. Rescreening from printing halftones.
2. Line and halftone Combination negative making.
3. Direct/Indirect separation from reflection copy.
4. Evaluation and retouching exercises.
5. Separations through scanner a colour scanner and evaluation.
6. Use of gray scale. Contrast control by different methods Practice on different contacts.
7. Use of densitometers & Spectrophotometer.
8. Digital image correction, enhancement and total adjustments.
9. Study of density, range contrast, gamma, characteristic curve.

**MEANS OF ASSESSMENT**

- Assignments and quiz/class tests.
- Mid-term and end-term written tests.
- Actual Practical Performance.
- Small projects.
- Progress chart, Attendance and punctuality
- Viva-voce.



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## INSTRUCTIONAL STRATEGY

While imparting instructions, teacher should show various types of colour separation materials; digital camera, electronic colour scanner, densitometer and photo spectrometer, to the students. Students should be asked to work on digital camera and electronic colour separation & take their proof and check proofs quality parameters using densitometer/spectrometer.

## RECOMMENDED BOOKS


1. Colour and Its Reproduction, GATF
2. Graphic Design and Print Production Fundamentals; BCCampus. VICTORIA B.C., CANADA.
3. Halftone Photography, Erwin Jaffe, AIFMP, New Delhi.
4. Graphic Arts Photography: Colour, GATF.
5. Halftone Photography, GATF, USA.
6. Graphic Reproduction Photo Graphic Focal Press London.
7. Electronic Colour Separation, R K Printing & Pub. Co.
8. Understanding Digital Colour, GATF, USA.


## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 06 | 10 |
| 2 | 14 | 25 |
| 3 | 12 | 20 |
| 4 | 10 | 20 |
| 5 | 08 | 15 |
| 6 | 06 | 10 |
| **Total** | **56** | **100** |



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## 5.2 WEB OFFSET TECHNOLOGY

| L | T | P |
|---|---|---|
| 5 | - | 4 |

**RATIONALE**

This is a technology subject. Technicians working in printing industry are required to deal with different printing machines of various processes. These machines have different operational units. The diploma holders are required to have a good knowledge of these machines. This subject deals with the printing machines of web offset printing process and their operational units.

**LEARNING OUTCOMES**

After undergoing this course, the students will be able to:

- Know About the web offset printing machines mechanical and operational features and Technical specification of different web offset machines.
- How to Infeed unit work on web offset machines.
- Know about the inking system and Dampening system with Diagram and details.
- How to works dryer and chilled roller and purpose of Sillicon applicator.
- How to Ready machine for a Printing job.
- Gain knowledge of color Mixing and matching.

**DETAILED CONTENTS**

1. Web-fed offset printing machines: (20 Periods)

1.1 Mechanical and operational features, pre-make ready and make ready, different types and their use in the printing industry.

1.2 Configuration- blanket to blanket, four- high unit, arch type, satellite type, twin satellite, three quarter satellite, combi- satellite.

2. Infeed unit: (10 periods)

2.1 Different elements, reel stand, AGV transport, splicing, web tension control, dancer roller, auto web up, turner bar

3. Printing Units: (12 periods)

3.1 Inking, RCI inking and dampening systems, contacting and non- contacting.

4. Registration: (08 Periods)

4.1 Manual and automatic registration, registration devices, sensor, registration mark, control chart and devices.



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5. Heat set web offset (06 Periods)

5.1 Hot air, IR lamp, UV lamp, heat set inks, suitable substrate for heatset inks, chilling unit.

6. Delivery Unit (06 Periods)

6.1 RTF roller, kite former, folder and its type, slitting, stackers, ancillary operations, numbering, punching, etc.

7. ANCILLARY EQUIPMENTS: (08Periods)

7.1 Noise protection encapsulation, automatic wash-up procedure, plate changing, ink and dampening solution supply.

## LIST OF PRACTICALS

1. Study of detailed technical specification of web offset machine.
2. Introduction to tools, Equipment required in lab.
3. Clamping of plate and rubber blanket on cylinders.
4. Web feeding, preparation of machine for printing and folding on web offset machine.
5. Preparation of fountain solution, dampening rollers.
6. Adjusting inking and dampening rollers, ink - fountain setting.
7. Make ready and practice on sheet fed and Web offset printing

## MEANS OF ASSEESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voce

## INSTRUCTIONAL STRATEGY

While imparting instruction teacher should show the web offset machine with detailed technical specification of different types of machine also differentiate the printed jobs. Student should be asked for clamping of plate and rubber blanket on cylinders, preparation of machine for printing and folding on web offset machine.



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**REFERENCE BOOKS**

1. Technology of offset printing, C.S. Misra Anupam Prakashan Allahabad-India.
2. Durrant, W.R., Machine Printing, Focal Press, London

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 20 | 25 |
| 2. | 10 | 15 |
| 3. | 12 | 20 |
| 4. | 8 | 10 |
| 5. | 6 | 10 |
| 6. | 6 | 10 |
| 7. | 8 | 10 |
| **Total** | **70** | **100** |


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## 5.3 PROCESS PLANNING AND FILM ASSEMBLY

**L T P**
**4 - 4**

**RATIONALE**

With the introduction of electronic and phototypesetting a bulk of text work is now printed by offset. Process planning & film Assembly Play a key role in Offset Printing Production. Introduction of Processes Planning and Film Assembly as an independent subject in the Diploma Curriculum is essential.

**LEARNING OUTCOMES**

After undergoing this course students will be able to

- Introduction of planning
- Planning for different processes
- Layout & design of book
- All type of imposition scheme
- Knowledge of positive and negative full assembly

**DETAILED CONTENTS**

1. Layout & Planning for Film Assembly (10 Periods)

1.3 Importance of planning and planning considerations.
1.4 Layout and planning information the layout factors- related to paper, machine, plate size, Plate Clamp allowance, paper grip allowance, arrangement of individual images of varying sizes, areas of critical register, ink distribution over the sheet.

2. Planning for Rapid Press make ready (10 Periods)

2.1 Planning for rapid press make ready: Plate-cylinder guide marks standard distance, fitting the plate to the press, gripper and plate clamp allowance.
2.2 Preparing the layout: Sheet base and center reference lines on the layout, placing the aids (register marks, colour guides, star-targets, etc.,) within the layout; complicated layouts - strait cut, die-cut and punched finishing and as per work specifications

3. Planning Imposition scheme (10 Periods)

3.1 Planning imposing schemes: The imposition, imposition terms heads, food, fore-edges,


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backs, gutters, tails, folios, perfecting, imposing rules upright and oblong.

3.2 Methods of printing book-work: Sheet - Work, work and turn, work and tumble, back margin allowance for sewing, saddle stitching, side stitching, perfect binding, etc. book- work margins.

3.3 Planning equipment, tools and materials.

3.4 Image quality control aids and devices.

4. Methods of Planning (06 Periods)

4.1 Direct ruling to the plate

4.2 Considerations and methods of manila/ paper template with projected lines, metal keys, Golden rod Key, hinged printing down flats, Burn and red keys on film, adhesive and transfer systems.

5. Image Register System (10 Periods)

5.1 Register pins; punched- hole methods.

5.2 Page layout scheme including bleeds, trims and folds.

5.3 Step & repeat.

6. Negative and positive file assembly (10 Periods)

6.1 Inspection of films for assembly

6.2 Attaching negatives to masking materials

6.3 Positive film assembly Opaquing and checking the flat.

6.4 Attaching tints on line negatives.

6.5 Film Assembly for multicolor printing.

**LIST OF PRATICALS**

1. Film Assembly for Single- Colour Printing
2. Preparation of Complimentary flats with negatives/ Positives using pin- bar for: burring images, surprint reverse, Screen tints, Silhouetting, halftones and drop out mask work.
3. Manual stepping of negatives/ Positive for plate exposure.
4. Method of duplicating film on daylight film.
5. Film Assembly for multi- Colour printing
6. Preparation of flats with negatives/Positives using register pin bar for flat colour work.
7. Multi colour film assembly using register pins.
8. Screen tints.



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**MEANS OF ASSEESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voce

**INSTRUCTIONAL STRATEGY**

While imparting instruction teacher should show various types of imposition scheme to the students. Student should be asked questions about various planning. Learn about different types of tools and materials related to planning.

**REFERENCE BOOKS**


1. Peck, H.L., Stripping: The Assembly of Film Images, Graphic Art Technical Foundation, U.S.A., 1989.
2. Gatehouse and Roper, film Assembly and Platemaking, Graphic Arts Technical Foundations U.S.A., 1982
3. Jorgensen and Field, Test Images for Printing, Graphic Arts Technical Foundation, U.S.A., 1989.


**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted |
|---|---|---|
| 1. | 10 | 08 |
| 2. | 10 | 08 |
| 3. | 10 | 10 |
| 4. | 6 | 08 |
| 5. | 10 | 06 |
| 6. | 10 | 10 |
| **Total** | **56** | **50** |



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## 5.4 FLEXOGRAPHY PROCESS AND TECHNOLOGY

**L T P**
**5- 0 -5**

**RATIONALE**

This is a technology subject Flexography process and technology. Technicians working in printing industry are required to deal with different printing machines of various processes. These machines have different operational unit. The diploma holders are required good knowledge of these machines. This subject deals with the printing machines of all the process and their operational units.

**LEARNING OUTCOMES**

After undergoing this course, the students will be able to:

1. Basics knowledge of flexography printing.
2. Future developments of flexography printing.
3. Flexography image carrier preparation computer rubber making plates, laser engraved rubber plates.
4. Flexography machine configuration there scope.
5. Flexography machine doctor blade preparation.
6. Classified various types ink and solvent use in flexography printing.
7. Explain the health & safety in the printing industry**.**

**DETAILED CONTENTS**

1. History of Flexography (18 Periods)

1.1 Introduction of flexography printing press.

1.2 Types of Flexography printing process.

1.3 Future developments of flexography plates.

2. Flexography products and markets (10 Periods)

2.1 Other commercial Flexography printing, Flexography packaging and converting.

2.2 Flexography flexible packaging, flexography labels and wrapper, decorative laminates. Other Flexography printed products.

3. Flexography image carrier preparation. (14 Periods)

3.1 Flexography rubber plate making and there process.

3.2 Flexography photopolymer plate making and there process.



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3.3 Making multiple plates, Computer flexography plates, computer rubber making plates, laser engraved rubber plates.

4. MECHANICS OF FLEXOGRPHY MACHINE (14 Periods)

4.1 Printing machines, Operating mechanics, Lubrication method,
4.2 Reel stand unit, Control of web momentum, Web control unit, New web feeding in turner bar machine, web length matching, web width matching automatic web control, automatic machine running technique, Printing unit, Setting of pressure.

4.3 The doctor blade assembly.

5. INKING SYSTEM OF FLEXGRAPHY MACHINES (14 Periods)

5.1 Compositions, Classifications of flexography inks, Solvents.
5.2 Inking system, Types of anilox roller, cleaning of anilox roller, ink supply, cleaning of ink tank.

**LIST OF PRACTICAL**

1. Introduction make ready of flexography press.
2. Cylinder loading and unloading flexography press.
3. Doctor Blade setting procedures,
4. Web loading and unloading on flexography printing machine.
5. Color matching and mixing flexography press.
6. Make ready and proofing flexography press.

**MEANS OF ASSEESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voce

**INSTRUCTIONAL STRATEGY**

While imparting instructions, teacher should show flexography printing machine and various packaging materials print in flexography printing machine to the student. Student should be asked flexography printing machine configuration and various parts. Visits to industry should be planned to demonstrate use of various types of flexography printing processes in the industry.


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**REFERCENCE BOOKS**

1 ASIA PACIFIC BUSINESS PRESS ANUPAM PRAKSHAN

2 NIIR BOARD OF CONSULTANTS AND ENGINEERS

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted |
|---|---|---|
| 1. | 18 | 20 |
| 2. | 10 | 20 |
| 3. | 14 | 20 |
| 4. | 14 | 20 |
| 5 | 14 | 20 |
| **Total** | **70** | **100** |



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## 5.5 Universal Human Values

**L T P**

**2 -0-1**

### Course Objectives

This introductory course input is intended

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature

   Thus, this course is intended to provide a much needed orientation input in value education to the young enquiring minds.

### Course Methodology

1. The methodology of this course is exploration and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. It is free from any dogma or value prescriptions.
3. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.
5. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

### The syllabus for the lectures is given below:

- After every two lectures of one hour each, there is one hour practice session.
- The assessment for this subject is as follows:
- Sessions Marks (Internal): 20
- Practical Marks (External): 30
- Total Marks: 50

### UNIT 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Understanding the need, basic guidelines, content and process for Value Education



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2. Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration

3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels

**UNIT 2: Understanding Harmony in the Human Being - Harmony in Myself!**

1. Understanding human being as a co-existence of the sentient 'I' and the material the Body'
2. Understanding the needs of Self ('I') and 'Body' - *Sukh* and *Suvidha*
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'
5. Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail
6. Programs to ensure *Sanyam* and *Swasthya*

-Practice Exercises and Case Studies will be taken up in Practice Sessions.

**UNIT 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**

1. *Understanding Harmony in the family – the basic unit of human interaction*
2. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*;

*a.* Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship

3. Understanding the meaning of *Vishwas*; Difference between intention and competence
4. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
5. Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sah-astitva* as comprehensive Human Goals
6. Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj),* Universal Order (*Sarvabhaum Vyawastha )*- from family to world family!

-Practice Exercises and Case Studies will be taken up in Practice Sessions.

**UNIT 4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence**

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature
3. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space
4. Holistic perception of harmony at all levels of existence

-Practice Exercises and Case Studies will be taken up in Practice Sessions.


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**UNIT 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics**

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in professional ethics:

a) Ability to utilize the professional competence for augmenting universal human order

b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,

c) Ability to identify and develop appropriate technologies and management patterns for above production systems.

5. Case studies of typical holistic technologies, management models and production systems
6. Strategy for transition from the present state to Universal Human Order:

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b) At the level of society: as mutually enriching institutions and organizations

7. To inculcate Human Values among Students: The Role of self ,Parents and Teachers

-Practice Exercises and Case Studies will be taken up in Practice Sessions.

**Practical Session also Includes Different Yogic Exercises and Meditation Session**

**INSTRUCTONAL STRATEGY**

The content of this course is to be taught on conceptual basis with plenty of real world examples.

**MEANS OF ASSESSMENT**

- Assignments and quiz/class tests,
- Mid-term and end-term written tests
- Practical assessment

**Reference Material**

The primary resource material for teaching this course consists of

a. The text book (Latest Edition)

R.R Gaur, R Asthana, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi.

b. The teacher's manual (Latest Edition)

R.R Gaur, R Asthana, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi.

In addition, the following reference books may be found useful for supplementary reading in connection with different parts of the course:

1. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Purblishers.
3. Sussan George, 1976, *How the Other Half Dies,* Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, *Energy & Equity,* The Trinity Press, Worcester, and HarperCollins, USA

5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.

6. Subhas Palekar, 2000, *How to practice Natural Farming,* Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
7. A Nagraj, 1998, *Jeevan Vidya ek Parichay,* Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, *Human Values*, New Age International Publishers.

**Relevant websites, movies and documentaries**

1. Value Education websites, http://uhv.ac.in, *http://www.aktu.ac.in*
2. Story of Stuff, *http://www.storyofstuff.com*
3. Al Gore, *An Inconvenient Truth*, Paramount Classics, USA
4. Charlie Chaplin, *Modern Times*, United Artists, USA
5. IIT Delhi, *Modern Technology – the Untold Story*
6. Case study Hevade Bazar Movie
7. RC Shekhar , Ethical Contradiction ,Trident New Delhi
8. *Gandhi A., Right Here Right Now, Cyclewala Production*

**SUGGESTED DISTRIBUTION OF MARKS**

| Unit | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 08 | 20 |
| 2 | 08 | 20 |
| 3 | 08 | 20 |
| 4 | 08 | 20 |
| 5 | 10 | 20 |
| **Total** | **42** | **100** |


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## 5.6 PACKAGING TECHNOLOGY

| | L | T | P |
|---|---|---|---|
| **RATIONALE** | **4** | **-** | **4** |

Packaging is an important tool in modern business. A bulk printing is done for packaging in the printing industry. Printing for packaging has emerged as an area of specialization. Hence this course has been included in the curriculum to impart basic knowledge of packaging technology to enable the student to apply the same in his professional career.

**LEARNING OUTCOMES**

After undergoing this subject, the student will be able to;

- Explain the basics of Packaging.
- Brief description about packaging design.
- Explain different types of packaging.
- Classify various types of packaging materials.
- Select suitable ancillary materials to be used for ease of protect, inform and transportation.
- Explain properties and applications of special packages.

**DETAILED CONTENTS**

1. Basics of Packaging (10 Periods)

1.1 Definition and historical development, purpose and functions of packaging.

1.2 Mechanical, chemical and biological protective functions of packaging.

1.3 Odour and flavor contamination, shelf life.

1.4 Interaction between package and its contents.

1.5 Type of packaging.

1.6 Packaging test – Mechanical-Drop test, Vibration test, Impact test, Compression test, Rolling test, Climatic tests - Rain test, Sand and dust test, salt spray test, Fungus resistance test.

**2.** Packaging Design (08 Periods)

2.1 Consumer research and sales promotion through package design.

2.2 Factors influencing design of a package.

2.3 Surface design to suit production limitations.



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2.4 Consideration of design and marketing.

**3.** Packaging Technology (08 Periods)

3.1 Different printing process for packaging purposes.

3.2 Paper based packaging; applications, advantage and limitations.

3.3 Glass and plastic based packaging; applications; advantages and limitations.

3.4 Wood, jute and textile based packaging; applications, advantages and limitations.

**4.** Packaging Material (14 Periods)

4.1 Paper and board; Characteristics and uses performance requirements- grammage, caliper, stiffness, bursting strength, brightness, surface finish etc.

4.2 Different kinds of fiber boards: Solid boards, corrugated boards, conversion properties, advantages and limitations.

4.3 Cellulose film: properties, manufacturing, applications and limitations.

4.4 Plastic based packaging materials: kinds, properties, applications and limitations.

4.5 Flexible packaging materials: Different materials used, flexible laminates, various combinations and applications, characteristics and limitations.

4.6 Metal based packaging materials: kind's applications, advantages and limitations.

**5.** Ancillary Materials (10 Periods)

5.1 Adhesives: kinds and selection factors.

5.2 Cushioning materials; functions, kinds and selection factors.

5.3 Sealing tapes: Kinds, applications, storage and compatibility.

5.4 Strapping and stapling: purpose and kinds of strapping; stapling; advantages and methods used for sealing corrugated board boxes, rigid boxes etc.

5.5 Labels and labeling: kinds of labels and their uses, label forms and shapes, label materials (paper, foil laminates and plastics), labeling faults.

5.6 Caps and Closures: functions, materials, metal caps, plastic molded caps, liners and materials used.



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**6.** Special Packages (06 Periods)

6.1 Aerosols.

6.2 Blister packaging, Strip packaging, Skin packaging.

6.3 Shrink packaging and stretch wrapping.

6.4 Advancement in food packaging – Tetra packaging.

## LIST OF PRACTICALS

1. Collection of specimens of printed packaging products and their study.
2. Collection of specimens of different packaging materials.
3. Packaging test – Drop test
4. Packaging test – Vibration test
5. Packaging test – Inclined impact test
6. Packaging test – Compression test
7. Packaging test – Rolling test
8. Packaging test – Rain test
9. Package design for production – label, cans, tetra pack, cartons, pouch, etc.

## MEANS OF ASSESSMENT

- Assignments and quiz/class tests,
- mid and end-term written tests,
- actual practical performance,
- Viva-voce.

## INSTRUCTIONAL STRATEGY

Packaging Technology is a packaging subject which increasing life of product and selling. Teacher should show various types of packaging materials to the students. Students should be asked to collect samples of various packaging material available in the market for better understanding about package designing and different packing procedure.

## RECOMMENDED BOOKS

1 Fundamentals of Packaging Technology – S. Natarajan, M. Govindarajan.



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2 Packaging Technology – Volume I – IIP

3 Packaging Technology – Volume II – IIP

4 Hand Book of Packaging Technology, Eiri Board

5 Complete Hand Book on Packaging Technology & Industries, Eiri Board

## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 10 | 20 |
| 2 | 08 | 10 |
| 3 | 08 | 15 |
| 4 | 14 | 25 |
| 5 | 10 | 20 |
| 6 | 06 | 10 |
| **Total** | **56** | **100** |



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## 6.1 BOOK DESIGN AND PRINT PRODUCTION

**L - T- P**
**6 - 6**

### RATIONALE

This is a diversified course .The objective of the course is to impart knowledge and skills in book designing and book production, and area of inter –disciplinary approach in printing technology.

### LEARNING OUTCOMES

After undergoing this subject, the students will be able to learn,

- Designing of books by latest software.
- Demonstration of finishing operations
- Use of Paper and ink properly
- Editorial of books ,
- Publication process of books
- Binding process of books

### DETAILED CONTENT

1. Selection of book format: (10 Periods)

1.1 Standard and Nonstandard book formats: ISO range, metric book publishing format.

1.2 Selection of right process as per book format.

2. Preparation of Text: (10 Periods)

2.1 Copy Preparation - Manuscript presentation, copy editing , house style ,structure of a book.

2.2 Designing of the text – Selection of type face, type area, page margin and text type size ,heading styles, subsidiary text and illustration, caption line, prelims matter body text and end matter.

3. Preparation of Illustration: (10 Periods)

3.1 Line illustrations and tone illustrations, process of picture selection.

3.2 Digital image editing.

4. Preparation of cover and Jackets: (10 Periods)

4.1 Process of cover design and jacket design.

4.2 1D and 2D bar codes, QR Codes.


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5. Text Setting : (6 Periods)

5.1 Step in text processing, front end operation and page makeup techniques. Outputting.

5.2 Proofing and Quality Control

6. Originating and Processing the illustration: (10 Periods)

6.1 Scanning of mono colour and multi colour illustrations.

6.2 Proof checking, single colour integrated books, colour books.

6.3 Proofing the cover/jacket, Quality Control

7. Paper and Ink for Book Printing: (10 Periods)

7.1 Selection of paper for different type of books, paper measurement and calculation, defects in paper.

7.2 Printing ink for book, process colour inks, calculation of ink consumption.

8. Book printing: (10 Periods)

8.1 Selection of printing process for books

8.2 Planning and plate making , CTP Process.

8.3 Selection of cover boards and Jacket.

9. Binding and Finishing Process: (8 Periods)

9.1 Different types of book binding.

9.2 Finishing Operations- Lamination, Varnishing, Foil Stamping, Embossing, Trimming, Spot UV, Spot lamination.

**LIST OF PRACTICALS**

1. Books inner page designing.
2. Book cover designing.
3. Book jacket designing.
4. Proofing of Book Cover
5. Proofing of Book Jacket.
6. Preparation of Dummy Book.
7. Edge decoration process.
8. Stitching of Books.
9. Sewing process of books


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10. Perfect Binding Process.

**MEANS OF ASSEESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voce

**INSTRUCTIONAL STRATEGY**

While imparting instructions, teacher should show various types of printed products and their process to applying for printing. Students should be asked to collect samples of various paper sample & card sheets available in the market.

**REFERENCE BOOKS**


1 Trevt J. Book Design , Cambridge University Press
2 Williams H. Methods of book design , Yale University Press USA
3 Baker D. Publishers guide to Copy Preparation,Bludprint London.
4 Bann D. The Print production handbook, Macdonald.


**SUGGESTED DISTRIBUTION OF MARKS**

| Topic no. | Time Allotted (periods) | Marks allotted (%) |
|---|---|---|
| 1 | 10 | 05 |
| 2 | 10 | 10 |
| 3 | 10 | 05 |
| 4 | 10 | 05 |
| 5 | 06 | 05 |
| 6 | 10 | 05 |
| 7 | 10 | 05 |
| 8 | 10 | 05 |
| 9 | 08 | 05 |
| **TOTAL** | **84** | **50** |

## 6.2 MODERN PRINTING TECHNOLOGY

| L | T | P |
|---|---|---|
| 6 | - | 4 |

**RATIONALE**

This is a technology subject. Technicians working in printing industry are required to deal with different printing machines of various processes. These modern printing machines have different operational units. The diploma holders are required to have a good knowledge of these machines. This subject deals with the printing machines of modern types and their operations.

**LEARNING OUTCOMES**

After undergoing this course, the students will be able to:

- Introduction of Digital Printing.
- Selection of digital printing process.
- Entrepreneurship in Digital Printing Industry
- Understanding digital printing fundamentals
- Understanding the modern printing advancements.

**DETAILED CONTENTS**

1. Digital Printing and printers (22 Periods)

1.1 Introduction to digital printing,

1.2 Toner base digital printing and Non-toner-based printing.

1.3 Selection of technology for digital printing. Market and Applications, Data base Marketing. Customizing traditional print, Variable data printing, print on demand, MICR printing. Different types of card printers (ATM Card, Credit Card, Identity Card ).

1.4 Inkjet printing, Electrostatic Process.

1.5 T-shirt printing, Mug printing, mobile cover printing etc. Sublimation printers and Heaters

2. Digital printing fundamentals (22 Periods)

2.1 Digital Printing fundaments, digitization, halftone & colour reproduction, resolution and its qualities.



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2.2 Pixel image, Digital image and printed image

2.3 Digital Camera CCD and CMOS

2.4 Various Software used in digital printing

2.5 Scanner and its types. Scanning of different original.

2.6 Digital Documents- Different Image file formats; TIFF, EPS, JPEG etc.

2.7 Colour management- Introduction and future, characterizing input & output device, Use of CIELAB, CMS.

3. Modern printing and Advancements (20 Periods)

3.1 Hybrid printing technology.

3.2 Modern devices for web control, Multicolor printing

3.3 inking system, Dampening system, Printing attachment, Feeding attachment. Delivery attachment

3.4 Pad printing.

3.5 PCB Printing.

4. 3D printing (20 Periods)

4.1 Brief introduction of 3D printing technology

4.2 3D printing machines

4.3 Market and Applications.

4.4 Raw Materials and out put products

**LIST OF PRACTICALS**

1. Capturing images with digital camera
2. Digitizing originals with high-end Scanners
3. Colour printing and proofing of job on digital printers
4. Preparing Digital Proofs with image reproduction process using colour management
5. Understanding the process of T-shirt printing and Mug printing
6. Understanding the 3D printing process machine.



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**MEANS OF ASSEESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voce

**INSTRUCTIONAL STRATEGY**

While imparting instructions, teacher should show various types of modern printing materials and printed products to the students. Students should be asked to collect samples of various product available in the market.

**RECOMMENDED BOOKS**

1 Digital colour printing technology - by Biswanath Charkaravarthy
2. Introduction to Prepress - by Hugh M. Speirs.
3. Scanning Primer - by Richard M. Adams II
4. Understanding Digital Colour - by Phol Green

5. Mastering 3D Printing by Joan Horvath

**SUGGESTED DISTRIBUTION OF MARKS**

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1. | 22 | 30 |
| 2. | 22 | 30 |
| 3. | 20 | 20 |
| 4. | 20 | 20 |
| **Total** | **84** | **100** |


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## 6.3 ENERGY CONSERVATION

**L T P**

**3 - 2**

**RATIONALE**

The requirement of energy has increased manifolds in last two decades due to rapid urbanization and growth in industrial/service sector. It has become 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 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 detailsout energy audit methodology and energy audit instruments.

**LEARNING OUTCOMES**

After undergoing this subject, the students 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.

**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: Concept of star rating and its importance, Types of product available



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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: Transformers Tariff structure, Components of power (kW, kVA and kVAR) and power factor, improvement of power factor, Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC)
3.5 Transformers: Introduction, Losses in transformer, transformer Loading, Tips for energy savings in transformers

3.6 Electric Motors
Types of motors, Losses in induction motors Features and characteristics of energy efficient motors, Estimation of motor loading, Variation in efficiency and power factor with loading, Tips for energy savings in motors

4. Energy Efficiency in Electrical Utilities

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

5. Lighting and DG Systems

5.1 Lighting Systems: Basic definitions- Lux, lumen and efficacy, Types of different lamps and their features, Energy efficient practices in lighting
5.2 DG Systems: Introduction, Energy efficiency opportunities in DG systems, Loading estimation
6. Energy Efficiency in Thermal Utilities

6.1 Thermal Basics: Thermal energy, Energy content in fuels, Energy Units and its conversions in terms of Metric Tonne of Oil Equivalent (MTOE)
6.2 Energy Conservation in boilers and furnaces : Introduction and types of boilers, Energy performance assessment of boilers, Concept of stoichiometric air and excess air for combustion, Energy conservation in boilers and furnaces, Do's and Don'ts for efficient use of boilers and furnaces
6.3 Cooling Towers: Basic concept of cooling towers, Tips for energy savings in cooling towers


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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: New Buildings, 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 TipsEnergy 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.


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## STUDENT ACTIVITIES ON ENERGY CONSERVATION/ENERGY EFFICIENCY

- Presentations of Case Studies
- Debate competitions
- Poster competitions
- Industrial visits
- Visual Aids

## 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.

## RECOMMENDED BOOKS


1. Guide book on General Aspects of Energy Management and Energy Audit by Bureauof Energy Efficiency, Government of India. Edition 2015
2. Guide book on Energy Efficiency in Electrical Utilities, by Bureau of EnergyEfficiency, Government of India. Edition 2015
3. Guide book on Energy Efficiency in Thermal Utilities, by Bureau of EnergyEfficiency, Government of India. Edition 2015
4. Handbook on Energy Audit & Environmental Management by Y P Abbi & ShashankJain published by TERI. Latest Edition


**Important Links:**

1. Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India. www.beeindia.gov.in.
2. Ministry of New and Renewable Energy (MNRE), Government of India. www.mnre.gov.in.
3. Uttar Pradesh New and Renewable Energy Agency (UPNEDA), Government of Uttar Pradesh. www.upneda.org.in.
4. **Central Pollution Control Board (CPCB),** Ministry of Environment, Forest andClimate Change, Government of India. www.cpcb.nic.in.
5. Energy Efficiency Sevices Limited (EESL). www.eeslindia.org.
6. Electrical India, Magazine on power and electrical products industry. www.electricalindia.in.


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## 6.4 PRINTING COSTING AND ESTIMATING

| | L | T | P |
|---|---|---|---|
| **RATIONALE** | **6** | **-** | **-** |

Costing and Estimating: Printing supervisors, owners of printing presses and so on, have to study costing for the purpose of cost recovery and cost control. The study of a scientific system of costing will give them proper guidance as to how the maximum utilization of the resources of the factory can be achieved and do away with waste of time and money.

In an extremely competitive market, scientific estimating can guarantee the meaningful survival of a printing organization by enabling it to forecast correctly and judiciously the estimated cost of jobs, the overhead expenditure of a business, and the amount of profit to be made from each job.

**LEARNING OUTCOMES**

After undergoing this subject, the student will be able to :

- Differentiate between Costing and Estimating
- Explanation of Price, Profit and Cost
- Explanation of Machine Depreciation
- Calculations of the costs which to be recovered from jobs
- Calculation of the cost of the book, Cost of Paper in the book and other materials
- Helps in calculations when the student start of own business.
- Cost and Price of the Article
- Estimating of Paper, Ink of the book
- Functions of Costing and Estimating
- Process of Tendering and Tender documents
- Calculations of Paper and Ink

**DETAILED CONTENT**

**1. Costing:** (32 Periods)

1.1 Introduction - the object of costing the factors likely to affect profitability, information sought in costing, national expenses, the outline of British Federation system of costing.

1.2 A study of the budget - classification of expenditure bases of allocation, apportionment and re-apportionment to cost centers, calculation of cost recovery rates, recovery of all budgeted costs,

1.3 Assessment of capital values, forecasting the life of assets methods of depreciation, cost sheet and estimate form.


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2. **Estimating** (40 Periods)

2.1 The importance of accurate estimating The tools of an estimator - Output table

2.2 Calculations of the printing substrate and flexible packaging materials.

2.3 Estimating for various method of image carrier preparation (conventional and latest printing processes)

2.4 Estimating of ink, Toner, Binding and Finishing materials.

2.5 Online estimating : Benefits, Types and processes.

2.6 Data base printing management system.

**3. Tenders and Job Specifications** (12 Periods)

3.1 Preparation of Tender documents, technical bids and financial bids

3.2 Classification of Printer for tendering purposes.

3.3 Preparation of panel of printers for Pre-Press, Press and Post Press activities

**MEANS OF ASSEESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voce

**INSTRUCTIONAL STRATEGY**

Student should be encouraged to participate in solving problems, numerical and estimating different papers, inks etc and activity participate in listing exercises.

**RECOMMENDED BOOKS**

1. Cost Accountancy for printers, British Printing Industries Federation, Landon.

2. Estimating for Printers, British Printing Industries Federation, Landon.

3. Estimating Methods and cost analysis for printers, Balaraman and Krishnamurthy, Ramya Features, Chinnai.



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4. Principles of applied costing for printing industry, K.S. Venkatraman, AIFMP, New Delhi.
5. Lagat Parikalan tatha Mulyankan, L.R. Nagpal, Neelam Prakashan, Chandigarh.

6. Mudran Samagri Prodyogiki, M.N. Lidbide, Madhaya Pradesh Hindi Granth, Academy Bhopal.
7. Costing and estimating for printers - by B. D. Mendiratta.

## SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks allotment |
|---|---|---|
| 1 | 32 | 30 |
| 2 | 40 | 35 |
| 3 | 12 | 10 |
| **TOTAL** | **84** | **75** |


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## 6.5 INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

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

**RATIONALE**

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mind set with managerial skills helps the student in the job market. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

**LEARNING OUTCOMES**

After undergoing this course, the students will be able to

- Know about various schemes of assistance by entrepreneurial support agencies
- Conduct market survey
- Prepare project report
- Explain the principles of management including its functions in an organization.
- Have insight into different types of organizations and their structures.
- Inculcate leadership qualities to motivate self and others.
- Manage human resources at the shop-floor
- Maintain and be a part of healthy work culture in an organization.
- Use marketing skills for the benefit of the organization.
- Maintain books of accounts and take financial decisions.
- Undertake store management.
- Use modern concepts like TQM, JIT and CRM.

**DETAILED CONTENTS**

**SECTION – A**

**ENTREPRENEURSHIP**

1. Introduction (04 Periods)

1.1 Concept /Meaning and its need
1.2 Qualities and functions of entrepreneur and barriers in entrepreneurship
1.3 Sole proprietorship and partnership forms and other forms of business organisations
1.4 Schemes of assistance by entrepreneurial support agencies at National, State, District –level, organisation: NSIC, NRDC, DC, MSME, SIDBI, NABARD, NIESBUD, HARDICON Ltd.,


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Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks

2. Market Survey and Opportunity Identification/Ideation (04 Periods)

2.1 Scanning of the business environment
2.2 Salient features of National and Haryana State industrial policies and resultant business opportunities
2.3 Types and conduct of market survey
2.4 Assessment of demand and supply in potential areas of growth
2.5 Identifying business opportunity
2.6 Considerations in product selection
2.7 Converting an idea into a business opportunity

3. Project report Preparation (06 Periods)

3.1 Preliminary project report
3.2 Detailed project report including technical, economic and market feasibility
3.3 Common errors in project report preparations
3.4 Exercises on preparation of project report
3.5 Sample project report

**SECTION –B**

**MANAGEMENT**

4. Introduction to Management (06 Periods)

4.1 Definitions and importance of management
4.2 Functions of management: Importance and process of planning, organising, staffing, directing and controlling
4.3 Principles of management (Henri Fayol, F.W. Taylor)
4.4 Concept and structure of an organisation
4.5 Types of industrial organisations and their advantages
4.6 Line organisation, staff organisation
4.7 Line and staff organisation
4.8 Functional Organisation

5. Leadership and Motivation (08 Periods)

5.1 Leadership: Definition and Need, Qualities and functions of a leader, Manager Vs leader, Types of leadership, Case studies of great leaders
5.2 Motivation: Definition and characteristics, Importance of self-motivation, Factors affecting motivation, Theories of motivation (Maslow, Herzberg, Douglas, McGregor)


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6. Management Scope in Different Areas (14 Periods)

6.1 Human Resource Management: Introduction and objective, Introduction to Man power planning, recruitment and selection, Introduction to performance appraisal methods

6.2 Material and Store Management: Introduction functions, and objectives, ABC Analysis and EOQ

6.3 Marketing and sales: Introduction, importance, and its functions, Physical distribution, Introduction to promotion mix, Sales promotion

6.4 Financial Management: Introductions, importance and its functions, knowledge of income tax, sales tax, excise duty, custom duty, VAT, GST

7. Work Culture (08 Periods)

7.1 Introduction and importance of Healthy Work Culture in organization
7.2 Components of Culture
7.3 Importance of attitude, values and behavior
7.4 Behavioral Science – Individual and group behavior.
7.5 Professional ethics – Concept and need of Professional Ethics and human values.

8. Basic of Accounting and Finance (10 Periods)

8.1 Basic of Accounting: Meaning and definition of accounting, Double entry system of book keeping, Trading account, PLA account and balance sheet of a company

8.2 Objectives of Financial Management: Profit Maximization v/s Wealth Maximization

9. Miscellaneous Topics (10 Periods)

9.1 Total Quality Management (TQM): Statistical process control, Total employees Involvement, Just in time (JIT)

9.2 Intellectual Property Right (IPR) : Introduction, definition and its importance, Infringement related to patents, copy right, trade mark

**INSTRUCTIONAL STRATEGY**

Some of the topics may be taught using question/answer, assignment, seminar or case study method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organisations on visit. Approach extracted reading and handouts may be provided.


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## MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/Prototype making.

## RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development and Management by J.S.Narang; Dhanpat Rai & Sons, Delhi.
3. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
4. Handbook of Small Scale Industry by PM Bhandari
5. Entrepreneurship Development and Management by MK Garg
6. E-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.

**Websites for Reference:**

http://swayam.gov.in

### SUGGESTED DISTRIBUTION OF MARKS

| Topic No. | Time Allotted (Periods) | Marks Allotted (%) |
|---|---|---|
| 1 | 04 | 06 |
| 2 | 04 | 06 |
| 3 | 06 | 08 |
| 4 | 06 | 08 |
| 5 | 08 | 12 |
| 6 | 14 | 20 |
| 7 | 08 | 12 |
| 8 | 10 | 14 |
| 9 | 10 | 14 |
| **Total** | **70** | **100** |



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## 6.6 PROJECT WORK

| L | T | P |
|---|---|---|
| - | - | 8 |

**RATIONALE**

Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place students for project oriented practical training in actual work situation for the stipulated period.

**LEARNING OUTCOMES**

After undergoing the project work, the students will be able to:

- Apply in totality the knowledge and skills gained through the course work in thesolution of particular problem or by undertaking a project.
- Develop understanding regarding the size and scale of operations and nature of field-workin which students are going to play their role after completing the courses of study
- Develop understanding of subject based knowledge given in the classroom in the context ofits application at work places.
- Develop firsthand experience and confidence amongst the students to enable them to useand apply polytechnic/institute based knowledge and skills to solve practical problems related to the world of work.
- Develop abilities like interpersonal skills, communication skills, positive attitudes and valuesetc.
- Assemble/fabricate and test an electronics gadget.

**General Guidelines**

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (say at the end of second year). Students should be allotted a problem of interest to him/her as a major project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

This practical training cum project work **should not be considered** as merely conventional industrial training in which students are sent at work places with either minimal or no supervision. This experience is required to be planned in advance and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience to students. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such that it matches with the curricular interest to students and of professional value to industrial/ field organizations. Each teacher is expected to supervise and guide 5-6 students.



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The project assignments may consist of:

- Development of prototypes
- Study of different types of : heat exchangers
- distillation columns
- evaporators
- reactors
- drying unit etc.
- Study of different types of vessels, heads and joints (can be done through factory visit)
- Study of pumps and valves used in process industries
- Fabrication of components/equipments
- Fault diagnosis and rectification experiences
- Bringing improvements in the existing system/equipment
- Audits of industry- energy audit, water audit, material audit etc.
- Case Studies

**NOTE:**

The list is only the guideline for selecting a project; however a student is at liberty to select any other related project of his choice independently under guidance of his teacher.
A suggestive criterion for assessing student performance by the external (person fromindustry) and internal (teacher) examiner is given in table below

| Sr. No. | Performance Criteria | Max.** Marks | Rating Scale | | | | |
|---|---|---|---|---|---|---|---|
| | | | Excellent | Very Good | Good | Fair | Poor |
| 1. | Selection of project assignment | 10% | 10 | 8 | 6 | 4 | 2 |
| 2. | Planning and execution of considerations | 10% | 10 | 8 | 6 | 4 | 2 |
| 3. | Quality of performance | 20% | 20 | 16 | 12 | 8 | 4 |
| 4. | Providing solution of the problems or production of final product | 20% | 20 | 16 | 12 | 8 | 4 |
| 5. | Sense of responsibility | 10% | 10 | 8 | 6 | 4 | 2 |
| 6. | Self-expression/ communication skills | 5% | 5 | 4 | 3 | 2 | 1 |
| 7. | Interpersonal skills/human relations | 5% | 5 | 4 | 3 | 2 | 1 |
| 8. | Report writing skills | 10% | 10 | 8 | 6 | 4 | 2 |


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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 9 | Viva voce | 10% | 10 | 8 | 6 | 4 | 2 |
| **Total marks** | | **100** | **100** | **80** | **60** | **40** | **20** |

The overall grading of the practical training shall be made as per following table.

In order to qualify for the diploma, students must get "Overall Good grade" failing which the students may be given one more chance to improve and re-evaluate before being disqualified and declared "not eligible to receive diploma ". It is also important to note that the students must get more than six "goods" or above "good" grade in different performance criteria items in order to get "Overall Good" grade.

**Important Notes**

2. This criteria must be followed by the internal and external examiner and they should seethe daily, weekly and monthly reports while awarding marks as per the above criteria.

3. The criteria for evaluation of the students have been worked out for 200 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.

4. The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.

5. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.

The teachers are free to evolve other criteria of assessment, depending upon the type of projectwork.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organizations in such an exhibition.

**RESOURCE REQUIREMENT:** As per AICTE NORMS.

| APPLIED PHYSICS LABORATORY | | | |
|---|---|---|---|
| **Sl.No.** | **Name of Equipment** | **No.** | **Amount (₹)** |
| 1. | Vernier calipers<br>Working length 160 mm, Internal and external dia with locking arrangement | 12 | 2,000 |
| 2. | Screw Gauges<br>Working length 15 mm, pitch 0.5 mm, least count .005 mm | 12 | 2,000 |
| 3. | Spherometers<br>Distance between legs 2.5 mm, pitch 0.5 mm, least count .005 mm. | 12 | 2,000 |
| 4. | Mirrors (convex, concave) | 5 Each | 1,500 |
| 5. | Pendulum Setup | 02 | 4,000 |
| 6. | Gravesand's Apparatus | 02 | 3,000 |
| 7. | Inclined Plane Setup | 02 | 2,000 |
| 8. | Flywheel Setup | 02 | 4,000 |
| 9. | Prism | 05 | 1,500 |
| 10. | Spectrometer | 02 | 25,000 |
| 11. | DC Ammeters<br>Moving coil Weston-type ammeter with ebonite stand | 10 | 3,500 |
| 12. | DC Mili ammeter | 02 | 1,000 |
| 13. | DC Micro ammeters | 02 | 700 |
| 14. | DC voltmeters | 10 | 700 |
| 15. | DC Millivolt meters | 10 | 2,000 |


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| | | | |
|---|---|---|---|
| 16. | Sensitivity Galvanometer | 02 | 800 |
| 17. | Student Galvanometers | 10 | 4,000 |
| 18. | | 02 | 1,000 |
| 19. | D type DC Voltmeter<br>Range : 0 to 1 Volt | 02 | 1,000 |
| 20. | D type Galvanometers<br>Sensitivity : 20 microamperes per scale division, | 08 | 8,000 |
| 21. | Resistance boxes (dial type) assorted | 08 | 8,000 |
| 22. | Rheostats | 10 | 4.000 |
| 23. | Miscellaneous items (Spring, Pan, Glycerin, Optic fibre, Ferromagnetic material) | LS | 2,000 |
| 24. | Fortin's Barometer (Wall type) | 02 | 20,000 |
| 25. | Stoke's Apparatus | 02 | 10,000 |
| 26. | Gumther's Apparatus | 02 | 16,000 |
| 27. | Resonance Tube Apparatus with accessories and Tuning fork set | 02 | 14,000 |
| 28. | Sodium Lamp setup with Bi-prism | 02 | 10,000 |
| 29. | Ohmic resistance coil | 10 | 5,00 |
| 30. | Slide wire bridge | 02 | 8,000 |
| 31. | PN Junction diode Apparatus | 02 | 10,000 |
| 32. | Laser (as per requirement) | 01 | 1,00,000 |
| 33. | Numerical aperture setup | 01 | 25,000 |
| 34. | Miscellaneous | LS | 3,000 |
| | | | |


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| APPLIED CHEMISTRY LABORATORY | | | |
|---|---|---|---|
| **Sl.No.** | **Name of Equipment** | **No.** | **Amount (₹)** |
| 1. | Digital Balance | 01 | 80,000 |
| 2. | Burette 50ml | 30 | 3,000 |
| 3. | Pipette 25ml | 60 | 4,000 |
| 4. | Beakers 100ml | 60 | 4,000 |
| 5. | Burette stand | 30 | 30,000 |
| 6. | Glazed tile | 30 | 1,000 |
| 7. | Conical flask 50ml (Titration flask) | 60 | 4,000 |
| 8. | Standard (Measuring) flask (to prepare standard solution) 250ml/100ml | 30 | 6,000 |
| 9. | Able's Flash Point apparatus | 02 | 10,000 |
| 10. | (1/10)°C thermometer | 06 | 6,000 |
| 11. | Candles | 20 | 100 |
| 12. | Crucible with lid | 06 | 2,000 |
| 13. | Muffle furnace | 01 | 18,000 |
| 14. | Desiccator | 06 | 8,000 |
| 15. | Pair of tongue (small and big) | 24 (Small)<br>2 (Big) | 2,000 |
| 16. | Chemicals<br>• EDTA-1 kg<br>• Eriochrome Black-T(Solo chrome black T)- 200g<br>• Buffer solution (NH3 - 2.5 Ltr, NH4Cl – 1 kg)<br>• Zinc sulphate- 500g<br>• H2SO4- 2.5 Ltr<br>• Phenolphthalein indicator (as per requirement)<br>• Methyl orange indicator (as per requirement)<br>• Charcoal (as per requirement)<br>• Kerosene- 1 Ltr | LS | 20,000 |


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| | | | |
|---|---|---|---|
| 17. | Miscellaneous | LS | 2,000 |

**ENGINEERING DRAWING**

| **Sl.No.** | **Name of Equipment** | **No.** | **Amount (₹)** |
|---|---|---|---|
| 1. | Drawing Boards (700 x 500mm) | 60 | 25,000 |
| 2. | Draughtsman Tables | 60 | 1,80,000 |
| 3. | Draughtsman Stools | 60 | 40,000 |
| 4. | Computer Aided Drawing (CAD) Software | 30 User | 5,00,000 |
| 5. | Model of different wooden joints | 01 | 1,000 |
| 6. | Model of different screw threads | 01 | 1,000 |
| 7. | Model of various locking devices | 01 | 1,000 |
| 8. | Model of various joints | 01 | 1,000 |
| 9. | Cut section Model of various couplings | 01 | 3,000 |
| 10. | Miscellaneous | LS | 5,000 |


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# SPECIFICATIONS OF BINDING & PACKAGING Lab

| Sr. No | Equipment Name | Specification/Remark | Quantity as per BTEUP | Approximate Unit Cost | Total Cost |
|---|---|---|---|---|---|
| 1 | Paper cutting machine hand operated | Manual paper cutting, size 36 inch paper cutting, max. cutting Depth 7 inch | 1 | 90000 | 90000 |
| 2 | Paper cutting machine Semi-Automatic | semi-automatic, cutter size: 33 inch, cut per minute 35 | 1 | 300000 | 300000 |
| 3 | Automatic paper cutting machine | – | 1 | – | |
| 4 | Wire stitching machines | manual machine - 1, semi auto machine - 1 (stitching capacity: 0.1 mm to 25mm, 0.1mm to 32mm, Stitching speed: 150 stitches per minutes) | 2 | 200000 | 400000 |
| 5 | Book Sewing machines with latest configuration | speed: 70 sections/minute, largest size of book: 115x100mm, no. of stiches up to 9 sets | 1 | 800000 | 800000 |
| 6 | Folding machine (automatic) | size: 61x91 cms, parallel fold 2, cross fold 2, paper feeding: semi-automatic | 1 | 550000 | 550000 |
| 7 | Folding machine (semi-automatic) | size: 61x91 cms, paper hand feeding, 4 fold, paper type: 50-120gsm | 1 | 250000 | 250000 |
| 8 | Book backing machine | hard case binding | 2 | 20000 | 40000 |
| 9 | Perfect binding single clamp machine with latest configuration | Clamping: mechanical, spine gluing: three roller, side gluing: separate, temp. control: digital, spine length: 70-430mm | 1 | 800000 | 800000 |
| 10 | Hard Press | manual book and paper press A4, A3 size | 3 | 20000 | 60000 |
| 11 | Board Cutter | manual paper board cutting | 1 | 50000 | 50000 |
| 12 | Comb-binding machine | A3 size | 2 | 10000 | 20000 |


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| | | | | | |
|---|---|---|---|---|---|
| 13 | Laminating machine with other minor binding equipments and accessories | A3 size | 1 | 100000 | 100000 |
| 14 | Laminating machine by hot process | A3 size | 1 | 100000 | 100000 |
| 15 | U. V. coating machine | A3 size | 1 | 300000 | 300000 |
| 16 | U. V. curing machine | A3 size | 1 | 400000 | 400000 |
| 17 | Hot Foil Stamping Machine | A3 size | 1 | 400000 | 400000 |

## SPECIFICATIONS OF IMAGE CARRIER Lab

| Sr. No | Equipment Name | Specification/Remark | Quantity as per BTEUP | Approximate Unit Cost | Total Cost |
|---|---|---|---|---|---|
| 1 | Photo Polymer Platemaking equipment accessories with latest version | machine size: 110x90x100cm, crate size: 105x100x10cm | 1 | 300000 | 300000 |
| 2 | Whirlers (Offset Plate coating machine) with variable speed range, fitted with warm air system with adjustable temperature control, drain outlet for easy accessibility. | – | 2 | – | |
| 3 | Printing down units with built in metal halide light source & vacuum Pump, rotating plate holder, Exposure Control timer, Exposure control start/lamp ON OFF device, vacuum control device. | – | 2 | – | |
| 4 | Etching machine. | – | 1 | – | |

| | | | | | |
|---|---|---|---|---|---|
| 5 | Graining machine 104 x 129 cm (41" x 51") with rustles plate clamping device adjustable stroke action of markles for variable plate grains, Trongh lined with thick sheets on base sides. | – | 1 | – | |
| 6 | Printing down frame (Automatic) . | automatic, 1.5 KW, 440V three phase, exposing area 900x1200mm, suitable for PS & conventional offset plate, vertical / flip top & additional one light | 1 | 225000 | 225000 |
| 7 | Plate processor | For PS, CTP & Conventional Plate, 660x860mm processing width, develop, wash, gum and dry stations, microprocessor control, automatic developer replenishment, plate thickness 0.15-0.30mm | 1 | 250000 | 250000 |

## SPECIFICATIONS OF SCREEN PRINTING Lab

| Sr. No | Equipment Name | Specification/Remark | Quantity as per BTEUP | Approximate Unit Cost | Total Cost |
|---|---|---|---|---|---|
| 1 | Wooden screen Frames | 10"x12", 12"x15", 15"x20" sizes | 2 | 5000 | 10000 |
| 2 | Screen cloth | Fine, Medium & Course | 5 | 10000 | 50000 |
| 3 | Squeeze | 10", 12", 6", 4", 3" (hardness 65-90 shA) | 1 | 5000 | 5000 |
| 4 | Semi-automatic screen printing machine | Semi-automatic stain steel vacuum bed size 15"X20, max. substrate thickness 5-7mm, micro register system 0.01mm (with allied equipment, exposure unit, coating unit, pneumatic stretching unit and retouching table) | 1 | 700000 | 700000 |


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| | | | | | |
|---|---|---|---|---|---|
| | | | | | |

## SPECIFICATIONS OF PRESS WORK Lab

| Sr. No | Equipment Name | Specification/Remark | Quantity as per BTEUP | Approximate Unit Cost | Total Cost |
|---|---|---|---|---|---|
| 1 | Medium size sheet fed offset machine | Single Colour, Sheet Fed, Size 19"x26", fully automatic, Highest Register quality | 1 | 2000000 | 2000000 |
| 2 | Two colour sheet fed offset printing machine | Two colour fully automatic 19"x26" sheet fed perfecting machine, paper gsm range 40-300, electronic control devices with all accessories | 1 | 5500000 | 5500000 |
| 3 | Web offset with two units Web width size 660 mm automatic blanket to blanket modern registration inking system & other latest device | 1 No. 2Hi tower with super folder (semi-automatic - RLC control) web width 850-915mm, vertical web leads, reel diameter, manual reel loading, 1067-1270mm, cut off 533mm/546mm, toolless plate lock, printing speed 25k-30k impression/hour, super folder 1:2 with quarter fold, brush mist dampening system | 1 | 5000000 | 5000000 |
| 4 | Small offset Machine 10"x15" | 10"x15" mini offset sheet fed offset printing machine | 1 | 550000 | 550000 |
| 5 | Small offset Machine 10"x20" | _ | 1 | _ | |
| 6 | Gravure machine 24" with auto terminal control unit web aligner of latest configuration | 2 colour rotogravure printing machine model-600S2 with 6kw capacity heating chamber | 1 | 2000000 | 2000000 |
| 7 | Proofing Press | _ | 1 | _ | |


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| | | | | | |
|---|---|---|---|---|---|
| 8 | Misc. Equipment & gauges, testing equipment including densitometers etc. | Vernier Calliper, Screw gauge, hardness tester, spit level, filler gauge set, pH meter, conductivity meter, roller stand, plate bending & punching mc, cylinder stand ) | 1 | 200000 | 200000 |

## SPECIFICATIONS OF PRESS TECHNOLOGY Lab

| Sr. No | Equipment Name | Specification/Remark | Quantity as per BTEUP | Approximate Unit Cost | Total Cost |
|---|---|---|---|---|---|
| 1 | Hand fed platens 9"x13", 10"x15" size 1 no. each | – | 2 Nos | – | |
| 2 | Automatic platens 10"x15", sizes 1 each . | – | 1 Nos | – | |
| 3 | Automatic Cylinders 15"x20", 20"x30" sizes 1 no. Each (For Demo) | – | 2 Nos | – | |
| 4 | Imposing tables (Standard size having galley of furniture racks) | glass top with fluorescent lamp | 4 | 15000 | 60000 |
| 5 | Type high gauge | – | 1 No | – | |
| 6 | Metal furniture (made of alloy metal) assorted size | – | set of 50 | – | |
| 7 | Mechanical Quoins (different sizes) | – | set of 50 | – | |
| 8 | Flexographic machine | 4-colour printing with heating, sheeting and rewinding arrangements including polythene printing, print width 600-800mm, 50-80 meter per minute speed, moderated registration and standard web guide attachments, auto tension, unwind & rewind type, vertical & horizontal registration system, drier length 600-800mm | 1 | 2000000 | 2000000 |


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# SPECIFICATIONS OF DIGITAL PRINTING Lab

| Sr. No | Equipment Name | Specification/Remark | Quantity as per BTEUP | Approximate Unit Cost | Total Cost |
|---|---|---|---|---|---|
| 1 | Digital colour printer A3 size with duplexing facility and booklet finishing with latest configuration | Digital Printer, print speed up to 20 M2/H, high speed USB 3.0 printing port, ture 1440 dpi print resolution, multi heating system, ultra print / photo print / maintop RIP software | 1 | 350000 | 350000 |
| 2 | LCD Projector | DLP Projector 500000:1 Contrast Ratio 84% DCI-P3 and 98% Rec.709 color coverage Colors 2300 lm Max. Brightness | 1 | 50000 | 50000 |
| 3 | Professional graphic dedicated system with latest configuration with operating system | CPU Ryzen 5 5600X<br>Motherboard MSI B450M PRO VDH MAX<br>RAM XPG 3200mhz 8GB<br>PSU MSI A550BN Bronze<br>Cabinet MSI MAG FORGE 100M<br>SSD Adata XPG 256GB M.2 NVME<br>HDD Seagate or WD 1TB<br>GPU GTX 1650 4GB | 20 | 45000 | 900000 |
| 4 | Work station with 24" professional monitor | Processor 12th Gen Intel® Core™ i5-12600<br>OS Windows 10 Pro (Windows 11 Pro license included)<br>Graphics NVIDIA® T400, 4 GB GDDR6, 3 mDP to DP adapters<br>Memory 8 GB, 1 x 8 GB, DDR5, 4800 MHz<br>Storage 256 GB, M.2, PCIe NVMe, SSD, Class 35 | 1 | 100000 | 100000 |



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| | | | | | |
|---|---|---|---|---|---|
| 5 | Professional server with backup facility capable of handling minimum 20 terminals each with LAN (Latest configuration) | Latest Configuration | 2 | 125000 | 250000 |
| 6 | LAN with complete accessories | LAN with complete accessories | 2 | 40000 | 80000 |
| 7 | Online UPS 10 KVA with on hour backup | 10 KVA with on hour backup | 2 | 325000 | 650000 |
| 8 | Air conditioner 2 tons with stabilizer | split AC | 4 | 50000 | 200000 |
| 9 | Coral draw (latest version multiuser) | Latest Version multi user | 2 | 125000 | 250000 |
| 10 | Adobe Acrobat professional (latest version multiuser) | Latest Version multi user | 2 | 125000 | 250000 |
| 11 | Adobe in design (latest version multiuser) | Latest Version multi user | 1 | 150000 | 150000 |
| 12 | Adobe Photoshop CS5 (latest version multiuser) | Latest Version multi user | 2 | 150000 | 300000 |
| 13 | ABBY find reader latest version | Latest Version multi user | 1 | 70000 | 70000 |
| 14 | Quark Express latest version (latest version multiuser) | (18.0.0) or Latest Version multi user | 1 | 50000 | 50000 |
| 15 | Adobe page maker (latest version multiuser) | – | – | – | |
| 16 | Room preparation and furniture | computer table, almirah, etc. | 1 | 600000 | 600000 |

# SPECIFICATIONS OF REPRODUCTION TECH Lab

| Sr. No | Equipment Name | Specification/Remark | Quantity as per BTEUP | Approximate Unit Cost | Total Cost |
|---|---|---|---|---|---|
| 1 | Electronic / Digital colour scanner:- with dot generation, negative & Positive output, graphic planning facilities | – | – | – | |
| 2 | Digital & Vertical Camera with all necessary accessories like each screens, filters light integrators, lamps, etc. | only digital camera (DSLR) | 1 | 200000 | 200000 |
| 3 | Enlarger and contact printer with provision for filters. | – | – | – | |
| 4 | Film/ Bromide processor | – | – | – | |
| 5 | Register Punch Pins and bars | – | – | – | |
| 6 | Developing Trays | – | – | – | |
| 7 | Transmission type digital Densitometer | – | – | – | |
| 8 | Reflection type Densitometer. | – | – | – | |
| 9 | Spectrophotometer | Stray Light <0.02%T at 340 nm,400 nm; <1.0%T at 198 nm Output USB Source Lamp Life 2000 hours Beam Type Double Bandwidth 1.0 nm Min Wavelength 190 nm Max Wavelength 1100 nm | 1 | 200000 | 200000 |


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| | | | | | |
|---|---|---|---|---|---|
| 10 | Computer to plate with work flow system . | 830nm thermal imaging plate setter, semi-automatic, external drum, max. Plate size 838 x 1143 mm, screening 450 LPI max line screen, imaging specifications Q400 plate setter, 2400 dpi, plate size: 724 x 838 mm | 1 | 3000000 | 3000000 |
| 11 | Plate setter and Processor. | | | | |
| 12 | Magnifying glass for printers 10X | 10X with torch light | 3 | 3000 | 9000 |
| 13 | 21 step wedge exposure - Stouffer | 21 step wedge exposure - Stouffer | 2 | 6000 | 12000 |

## SPECIFICATIONS OF Text & Image Setting Lab

| Sr. No | Equipment Name | Specification/Remark | Quantity as per BTEUP | Approximate Unit Cost | Total Cost |
|---|---|---|---|---|---|
| 1 | Case Racks to accommodate 15 cases of English and Hindi) | _ | 10 sets | _ | |
| 2 | Galley Racks (for 100 galleys) | _ | 3 Nos | _ | |
| 3 | Lead/Rule Racks cut to size, rack for leads and rules accommodation 15 cms to 60 cms length with three separators. | _ | 1 Nos | _ | |
| 4 | Galleys :- | _ | | _ | |
| 5 | (a) Standard folio galleys . | _ | 06 Nos | _ | |
| 6 | (b) Standard demy Quarto . Galleys | _ | 12 Nos | _ | |
| 7 | Type cases (of standard size) English cases Pair of cases | _ | 4 | _ | |
| 8 | Double cases | _ | 10 | _ | |
| 9 | Devanagari calcuttia style | _ | 03 set | _ | |
| 10 | Types : | _ | | _ | |
| 11 | Book faces with standard variations in design & size. | – | 3 faces | _ | |
| 12 | Display faces with complete variations. | _ | 3 faces | _ | |
| 13 | Type metal | _ | 1 Quintals | _ | |

| | | | | | |
|---|---|---|---|---|---|
| 14 | Galley Proofing Press(Std.) | _ | 1 No. | _ | |
| 15 | Photo type setters with accessories | _ | 1 Nos | _ | |
| 16 | Linotype Machine (Demo) | _ | 1 | _ | |
| 17 | Mono Type | _ | 1 " | _ | |
| 18 | Image Setter (Latest Config.) | _ | 1No | _ | |
| 19 | Professional System graphic dedicated. of latest config. capable of handling latest image editing software easily | Latest Configuration, Processor: i5/i7, with 12-16 GB RAM, Monitor: 28/30 inch LED | 20 | 60000 | 1200000 |
| 20 | Desk top publishing terminal latest. configuration for | _ | 30 | _ | |
| 21 | Lan connectivity with professional server with backup facility capable of handling minimum 20 terminals Each with LAN (Latest configuration) | Latest Configuration | 2 | 125000 | 250000 |
| 22 | Professional laser network printer A3 | Print Speed 20 Print Resolution 1200 DPI Duty Cycle 15000 Prints Functions Print First Copy Time 37 Second Supported Paper Size A3 Model Name/Number Canon IR-2006N with Duplex Unit | 2 | 150000 | 300000 |
| 23 | Professional Scanner A4 (flatbed) high res. | Latest Configuration | 1 | 150000 | 150000 |
| 24 | Professional Scanner A3 (flatbed) high res. | Output Resolution 100 / 150 / 200 / 240 / 250 / 300 / 400 / 600 / 1200 dpi | 1 | 250000 | 250000 |
| 25 | Inkjet Printer A3 Size High End | Category: A3 color inkjet printer Print speed: 25ppm (mono)Paper capacity: 500Paper | 2 | 100000 | 200000 |

| | | | | | |
|---|---|---|---|---|---|
| | | size: up to A3Weight: 13.5kg | | | |
| 26 | Adobe Photoshop (Latest version multiuser) | Latest Version multi user | 1 | 150000 | 150000 |
| 27 | Coral draw (Latest version multiuser) | Latest Version multi user | 1 | 125000 | 125000 |
| 28 | Adobe Acrobat professional (Latest version multiuser) | Latest Version multi user | 1 | 125000 | 125000 |
| 29 | Adobe in design (Latest version multiuser) | Latest Version multi user | 1 | 150000 | 150000 |
| 30 | Quark Express (Latest version multiuser) | (18.0.0) or Latest Version multi user | 1 | 60000 | 60000 |
| 31 | Adobe page maker (Latest version multiuser) | – | – | – | |
| 32 | FOSS inks cape vextor drawing | – | – | – | |
| 33 | FOSS gimp shop photo plus 6 image editing | – | – | – | |
| 34 | R.I.P. software | Latest Version | 1 | 150000 | 150000 |

# SPECIFICATIONS OF PRINTING SCIENCE Lab

| Sr. No | Equipment Name | Specification/Remark | Quantity as per BTEUP | Approximate Unit Cost | Total Cost |
|---|---|---|---|---|---|
| 1 | Digital Paper GSM Tester with template | direct reading in gsm using different templates size (10x10cm, 20x25cm), least count: 0.01gm/1 GSM, LED display | 1 | 11000 | 11000 |
| 2 | Bursting Strength Tester | air pressure method, measuring range: 0-1000kPa, accuracy: 0.2%, pressing rate: 1-100 kPa/minute, speed adjustable | 1 | 50000 | 50000 |
| 3 | Brightness / Opacity Tester | digital brightness & opacity tester (Photo volt Type) | 1 | 120000 | 120000 |
| 4 | Tensile Strength Tester | Type: Electro mechanical, Force: 9 kN (2000 lbf) | 1 | 150000 | 150000 |
| 5 | COBB Tester Paper | material: SS, Test Area: 100+-0.2 cm2, Roll Mass: 10+-0.5kg, Roll Length: 200+-0.5mm, dimension: 270x400x300mm | 1 | 20000 | 20000 |
| 6 | Digital pH Tester | digital pH meter / conductivity / thermometer, display type: 16x12 alpha numeric LCD display 3 digit LED display | 1 | 5000 | 5000 |
| 7 | Ink Proofing Kit | printing width: 50mm, printing length: 110mm, printing roller options standard conventional & UV, Roller diameter: 35mm and length: 50mm | 1 | 40000 | 40000 |
| 8 | Semi Auto Ink Drawdown Machine | effective coating area or drawdown size: 20x25cms | 1 | 125000 | 125000 |
| 9 | Mild Steel Flow Cup Viscometer | stainless steel flow cup viscometer for industrial | 1 | 4000 | 4000 |
| 10 | Paper surface oil absorbency tester | oil absorption resistance of the surface of paper and paper board provided with electronic self-starting timer | 1 | 85000 | 85000 |


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| | | | | | |
|---|---|---|---|---|---|
| 11 | Folding Endurance Tester (Mullen Type) | Testing of paper: 0-25mm thickness of paper, specimen width x length 15x98mm, stretching force: max. 9.81 N and min 7.55 N, folding roll diameter: 6mm, working speed: 120 strokes/min | 1 | 85000 | 85000 |

**Note: Printing Science Lab equipment list is not included in BTE list but required in NSQF**

## LIST OF PARTICIPANTS

The following experts participated in workshop for Developing the Curricula Structure and Contents of **PRINTING TECHNOLOGY** on 17th October 2022 at I.R.D.T. Kanpur.

1. Shri Rakesh Tiwari HOD NRIPT Prayagraj
2. Mohd. Imran Ahmad Lecturer NRIPT Prayagraj
3. Shri C.P. Maurya Lecturer NRIPT Prayagraj
4. Shri S. K. Vishvkarma Lecturer NRIPT Prayagraj
5. Shri Dharmendra Shukla Lecturer NRIPT Prayagraj
6. Shri Kshitiz Kumar Gupta Lecturer G. P. Chandausi Sambhal
7. Shri Chandra Kant Gupta Lecturer G. P. Chandausi Sambhal
8. Shri K.K. Chaurasiya Lecturer G. P. Chandausi Sambhal
9. Shri Rohit Kumar Lecturer G. P. Chandausi Sambhal
10. Shri Dr. A.P. Singh Deputy Director I.R.D.T. Kanpur
11. Shri Ravindra Kumar Research Assistant I.R.D.T. Kanpur

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