COMMUNICATION SKILLS
(Subject Code: 7101)

I

a) RATIONALE:

The snap study conducted for the role of technicians in industry revealed that diploma pass out lacks in grammatically correct written and oral communication. In order to develop the abilities in students the written and practical have been incorporated.

b) OBJECTIVES:

1. The subject is introduced to enable the students to improve oral and written communication. This will equip the students with professional and organizational skill.
2. To enable the students to improve both oral and written communication not only during academic career, but also in professional life.
3. To equip the students with basic of professional and organizational communication. This subject will develop technical report writing skill in them.
4. To develop students' vocabulary as to enable to appear and perform well in interview and group discussion.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	No Exam
Credit	: 3	Duration	:	NIL
		Unit Test	:	20 Marks
		T / W (Internal)	:	50 Marks
		Total	***:***	***70 Marks***

III DETAILS OF CURRICULUM:

Chapter 1 Communication

1.1 What is communication? Importance of communication, barriers to communication, verbal and non verbal communication, barriers to communication, verbal and non verbal communication, oral and written communication, techniques to improve communication,
1.2 Effective Public Speaking
1.3 Group Discussion

Chapter 2 Grammar

2.1 Articles
2.2 Tenses
2.3 Active & Passive Voice
2.4 Direct – Indirect Speech
2.5 Verbs ; Auxiliary Verbs
2.6 Transformation of sentences
2.7 Punctuation
2.8 Antonyms (Opposites)
2.9 Synonyms (meanings)
2.10 Homhyms (words having the same sound but different meanings)
2.11 Idioms

Chapter 3 Composition

3.1 Essay Writing
3.2 Letter Writing, Business Letters including placing orders
3.3 Paragraph Writing
3.4 Precis Writing
3.5 Report Writing, Informative Report, Analytical Report, Survey Report, Engineering Test Report, Fall of Production Report, etc.

IV **TERM WORK:** Marks : 50

Term work will consists of assignments based on the above syllabus given periodically.

V **REFERENCE BOOKS:**

1. Communication Skill by *Dongerwar*
2. English Grammer & Composition by *Rajendra Pal & Premdata Suri*
3. Contemporary English Grammer, Structure & Composition by *David Green (Macmillon)*
4. English Grammer & Composition by *R.C. Jain (Macmillon)*
5. English for practical purposes by *Z.N. Patil, etel, (Macmillon)*
6. Effective letters in Business by *R.L.Shurter* (IInd Edition)
7. A course in Technical English: Book Two, T. T. T. I., Bhopal

ENGINEERING MATHEMATICS - I

(Subject Code: 7102)

I **OBJECTIVES:**

1. To expose the students on the basis of determinants, partial fractions, binomial theorem, progressions, trigonometric ratio, inverse functions, graphs, etc.
2. To improve the students both in numerical and analytical thinking and habit of mind searching.
3. To equip the students with tools and techniques to be applied in deriving engineering solutions to problems and understanding theoretical background.
4. To augment the ability of 'Calculating', in practical life as well as that required in workshop technologies.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Tutorial	: 1 Hour	Duration	:	3 Hours
Credit	: 4	Unit Test	:	20 Marks
		T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III **DETAILS OF CURRICULUM:**

SECTION I

[S.C: 7102]

Chapter 1 Complex Numbers — Marks : 08, Hours : 04

1.1 Definition with different forms.
- a. Cartesian form
- b. Polar form
- c. Exponential form
- d. Modulus - amplitude form

1.2 De Moivre's Theorem (only application)

Chapter 2 Determinants — Marks : 08, Hours : 04

2.1 Definition of determinant.
- a. Solution of Triangle
- b. Order of determinants.
- c. Expansion of determinants of order 2 & 3.

2.2 Properties of determinants of order 3.

2.3 Solution of simultaneous equations in two and three unknowns (Cramer's rule).

Chapter 3 Partial Fractions — Marks : 08, Hours : 04

3.1 Rational fractions.
3.2 To resolve given rational fraction into partial fractions.
- a. Denominator containing non repeated linear factor.
- b. Denominator containing repeated linear factors.
- c. Denominator containing irreducible quadratic factors.

Chapter 4 Binomial Theorem — Marks : 08, Hours : 04

4.1 Definition of permutation and combinations.
4.2 Factorial notation.
4.3 Meaning of nCr and nPr
4.4 Statement of Binomial expansion theorem for positive integral index.
4.5 General term in Binomial expansion.
4.6 Middle term in Binomial expansion.
4.7 Coefficient of X and term independent of X in Binomial expansion.
4.8 Binomial theorem for any rational index.
4.9 Application of Binomial theorem for approximate values.

Chapter 5 Logarithm — Marks : 08, Hours : 04

5.1 Introduction & Definition
5.2 Laws of logarithm with proof
5.3 Change of base
5.4 Numerical problems

SECTION II
[S.C: 7102]

Chapter 6 Trigonometric Ratio — Marks : 08, Hours : 04

6.1 Relation between degree & radian
6.2 Trigonometric ratios of any angle
6.3 Relation between Trigonometric ratios.
6.4 Trigonometric ratios of standard angles.
6.5 Signs of Trigonometric ratios.
6.6 Trigonometric Identities

Chapter 7 Trigonometric Ratios of Allied, Compound, Multiple Angles — Marks : 12, Hours : 06

7.1 Trigonometric Ratios of allied angles.
7.2 Trigonometric ratios of compound angles.
7.3 Trigonometric ratios of multiple and submultiple angles.
7.4 Product, Sum-Difference formulae.

Chapter 8 Inverse Circular Functions — Marks : 06, Hours : 03

8.1 Definition.
8.2 Principle value of inverse circular functions.
8.3 Simple problems.

Chapter 9 Properties and Solution of Triangle — Marks : 08, Hours : 04

9.1 Sine Rule.
9.2 Cosine Rule.
9.3 Projection Rules.
9.4 Tangent Rules
9.5 Half angle Formulae.
9.6 Area of triangle in terms of sides of triangle.
9.7 Problems.

Chapter 10 Graphs — Marks : 06, Hours : 03

10.1 Solution of Algebraic & Trigonometric equations

IV **TERM WORK (Internal):** Marks : 25

Tutorial No.	Topic on which tutorial is to be conducted
1	Partial fractions
2	Determinants
3	Binomial theorem
4	Trigonometry – fundamental identities-revision only
5	Trigonometry-allied, compound and multiple angles
6	Trigonometry-factorization and defactorization formulae
7	Trigonometry-inverse trigonometric ratios
8	Properties & Solution of triangle
9	Graphs

Term work shall comprise of submission of journal containing at least 8 problems on each topic mentioned above.

V **REFERENCE BOOKS:**

1. Mathematics for polytechnic students Volume I : *S. P. Despande*
2. Mathematics for polytechnic students : *T. T. T. I. - Bhopal*
3. Mathematics for polytechnic students : *Patel & Rawal.*
4. Mathematics for polytechnic students : *Gore.*
5. Trigonometry : *S. L. Loney*

ENGINEERING SCIENCE I

(Subject Code: 7103)

I **OBJECTIVES:**

1. To expose the students on rudimentary of units, heat, electrostat, current electricity, Atomic structure, electrochemistry, water, corrosion, etc.
2. To strengthen the students with basic knowledge in both physical and chemical science so as to be aware of facts, concepts principles and techniques carry out scientific investigations.
3. To build in them the foundation of scientific knowledge to be able to carry out engineering applications.
4. To build in them problem solving attitude requiring knowledge on basic concepts of engineering science.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Semester Exam	:	80 Marks
Practical	: 2 Hours	Duration	:	3 Hours
Credit	: 5	Unit Test	:	20 Marks
		T / W (External)	:	25 Marks
		Total	***:***	***125 Marks***

III **DETAILS OF CURRICULUM:**

SECTION I
[S.C: 7103]

ENGINEERING PHYSICS- I:

Chapter 1 Units and Dimensions — Marks : 06, Hours : 03

1.1 Unit of physical quantity
1.2 Requirements of Standard Unit
1.3 System of Units – CGS, MKS, SI
1.4 Rules of SI System
1.5 Fundamental & Derived Physical Quantities with their units
1.6 Dimensions
1.7 Dimensional analysis
1.8 Significant figures
1.9 Errors in measurement

Chapter 2 Heat — Marks : 08, Hours : 04

2.1 Statements of Boyle's Law, Charle's Law, Gay lussac's Law.
2.2 General Gas Equation
2.3 Concept of absolute zero.
2.4 Kelvin scale of temp.
2.5 Definitions of specific heat of gas at constant pressure and constant volume.
2.6 Work done in expansion of gas at constant pressure.
2.7 Relation between C_P and C_V

Chapter 3 Electrostatics — Marks : 08, Hours : 04

3.1 Gauss's theorem.
3.2 Coulomb's inverse square law.
3.3 Unit Charge.
3.4 Electric line of force.
3.5 Electric flux, Electric Intensity
3.6 Electric flux density.
3.7 Electric Potential at a point. Relation between electric change and flux density.
3.8 Potential difference and absolute potential.

Chapter 4 Current Electricity — Marks : 10, Hours : 05

4.1 Ohm's Law.
4.2 Resistance.
4.3 Specific Resistance.
4.4 Resistance in series and parallel.
4.5 Theory of shunt.
4.6 General equation of Ohm's Law.
4.7 Wheatstone's bridge.
4.8 Heating Effect of electric current.
4.9 Joule's Law.
4.10 Electric power.
4.11 Electric energy.
4.12 Calculation of Electric bills.
4.13 Seebeck effect & Peltier effect.

Chapter 5 Quantum Physics — Marks : 08, Hours : 03

5.1 Planck's Hypothesis
5.2 Concept of Quantum
5.3 Planck Einstein Equation
5.4 Photoelectric Effect
5.5 Characteristics of photoelectric effect
5.6 Applications of photoelectric cell
5.7 X-rays
5.8 Production of X-rays using Coolidge tube
5.9 Properties & uses of X-rays

SECTION II
[S.C: 7103]

ENGINEERING CHEMISTRY - I:

Chapter 6 Atomic Structure — Marks : 12, Hours : 08

6.1 Atom, Electron, Proton, Neutron, Nucleus.
6.2 Atomic Theories-Rutherford's Model, Bohr's Theory
6.3 Atomic Number, Atomic weight.
6.4 Distribution of electrons in shells.
6.5 Energy level and sub-energy level.
6.6 Quantum Numbers.
6.7 Mass defect.
6.8 Isotopes & Isobars.

Chapter 7 Electrochemistry — Marks : 08 — Hours : 04

7.1 Atom & Ion
7.2 Distinction between atom and Ion
7.3 Arrhenuis Theory of ionization.
7.4 Mechanism of electrolysis of copper sulphate solution using Copper electrodes.
7.5 Faraday's laws of electrolysis.
7.6 Degree of ionisation & factors affecting it.
7.7 Application of electrolysis.
7.8 Concept of pH & pOH and its applications

Chapter 8 Water — Marks : 14 — Hours : 08

8.1 Impurities in natural water with its characteristics.
8.2 Hard and soft water.
8.3 Disadvantages of hard water in domestic, industrial application.
8.4 Scale and sludge formation in boiler - causes & prevention.
8.5 Laboratory methods of softening of hard water.
8.6 Industrial method of softening of water.
(i) Permutit process (ii) Lime -Soda process
8.7 Treatment of drinking water by
a) Coagulation b) Sedimentation c)Filtration d) Chlorination

Chapter 9 Corrosion — Marks : 10 — Hours : 04

9.1 Basic idea of Metals & alloys.
9.2 Corrosion.
9.3 Types of Corrosion
a) Dry atmospheric corrosion b) Wet immersed corrosion
9.4 Protection of metals from corrosion by
a) Galvanising b) Tinning c) Cladding d) Sherardzing
e) Metal spraying f) Organic coating

IV TERM WORK: — Marks : 25

a) List of Experiments:
1. Linear measurements by
i) Vernier Caliper ii) Micrometer iii) Spherometer
2. To determine the thermal conductivity of a good conductor.
3. To measure resistance by ammeter and voltmeter & verification of series and parallel combination.
4. To determine resistance by wheatstone bridge.
5. To determine e.m.f. of a given cell by potentiometer.
6. To identify one cation and one anion in a given solutions of sample. (excluding interfering radicals) Minimum 4 compounds of Cu, Zn, Ca & Pb.
7. To estimate Cu in brass.
8. Determination of acidity and basicity of a given sample by pH-meter.

b) Assignments based on the syllabus:
Term work consists of satisfactory completion and submission of journal based on the above mentioned experiments and assignments.

V REFERENCE BOOKS:

1. Applied Physics: *B. G. Bhandarkar*
2. Applied Physics: *Dr. R. H. Jog*
3. Chemistry of Engg. Materials: *Dr. V. D. Kodgire*
4. Applied Chemistry : *Sane and Kolhe*

ENGINEERING DRAWING I

(Subject Code: 7104)

I **OBJECTIVES:**

1. To expose student in areas of Engineering curves, Orthographic projections,
2. Projections of points, Lines, & Planes.
3. To build in the student skills required for constructions on paper, graphical representation, linear representation of objects on paper and dimensional representation.
4. To enable student to understand objects & techniques to represent them in two dimensional views.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Semester Exam	:	80 Marks
Practical	: 6 Hours	Duration	:	4 Hours
Credit	: 9	Unit Test	:	20 Marks
		T / W (External)	:	50 Marks
		Total	***:***	***150 Marks***

III **DETAILS OF CURRICULUM:**

SECTION I
[S.C: 7104]

Chapter 1 Introduction to Drawing — Marks : Nil; Hours : 02

1.1 Use of different drawing instruments, equipments.
1.2 Types of letters.
1.3 Types of straight lines.
1.4 Dimensioning Techniques.

Chapter 2 — Marks : 15; Hours : 04

2.1 Geometrical constructions.
2.2 To redraw the given figure.

Chapter 3 Engineering Curves — Marks : 25; Hours : 12

3.1 To draw an ellipse by
- 3.1.1 Arcs of circle method.
- 3.1.2 Concentric circle method.
- 3.1.3 Rectangle/ oblong method.
- 3.1.4 Directrix focus method.

3.2 To draw a parabola by
- 3.2.1 Directrix focus method.
- 3.2.2 Rectangle method.

3.3 To draw hyperbola by
- 3.3.1 Directrix focus method.
- 3.3.2 Rectangular hyperbola.
- 3.3.3 Involute of circle.

3.4 To draw a cycloid, epicycloids and hypocycloid.
3.5 Tangent & Normal to the curves.

Note: Simple problems without any applications

SECTION II
[S.C: 7104]

Chapter 4 Orthographic Projections — Marks : 15, Hours : 06

4.1 Introduction to orthographic projections, Quadrants and use of first and third angle method of projection. Conversion of simple pictorial view into orthographic view.

Chapter 5 Projection of Straight Lines — Marks : 10, Hours : 06

5.1 Projection of points.
5.2 Projection of Lines inclined to one reference plane ad parallel to other
5.3 Projection of lines inclined to both the reference planes.
(Problems involving lines with both ends in one quadrant only)

Chapter 6 Projection of Planes — Marks : 15, Hours : 06

6.1 Projection of planes (circular, square, rectangular, Pentagonal, and hexagonal shapes) inclined to one reference plane and perpendicular to the other.
6.2 Projection of oblique planes.

IV **TERMWORK** (External): Marks : 50

List of practical:

1. Lettering, dimensioning, line work.
2. Basic geometric constructions.
3. To redraw the given figure.
4. Orthographic projections.
5. Projection of lines.
6. Projection of planes.

The Term work Submission should cover the following:

1. One sheet on "Redraw the given figure" (4 problems)
2. One sheet on engineering curves (4 problems)
3. One sheet on Projection of lines (4 problems)
4. One sheet on Projection of planes (4 problems)
5. One sheet on Orthographic projection (4 problems)

V **REFERENCE BOOKS:**

1. Elementary Engineering Drawing :*N. D. Bhatt*
2. Engineering Drawing : *R. V. Mali, B. S. Choudhary & A.S. Dhongde*
3. Engineering Drawing : *P.J. Shah*
4. Engineering Drawing : *Kamat & Rao*

MACHINE TOOLS I
(Subject Code: 7105)

I OBJECTIVES:

Machine Tools:

1. To expose the students fully in the basics of hand tools, measuring instruments, machine tools like drilling machines centre lathe, shaper, planner, slotter and also cutting tool materials and cutting fluids.
2. To appraise the students with all basic engineering process and to enable them to distinguish between different process from point of view of their limitations and practical application.
3. To equip them with knowledge of tools those are used on these machines for different application.
4. To enable the students to understand facts, concepts and techniques of manufacturing items of simple and complicated products and machine parts.
5. To make them aware of instructional procedures and safety precautions while operating machine.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Semester Exam	:	80 Marks
Credit	: 3	Duration	:	3 Hours
		Unit Test	:	20 Marks
		T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III DETAILS OF CURRICULUM:

SECTION I
[S.C: 7105]

Chapter 1 Hand Tools & Measuring Instruments — Marks : 16, Hours : 08

1.1 Classification of files, chisels.
1.2 Types of hammers, punches.
1.3 Types of Vices.
1.4 Hacksaw.
1.5 Taps, Dies and die stocks.
1.6 Surface plate.
1.7 Try square, Bevel square & Protector.
1.8 Combination set.
1.9 Dial gauge.
1.10 Fillet and radius gauge.
1.11 Cares of instruments.

Chapter 2 Drilling — Marks : 08, Hours : 05

2.1 Introduction.
2.2 Types of drilling and machines.
2.3 Main parts and their functions.
2.4 Work holding devices.
2.5 Tool holding devices.
2.6 Different operations.
2.7 Drill elements & reamer types.
2.8 Speed, feed, machining time.
2.9 Specification of drilling machines & drills.

Chapter 3 Cutting Tool Materials — Marks : 05, Hours : 01

3.1 Introduction.
3.2 Characteristics of tool material.
3.3 Application of plain carbon, alloy carbon & high speed steels.

Chapter 4 Shaper, Planner, Slotters — Marks : 11, Hours : 06

4.1 Working principle.
4.2 Quick return mechanism of shaper.
4.3 Basic parts, their description & functions.
4.4 Drive mechanisms (Mechanical & Hydraulic) for shaper only.
4.5 Various tools & tool holders & job holding devices.
4.6 Various operations.
4.7 Speed feed and machining time.
4.8 Specification of the machines & the tools used.

SECTION II
[S.C: 7105]

Chapter 5 Centre Lathe — Marks : 30, Hours : 14

5.1 Introduction.
5.2 Classification.
5.3 Principle parts & functions & working.
5.4 Accessories.
5.5 Attachment.
5.6 Lathe operations (Thread cutting, taper turning etc.)
5.7 Cutting parameter (Feed and Speed)
5.8 Calculation of machining time.
5.9 Specification of lathe & cutting tools used.

Chapter 6 Broaching Machines — Marks : 08, Hours : 05

6.1 Introduction.
6.2 Types of broaching machines.
6.3 Broaching tool nomenclature.
6.4 Types of broaches and their specifications.
6.5 Advantages & limitations of broaching operation.
6.6 Lubricating.

Chapter 7	Cutting Fluids	Marks	:	02
		Hours	:	01

7.1 Introduction and function.
7.2 Types of fluids & Application.

IV **TERM WORK**: Marks : 25

Term work will consists of assignments based on the above syllabus given periodically.

V **REFERENCE BOOKS:**

1. Workshop Technology by *Hajra Chaudhary, Vol. 1 & Vol. 2*
2. Workshop Technology by *Chapman, Vol. I, II, III & IV*
3. Production Technology by *Jain & Gupta*
4. Production Engineering by *P. C. Shah*
5. Production Technology by *HMT*
6. Manufacturing Process by *Young*
7. Manufacturing Process by *Cambell*
8. Mechanical Technology by *Chamok*

WORKSHOP PRACTICE I

(Subject Code: 7106)

I OBJECTIVES

1. To expose the students fully in the rudimentary of practical applications, fitting so that they are effectively able to supervise and understand all the necessities of skills and other preliminaries required therein.
2. To develop the aptitude and skill in electrical wirings and measurements.
3. To train the students to acquire skills to demonstrate to the workmen the continuation of production processes.
4. To equip the students with the knowledge of operations of machine and tools by involving therein and working with own hands which could build in them the confidence to go ahead themselves as entrepreneurs.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION	
Fitting/ electrical wiring	: 6 Hours	Practical	: 100 Marks
Credit	: 6	Duration	: 6 Hours
		T / W (Internal)	
		Fitting	: 40 Marks
		Electrical wiring	: 10 Marks
		T / W (External)	
		Fitting	: 40 Marks
		Electrical wiring	: 10 Marks

III DETAILS OF CURRICULUM:

a) FITTING (50 hours)

1. To study various fitting tool and their specification for cutting, chipping, filing, marking, centre punching, drilling, tapping, thread cutting with the help of die.
2. To use try square, vernier caliper, Micrometer, Radius Gauges & combination set etc..
3. Four Exercises involving flat filing, chipping, hack-saw cutting, marking, making right angle by filing, draw filing, drilling, reaming, tapping, concave and convex radius / dovetail filing.

b) ELECTRICAL WIRING (20 hours)

1. To study various types of electric supply and their uses, various tools used for wiring and their specifications.
2. To study various electrical connections and their applications.
3. To study electrical measurements.
4. Minimum six exercises (in a group of 2– 3) in electrical wiring and measurements from below.
   - i) To do termination of cable by using lug, thimble and connector.
   - ii) To carry out a house wiring having 2 socket points, one light point and one main switch.
   - iii) To prepare a series parallel testing board.
   - iv) To connect resistors in parallel and identify their properties.
   - v) To connect resistors in series and identify their properties.
   - vi) To connect lamp load in star connection and identify their properties.
   - vii) To connect lamp load in delta connection and identify their properties.
   - viii) To carryout various types of joints with stranded conductors, bare conductors and aluminum conductors.
   - ix) To assemble resistors in a board and measure their properties.

Note: Job report file has to be prepared based on the practical conducted.

IV **TERM WORK:**

	Term Work	Internal	External
1	Four exercises in Fitting	40	40
2	Six exercises in electrical	10	10
	Total	**50**	**50**

Term Work Submission consists of the satisfactory completion of above mentioned exercises and submission of Job Report File.

V **PRACTICAL EXAMINATION:**

Practical examination is based on fitting of 6 hours duration.

PROFESSIONAL PRACTICE I

(Subject Code: 7107)

I **OBJECTIVES:**

1. To provide the basic computer literacy needed to work in office environment..
2. To develop basic computer skills of creating, formatting and printing of word documents and worksheets.
3. To familiarize students with the various tools and functions which can be used when working with the documents and worksheets.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: NIL	Sem. Exam	:	No Exam
Practical	: 2 Hours	Duration	:	NIL
Credit	: 2	Unit Test	:	NIL
		T / W (Internal)	:	50 Marks
		Total	***:***	***50 Marks***

III **LIST OF PRACTICALS:**

1.	Working with Windows 2000 desktop, start icon, taskbar, Recycle Bin, My Computer icon, The Recycle Bin and deleted files, Creating shortcuts on the desktop.	Hours	:	02
2.	The Windows 2000 accessories, WordPad – editing an existing document, Use of Paint – drawing tools, The Calculator, Clock	Hours	:	02
3.	The Windows Explorer Window, concept of drives, folders and files Folder selection techniques, Switching drives, Folder creation, Moving or copying files, Renaming, Deleting files, and folders.	Hours	:	02
4.	Printing, Installing a printer driver, Setting up a printer, Default and installed printers, Controlling print queues, Viewing installed fonts. The clipboard and 'drag and drop', Basic clipboard concepts, Linking vs. embedding.	Hours	:	02
5.	Moving through a Word document menu bar and drop down toolbars	Hours	:	02
6.	Entering text into a Word 2000 document, selection techniques Deleting Text			
7.	Font formatting keyboard shortcuts.			
8.	Paragraph formatting, Bullets and numbering.			
9.	Page formatting, What is page formatting? Page margins, page size and orientation, page breaks, Heads and footers.	Hours	:	02

10.	Introducing tables and columns.	Hours : 02
11.	Printing within Word 2000 Print Setup Printing options Print Preview.	
12.	Development of application using mail merge, Mail merging addresses for envelopes, Printing an addressed envelope and letter.	Hours : 02
13.	Creating and using macros in a document	
14.	Creating and opening workbooks, entering data.	Hours : 02
15.	Navigating in the worksheet, Selecting items within Excel 2000, Inserting and deleting cells, rows and column, Moving between worksheets, saving worksheet, workbook.	Hours : 03
16.	Formatting and customizing data.	Hours : 02
17.	Formulas, functions and named ranges	
18.	Creating, manipulating & changing the chart type.	Hours : 03
19.	Printing, Page Set up, Margins, Sheet printing options, Printing a worksheet.	

IV **<u>TERM WORK</u>:**

1. Preparation of one document integrating various word documents and taking printout of the same.
2. Preparation of one excel database workbook involving chart / graph, formulae, tables, etc.

ELECTRICAL TECHNOLOGY
(Subject Code: 7201)

I OBJECTIVES:

To teach the student facts, concepts, principles & procedure of operation & control of electric machines & applications of electrical energy in manufacturing industry which enables him to work as a supervisor in a manufacturing shop & as an assistant in research & development department.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 2 Hours	Sem. Exam	:	80 Marks
Practical	: 2 Hours	Duration	:	3 Hours
Credit	: 4	Unit Test	:	20 Marks
		T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III DETAILS OF CURRICULUM:

SECTION I
[S.C: 7201]

Chapter 1 Introduction to Electrical Technology — Marks : 05, Hours : 02

1.1 Generation of electric power
1.2 Transmission of electric power
1.3 Distribution of electric power
1.4 Utilization of electric power
1.5 AC and DC supply
1.6 Advantages of AC over DC

Chapter 2 AC Fundamentals — Marks : 18, Hours : 07

2.1 Cycle, frequency, phase, period and amplitude
2.2 RMS value and Average value
2.3 Peak factor and Form factor
2.4 Current, voltage and power Equations in R-L circuit
2.5 Current, voltage and power Equations in R-C circuit
2.6 Current, voltage and power Equations in R-L-C circuit
2.7 Three phase supply
2.8 Advantages of three phase supply over single phase supply
2.9 Three phase Star and Delta connection
2.10 Line and Phase Relations in Star connections
2.11 Line and Phase Relations in Delta connections

Chapter 3 Transformer — Marks : 17, Hours : 06

3.1 Construction
3.2 Principle of operation
3.3 Types of transformer based on construction and voltage
3.4 EMF Equation and Transformation Ratio
3.5 Characteristics of an Ideal Transformer
3.6 Losses in Transformer : Copper losses
3.7 Iron Losses : Hysteresis Losses, Eddy Current Losses
3.8 Concept of Auto transformer and Three phase Transformer
3.9 Applications of Transformers

SECTION II
[S.C: 7201]

Chapter 4 DC Machines — Marks : 17, Hours : 06

4.1 Construction of DC Generator
4.2 Principle of operation of DC Generator
4.3 EMF equation of a voltage generated in a DC Generator
4.4 Types of DC Generator
4.5 Construction of DC Motor
4.6 Principle of operation of DC Motor
4.7 Types of DC Motor
4.8 Speed Torque characteristics of DC Motor
4.9 Applications of DC Motor

Chapter 5 AC Machines — Marks : 17, Hours : 07

5.1 Construction of 3 phase Induction Motor
5.2 Principle of operation of 3 phase Induction Motor.
5.3 Applications of 3 phase AC motors
5.4 Single phase Induction Motor
5.5 Comparison of 3 phase and single phase Induction Motors
5.6 Types of Single phase Induction Motors
5.7 Applications of single phase AC motors
5.8 Classification of Industrial drives
5.9 Factors for selection of a motor for different drives.
5.10 Alternator: Construction
5.11 Principle of Operation of an alternator
5.12 Applications of alternator

Chapter 6 Electric Safety, Tariff and Power Conservation — Marks : 06, Hours : 02

6.1 Necessity of Earthing
6.2 Types of safety tools
6.3 First aid measures
6.4 Types of tariff
6.5 Energy conservation

IV TERM WORK:

a) PRACTICAL:

1. Verify characteristics of 3 phase balanced Star/ Delta connection
2. Study of SC and OC tests of transformer
3. Study of DC Motor
4. Study of three phase Induction Motor
5. Demonstration of Electric wiring, Cable connection and Earthing of a building
6. Study of different types Lamps and there specifications
7. Study of various types of Electric Accessories
8. Demonstration of Safety tools and First aid measures

b) ASSIGNMENT BASED ON THE SYLLABUS:

Term work includes submission of journal based on the above-mentioned practical and assignments based on above-mentioned syllabus.

V REFERENCE BOOKS:

1. Electrical Technology: *V.K. Mehta*
1. Electrical Technology (Vol. I to IV) : *B. L. Theraja*
2. Electrical Technology: *H. Cotton*

ENGINEERING MATHEMATICS II
(Subject Code: 7202)

I OBJECTIVES:

1. To expose the student to rudimentaries of
   a) Co-ordinate geometry covering points, distance, straight line, circle.
   b) Calculus covering functions, limits, derivatives and their applications.
2. To improve in the student numerical and analytical thinking and habit of mind searching.
3. To equip the student with tools and techniques to be applied in deriving engineering solutions to the problems and understanding theoretical background.
4. To augment in the student the habit of restoring to calculations for problems requiring estimates etc required in practical life as well as required in workshop techniques.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: 1 Hour	Duration	:	3 Hours
Credit	: 4	Unit Test	:	20 Marks
Pre-requisite	: sub code 7102	T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III DETAILS OF CURRICULUM:

SECTION I
[S.C: 7202]

CO-ORDINATE GEOMETRY:

Chapter 1 Point and Distance — Marks : 10, Hours : 05

1.1 Distance between two points.
1.2 Section formulae.
1.3 Centroid of the triangle.
1.4 Area of a triangle.
1.5 Collinearity of the points.
1.6 Centroid & Circum centre of triangle.

Chapter 2 The Straight Line — Marks : 10, Hours : 05

3.1 Slope and Intercepts of a line.
3.2 Angle between two lines.
   3.2.1 Parallel and perpendicular lines.
3.3 Various forms of the straight lines.
   3.3.1 Slope-point form.
   3.3.2 Equation of the straight line through the point of intersection of two lines.
   3.3.3 Two points form.
   3.3.4 Double intercepts form.
   Normal form.
3.4 General equation of the straight line.
   3.4.1 To find slope and intercepts of line $Ax + By + C = 0$
3.5 Perpendicular distance of a point from a straight line.
   3.5.1 Distance between two parallel lines.

Chapter 3 Circle — Marks : 10, Hours : 05

4.1 Equation of circle.
- 4.1.1 Equation of circle with centre at (h, k) and radius r.
- 4.1.2 Equation of circle with centre at origin and radius r.
- 4.1.3 General equation of circle.

4.2 Centre and radius of circle "x2 + y2 + 2gx + 2 fy + c = 0".

4.3 Equation of Tangent and Normal of the circle.

Chapter 4 Vector Algebra — Marks : 10, Hours : 05

4.1 Definitions of all types of vectors.

4.2 I, j, k vectors.

4.3 Scalar product and vector product and their properties.

4.4 Triple product.

4.5 Application to work done and moment of force about a point.

SECTION II
[S.C: 7202]

FUNCTION AND LIMITS:

Chapter 5 Function & Limits — Marks : 16, Hours : 08

5.1 Definition of Constant and Variable.

5.2 Definition of Function and Notation.

5.3 Value of a Function.

5.4 Different types of Function (Illustration by examples)
- 5.4.1 Algebric functions, Rational functions.
- 5.4.2 Trigonometric and Inverse trigonometric functions.
- 5.4.3 Logarithmic and Exponential functions.
- 5.4.4 Parametric functions.
- 5.4.5 Implicit functions.
- 5.4.6 Even and odd functions.

5.5 Concept of Limit.

5.6 Algebra of Limit.

5.7 Methods of finding limit.
- 5.7.1 Limit of Algebric functions by factorisation, rationalization, etc.
- 5.7.2 Limit of Trigonometric functions.
- 5.7.3 Limit of Exponential functions.

DIFFERENTIAL CALCULUS:

Chapter 6 Derivatives — Marks : 14, Hours : 07

6.1 Concepts and definition of derivative.
- 6.1.1 Symbolic notation of derivative.
- 6.1.2 Derivatives of standard functions.

6.2 Laws of derivatives.
- 6.2.1 Derivatives of sum and difference, product and quotient of two functions.

6.3 Methods of differentiation of various functions.
- 6.3.1 Derivative of composite function, inverse functions.
- 6.3.2 Logarithmic differentiation.
- 6.3.3 Derivatives of parametric function
- 6.3.4 Derivatives of implicit functions.

6.4 Second order derivatives.

Chapter 7 Application of Derivatives — Marks : 10; Hours : 05

7.1 Application of derivatives.

7.1.1 Geometrical meaning of derivative, tangent and normal, radius of curvature.

7.1.2 Rates and motions.

7.1.3 Maxima and minima (Problems related to Engineering) one variable only.

IV **TERM WORK :** Marks : 25

LIST OF TUTORIALS:

Tutorial No.	Topic on which tutorial is to be conducted
1	Point & Distance Formulae
2	The Straight line
3	Circle
4	Vector Algebra
5	Function
6	Limits
7	Derivative (Laws)
8	Derivative (Methods of Differentiation)
9	Derivative (Second order derivative)
10	Application of derivative

Term work shall comprise of submission of journal containing at least 8 problems on each topics mentioned below.

V **REFERENCE BOOKS:**

1. Mathematics for polytech students : *TTTI Bhopal*
2. Mathematics for polytech students : *S. P. Despande*
3. Mathematics for polytech students : *Patel & Rawal*
4. Mathematics for polytech students : *Gore*
5. Applied Mathematics : P.N. Wartikar

ENGINEERING SCIENCE II
(Subject Code: 7203)

I OBJECTIVES:

1. To expose students on rudimentaries of General physics, covering surface tension, viscosity, gravitation, kinematics, sound, optics, quantum physics. Paints and varnishes, lubricants, fuels, non metallic materials, pollution
2. To strengthen the students with basic knowledge in both physical and chemical sciences so as to be aware of facts, concepts, principles and techniques to carry out scientific investigations.
3. To build in them the foundation of scientific knowledge to be able to carry out engineering.
4. To build in them an attitude to solve problems requiring knowledge on basic concepts of engineering science.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: 2 Hours	Duration	:	3 Hours
Credit	: 5	Unit Test	:	20 Marks
Pre-requisite	: 7103	T / W (External)	:	25 Marks
		Total	***:***	***125 Marks***

III DETAILS OF CURRICULUM:

SECTION I
[S.C: 7203]

ENGINEERING PHYSICS

Chapter 1 General Physics — Marks : 20, Hours : 10

1.1 Surface Tension.
- 1.1.1 Concept and definition of surface tension.
- 1.1.2 Molecular theory of surface tension.
- 1.1.3 Angle of contact.
- 1.1.4 Rise of liquid in a capillary tube
- 1.1.5 Determination of surface tension by capillary rise.
- 1.1.6 Application of Surface tension.

1.2 Viscosity
- 1.2.1 Definition and concept of viscosity.
- 1.2.2 Coefficient of viscosity.
- 1.2.3 Determination of viscosity by Poisuellie's method (Derivation of formula not necessary)
- 1.2.4 Stoke's Law.
- 1.2.5 Terminal Velocity.
- 1.2.6 Application of viscosity.

1.3 Gravitation
- 1.3.1 Newton's Law of Gravitation.
- 1.3.2 Definition and derivation of unit of 'G'
- 1.3.3 Acceleration due to gravity.
- 1.3.4 Satellite, Escape velocity, critical velocity, Communication Satellite & its uses.

Chapter 2 Sound — Marks : 12, Hours : 06

2.1 Simple harmonic motion.
2.2 Concept of wave motion.
2.3 Amplitude, Frequency, Wavelength, Periodic time, Phase, Frequency and Wavelength of a wave
2.4 Transverse waves & Longitudinal waves - Distinction
2.5 Sound as a Longitudinal wave
2.6 Newton's formula for velocity of sound
2.7 Laplace's correction to Newton's formula
2.8 Effect of temperature, pressure and humidity on velocity of sound
2.9 Echo
2.10 Reverberation & Reverberation time
2.11 Sabine's formula
2.12 Factors affecting reverberation time
2.13 Acoustical planning of a auditorium
2.14 Types of sound waves : Ultrasonic, Audible and Infrasonic waves

Chapter 3 Optics — Marks : 08, Hours : 04

3.1 Refraction through prism, laws of refraction
3.2 Deviation, Spectrum of light.
3.3 Minimum deviation position.
3.4 Prism formula.
3.5 Dispersion & Dispersive Power

SECTION II

[S.C: 7203]

ENGINEERING CHEMISTRY-II

Chapter 4 Paints & Varnishes — Marks : 08, Hours : 05

4.1 Definition and significance of paint.
4.2 Characteristics of a good paint.
4.3 Principle constituents of paints such as, pigment, vehicle, thinner, drier, extender, plasticizer and their functions
4.4 Methods of application of paints such as, brushing, spraying, dipping, Roller coating
4.5 Failure of paint film and remedies.
4.6 Varnish & its types.
4.7 Characteristics of good varnish
4.8 Use of varnish

Chapter 5 Lubricants — Marks : 08, Hours : 04

5.1 Lubricants & its functions.
5.2 Classification of lubricants.
5.3 Types of lubrication
  a) Fluid film lubrication.
  b) Extreme pressure lubrication.
  c) Boundary lubrication.
5.4 Properties of lubricants like viscosity, viscosity index, oilness, volatility, flash and fire point, cloud and pour point, acidity or neutralization number, saponification, emulsification value
5.5 Selection of lubricants for various types of machineries

Chapter 6 Fuels — Marks : 08, Hours : 04

6.1 Fuel.
6.2 Classification of fuels.
6.3 Characteristics of a good fuel.
6.4 Petroleum & its refining.
6.5 Important fractions of petroleum and their application in industry.
6.6 Gaseous fuels
a) Natural gas.
b) LPG
6.7 Comparison of solid, liquid & gaseous fuels.

Chapter 7 Non – Metallic Materials — Marks : 10, Hours : 04

7.1 Plastics, Types of plastics.
7.2 Types of polymerisation.
7.3 Compounding of plastics.
7.4 Properties of plastics and their engineering applications.
7.5 Rubber, types of rubber.
7.6 Properties of natural rubber.
7.7 Vulcanization of rubber.
7.8 Properties of vulcanised rubber.
7.9 Applications of rubber.
7.10 Thermal insulating materials.
7.11 Characteristics of good insulating material.
7.12 Applications of glasswool, thermocol, puf, cork, asbestos as thermal insulators.

Chapter 8 Pollution & It's Control — Marks : 06, Hours : 03

8.1 Pollution and pollutants and causes of pollution.
8.2 Types of pollution and its prevention.
a) Air pollution b) Water pollution

IV TERM WORK:

a) List of Experiments:
1. To determine the focal length of a combination of lenses.
2. To determine Young's modulus.
3. To study effect of length, mass of bob & amplitude on the time period of a simple pendulum.
4. To determine the surface tension of a liquid by rise in capillary tube.
5. Determination of viscosity of lubricating oil.
6. Determination of flash point of volatile liquid.
7. Determination of saponification value of non-drying oil.
8. Determination of acid value of plastic.

b) Assignments based on the syllabus:
Term work consists of satisfactory completion and submission of journal based on the above mentioned experiments and assignments.

V REFERENCE BOOKS:

1. Applied Physics : *B. G. Bhandarkar*
2. Applied Physics : *Dr. R. H. Jog*
3. Chemistry of Engg. materials : *Dr. V. D. Kodgire*
4. Applied Chemistry : *Sane and Kolbe*

ENGINEERING DRAWING II

(Subject Code: 7204)

I OBJECTIVES:

1. To expose student in the areas of projections of solids and their sections.
2. To make student familiar in drawing the sectional views of an object when it is cut by a cutting plane.
3. To build in student the skill required for construction of objects on paper as two dimensional and three dimensional drawings.
4. To expose student in development of lateral surfaces of solids for sheet metal applications.
5. To develop expertise in free hand sketching of machine components.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: 6 Hours	Duration	:	4 Hours
Credit	: 9	Unit Test	:	20 Marks
Pre-requisite	: sub code 7104	T / W (External)	:	50 Marks
		Total	***:***	***150 Marks***

III DETAILS OF CURRICULUM:

SECTION I

[S.C: 7204]

Chapter 1 Free Hand Sketches — Marks : 15, Hours : 07

1.1 Single & double riveted lap and butt joints (using cup head rivets).

1.2 All types of

- 1.2.1 Thread profiles, left and right hand threads, single and multi start.
- 1.2.2 Nuts
- 1.2.3 Bolts
- 1.2.4 Set Screws
- 1.2.5 Locking arrangements,
- 1.2.6 Foundation Bolts
- 1.2.7 Studs (Plain & Collar)
- 1.2.8 Washers.

1.3 Keys

Saddle keys, Sunk keys, Round keys, Parallel and Taper keys, Gib -headed keys, Wood ruff key, Splined shaft (Key fitted with shaft and hub).

Note: No Analytical Treatment

1.4 Elementary wielding Symbols & machining symbols

Chapter 2 Isometric Views — Marks : 10, Hours : 05

2.1 Isometric scale and views of simple objects.

Chapter 3 Sectional Orthographic Views — Marks : 15, Hours : 06

SECTION II
[S.C: 7204]

Chapter 4 Projection of Solids — Marks : 10, Hours : 06

4.1 simple solids - Prism, Pyramid, Cone, Cylinder etc
4.2 Projection of solids with axis perpendicular to one of the reference planes
4.3 Projection of solids with axis perpendicular to one of the reference Planes and parallel to the other.
4.4 Projection of solids with axis inclined to one of the reference planes only.

Chapter 5 Sections of Solids — Marks : 15, Hours : 06

5.1 Section planes, sections & true shape of a section
5.2 Sections of solids such as prisms, pyramids, cylinders, and cones involving cutting plane inclined to one reference plane & perpendicular to other reference plane true shape of the section.

Chapter 6 Development of Surfaces — Marks : 15, Hours : 07

6.1 Development of lateral surfaces of solids (Prism, Pyramid, Cone, Cylinder) including those with sections.

IV TERM WORK:

List of Practicals:
1. Free hand sketches.
2. Isometric views.
3. Sectional views.
4. Projection of solids.
5. Section of solids.
6. Development of surfaces.

The Term Work submission shall cover the following:
1. One sheet on free hand sketches (6 problems, minimum)
2. One sheet on Isometric views. (4 problems)
3. One sheet on Sectional Orthographic views. (4 problems)
4. One sheet on Projection of solids. (4 problems)
5. One sheet on Sections of solids.(4 problems)
6. One sheet on Development of surfaces. (4 problems)

V REFERENCE BOOKS:

1. Elementary Engineering Drawing: *N. D. Bhatt*
2. Engineering Drawing : *R. V. Mali, B. S. Choudhary & A.S. Dhongde*
3. Engineering Drawing : *P.J. Shah*
4. Engineering Drawing : *Kamat & Rao*
5. Machine Drawing : *N.D. Bhatt*

MACHINE TOOLS II
(Subject Code: 7205)

I **OBJECTIVES:**

Machine Tools:

1. To expose the students fully in the basics of grinding Machines, Thread cutting machines, Capstan and Turret lathes, automats, boring machines.
2. To appraise the students with all basic engineering processes so as to enable them to distinguish between different processes from point of view of their limitations and practical applications.
3. To equip them with knowledge of tools that are used on above machines for different applications.
4. To enable students to understand facts, concepts and techniques of manufacturing items of simple and complicated products and machine parts.
5. To make them aware about instructional procedures and safety precautions while operating machines.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Semester Exam	:	80 Marks
Credit	: 3	Duration	:	3 Hours
Pre-requisite	: sub code 7105	Unit Test	:	20 Marks
		T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III **DETAILS OF CURRICULUM:**

SECTION I
[S.C: 7205]

Chapter 1 Grinding Machines — Marks : 15, Hours : 08

1.1 Introduction.
1.2 Types of grinding machines & their specifications. (Surface, Cylindrical, Universal, Internal)
1.3 Grinding wheel.
1.4 Grinding wheel elements.
1.5 Grinding wheel Specification.
1.6 Grinding wheel selection
1.7 Allowance for grinding.
1.8 Mounting grinding wheel, balancing.
1.9 Dressing & Tracing of wheel.
1.10 Work holding devices.
1.11 Work measuring instruments.
1.12 Cutting speed and feed.

Chapter 2 Tool & Cutter Grinder — Marks : 10, Hours : 05

2.1 Introduction.
2.2 Types of wheels used on tool & cutter grinder.
2.3 Attachments and accessories.
2.4 Drill and Reamer grinding.
2.5 Milling and cutter grinding. (only application & not the method)
2.6 Wheel selection.

Chapter 3 Thread Cutting Machines — Marks : 15 — Hours : 07

3.1 Introduction.
3.2 Methods of making threads (Casting, Die head cutting, Chasing,
3.3 Milling, Grinding, Rolling)
3.4 Radial Chaser, Tangential Chaser.
3.5 Selection of methods.
3.6 Specification of thread cutting tools.

SECTION II
[S.C: 7205]

Chapter 4 Capstan & Turret — Marks : 24 — Hours : 14

4.1 Introduction.
4.2 Types of turrets and their specifications.
4.3 Principle parts and their functions.
4.4 Methods of holding jobs.
4.5 Types of tool holders.
4.6 Tool layout.
4.7 Various operations performed.

Chapter 5 Automatic Lathes — Marks : 08 — Hours : 03

5.1 Introduction.
5.2 Classification of automatic lathes.
5.3 Principal part & functions.
5.4 Swiss type automat.
5.5 Multi-spindle automat.
5.6 Machining time calculations.

Chapter 6 Boring Machines — Marks : 08 — Hours : 03

6.1 Introduction.
6.2 Horizontal, vertical, floor type boring machines.
6.3 Boring tools, attachments and accessories.
6.4 Operations.

IV TERM WORK:

Term work will consists of assignments based on the above syllabus given periodically.

V REFERENCE BOOKS:

1. Workshop Technology : *Hajra Chaudhary*, Vol. 1 & Vol. 2
2. Workshop Technology : *Chapman*, Vol. I, II, III & IV
3. Production Technology : *Jain & Gupta*
4. Production Engineering : *P. C. Shah*
5. Production Technology : *HMT*
6. Manufacturing Process : *Young*
7. Manufacturing Process : *Cambell*
8. Mechanical Technology : *Chamok*

WORKSHOP PRACTICE II

(Subject Code: 7206)

I **OBJECTIVES:**

1. To expose the students fully in the rudimentary of practical applications on carpentry, welding and plumbing/ assembly jobs so that they are effectively able to supervise and understand all the necessities of skills and other preliminaries required therein.

2. To train the students to acquire skills as far as possible, so that, they are able to demonstrate to the workmen in the continuation production processes.

3. To equip the students with the knowledge of operations and other details of workshop practices by involving therein and working with their own hands so as to build confidence in them to become entrepreneurs.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION	
Carpentry / Welding / Plumbing or Assembly Practical	: 6 Hours	Practical	: 100 Marks
Credit	: 6	Duration	: 6 Hours
		T / W (Internal)	
		Carpentry	: 30 Marks
		Welding	: 10 Marks
		Plumbing/Assembly	: 10 Marks
Prerequisite	: sub code 7104	T / W (External)	
		Carpentry	: 40 Marks
		Welding	: 10 Marks
		Plumbing/Assembly	: 10 Marks

III **DETAILS OF CURRICULUM:**

a) Carpentry (50 hours):
   1. To study various carpentry hand tools and their specifications for marking, cutting chiseling and planning.
   2. To study various parts of wood working lathe machine.
   3. To study the use and setting of various hand tools like saw, jack plane, chisel and gauges
   4. Three exercises involving joints / assemblies (T half lap, cross half lap dovetail, radius etc.)

b) Welding (20 hours):
   1. To study various welding techniques and their uses.
   2. To study various welding equipments, tools, electrodes, welding gases etc. used for used for welding and their specifications.
   3. To conduct three exercises on arc welding and two exercises on gas welding.

c) Plumbing work (10 hours)

1. To study various plumbing methods, tools and their specifications and uses.
2. To conduct (in a group of 4 to 5) minimum five exercises involving nipple, joints and assemblies.

OR

c) Assembly work (10 hours)

1. To study various assemblies and their drawings (details and assembly).
2. To conduct (in a group of 4 to 5) two exercises, dissembling machine components, fixtures, jigs, electrical appliances etc. and subsequently assembling them with the help of drawings and tools.

Note: Job report file has to be prepared based on the practical conducted.

IV **<u>TERM WORK</u>:**

	Term Work	Internal	External
1	Four exercises in Carpentry	30	30
2	Six exercises in Welding	10	10
3	Five exercises in Plumbing OR (two exercises in assembly)	10	10
	Total	50	50

Term Work Submission consists of the satisfactory completion of abovementioned exercises and submission of Job Report File.

PROFESSIONAL PRACTICE II

(Subject Code: 7206)

I **OBJECTIVES:**

1. To develop skills of creating presentation using PowerPoint slides.
2. To create awareness of using Internet to search information, sending e-mails and forming mailing groups.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: NIL	Sem. Exam	:	No Exam
Practical	: 2 Hours	Duration	:	NIL
Credit	: 2	Unit Test	:	NIL
		T / W (Internal)	:	50 Marks
		Total	***:***	***50 Marks***

III **LIST OF PRACTICALS:**

1.	Preparing presentations with Microsoft Power Point Slides and Presentations, Opening an existing presentation, Saving a presentation	Hours	:	03
2.	Using the Autocontent Wizard, starting the Autocontent Wizard, Selecting a presentation type within the Autocontent wizard Presentation type, Presentation titles, footers and slide number	Hours	:	03
3.	Creating a simple text slide, Selecting a slide layout ,Manipulating slide information within normal and outline view, Formatting and proofing text Pictures and background, Drawing toolbar, Autoshapes, Using clipart, Selecting objects Grouping and un-grouping objects, the format painter.	Hours	:	04
4.	Creating and running a slide show, Navigating through a slide show, Slide show transitions, Animation effects	Hours	:	03
5.	Microsoft Internet Explorer 5 & the Internet, Connecting to the Internet, The Internet Explorer program window, The on-line web tutorial using hyper links, Responding to an email link on a web page	Hours	:	02
6.	Searching the Internet, Searching the web via Microsoft Internet Explorer, Searching the Internet using Web Crawler, Searching the Internet using Yahoo, Commonly used search engines	Hours	:	02
7.	Favorites, Security & Customizing Explorer, Organizing Favorite web sites, Customizing options – general, security, contents, connection, programs, advanced.	Hours	:	02

8.	Using the Address Book, Adding a new contact, Creating a mailing group, Addressing a message, Finding an e-mail address.	Hours	:	03
9.	Using electonic mail, Starting Outlook Express, Using the Outlook Express window, Changing the window layout, Reading file attachment Taking action on message-deleting, forwarding, replying	Hours	:	03
10.	E-mail & newsgroups, Creating and sending e-mails, Attached files, receiving e-mails, Locating and subscribing to newsgroups, posting a message to a newsgroup.	Hours	:	03
11.	Chatting on internet, Understanding Microsoft chat environment Chat toolbar	Hours	:	02

III **TERM WORK:**

1. One PowerPoint presentation on a topic like the syllabus of D.P.E., library or on any facility available in the complex.
2. One assignment based on internet search.
3. To create an e-mail ID and composing and sending message.
4. Forming mail groups (one group for each batch)

MECHANICAL ENGINEERING
(Subject Code: 7300)

I **OBJECTIVES**:

The students will be able to :-

1. Understand basic concepts of thermodynamics
2. Explain the importance and use of laws of thermodynamics
3. Know the working principle of compressors, Gas Turbines, Hydraulic Machines, I.C. Engines, etc.
4. Know the principles of refrigeration and air-conditioning systems and their working

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 2 Hours	Sem. Exam	:	80 Marks
Practical	: 2	Duration	:	3 Hours
Credit	: 4	Unit Test	:	20 Marks
		T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III **DETAILS OF CURRICULUM**:

SECTION I
[S.C: 7300]

Chapter 1 Thermodynamics — Marks : 05, Hours : 03

1.1 Thermodynamic System, Classification and Properties, Laws of Thermodynamics

Chapter 2 Compressors — Marks : 15, Hours : 06

2.1 Introduction, classification of Air-compressors, Technical Terms, Working Principle of reciprocating air-compressors, Multistage compression, Intercooler, Advantages of multistage compression

2.2 Rotary compressors, types, working principles, Merits and Demerits, Difference between reciprocating and rotary compressors, Air motors

Chapter 3 Gas Turbines — Marks : 10, Hours : 03

3.1 Introduction, classification, open and closed cycle Gas Turbines, advantages and applications.

Chapter 4 Hydraulic Machines — Marks : 10, Hours : 05

4.1 Classification of pumps, working principle of reciprocating and rotary pump, Merits, Demerits, classification of Turbines, Principles, Types

SECTION II
[S.C: 7300]

Chapter 5 Internal Combustion Engines — Marks : 20, Hours : 09

5.1 Introduction, classification, main components, sequence of operation in a cycle, Two stroke and four stroke cycle engines, four stroke cycle petrol engine and four stroke diesel engine, comparison of petrol and diesel engines, two stroke cycle petrol engine, two stroke cycle diesel engine

Chapter 6 Refrigeration and Air-conditioning — Marks : 20, Hours : 06

6.1 Introduction, types of mechanical refrigerations, important terms
6.2 Vapour compression refrigeration mechanism, Vapour Absorption refrigerator, Electrolux Refrigerator.
6.3 Air-conditioning
Introduction, factors for human comfort, equipments used in Air-conditioning cycle, Air-conditioning system, classification, Industrial Air-conditioning system, winter and summer air-conditioning system

IV PRACTICAL:

1. Demonstration of any four of the following:-
   - 1.1 Compressors
   - 1.2 Diesel engine
   - 1.3 Petrol engine
   - 1.4 Refrigerator
   - 1.5 Air-conditioner
   - 1.6 Pumps
   - 1.7 Turbines
   - 1.8 Boiler
   - 1.9 Steam Turbine

2. Any two assignments on the above mentioned syllabus

V REFERENCE BOOKS:

1. Thermal Engineering : *P.L. Ballaney*
2. Mechanical Technology :*R.S. Khurmi*
3. Automobile Engineering :*Narang*
4. A course in Refrigeration & Air-conditioning : *Arora, Domkundwar*
5. Internal Combustion Engine : *Mathur, Sharma*

ELECTRONICS ENGINEERING
(Subject Code: 7301)

RATIONALE:

This subject is classified under core technology group and forms an important course of any branch of engineering. The course envisages identification and testing of components, their principles of working and applications of various electronic devices and circuits in analog and digital electronics.

I OBJECTIVES:

Students should be able to:

1. Identify and test different components.
2. Use principles of circuit operations and its applications.
3. Distinguish various elements in digital electronics.
4. Understand working of different types of power supplies.
5. Use test instruments.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 2 Hours	Sem. Exam	:	80 Marks
Practical	: 2	Duration	:	3 Hours
Credit	: 4	Unit Test	:	20 Marks
		T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III DETAILS OF CURRICULUM:

SECTION I
[S.C: 7301]

Chapter 1 Electronic Devices — Marks : 15, Hours : 06

Introduction to electronic devices, their symbols and principle of working – Diode, Zener diode, Bipolar Junction Transistor (BJT), Field Effect Transistor (FET) – JFET & MOSFET, Uni-junction Transistor(UJT), power devices – DIAC, TRIAC, SCR, Photo devices-, LDR, Photo diode, Photo transistor, LED & LED display (7 segment), Liquid crystal display (LCD).

Chapter 2 Power Supply — Marks : 15, Hours : 05

Circuit diagram and operation – Half wave, full wave & bridge rectifier, Filters – L, C, L-C, n filter concept of unregulated power supply, regulated power supply – regulated power supply – line regulation & load regulation, switch mode power supply (SMPS).

Chapter 3 Transistor Marks : 10
Hours : 05

Transistor as a switch and amplifier, single stage transistor amplifier CB, CE and CC configuration and their applications, RC coupled and direct coupled amplifier, their frequency response and application.

SECTION II
[S.C: 7301]

Chapter 4 Oscillator Marks : 10
Hours : 04

Requirement of oscillator circuit, Barkhauson's criteria of oscillator, circuit diagram and its application. Phase shift oscillator, Hartley oscillator, Colpitts oscillator, Crystal oscillator

Chapter 5 OP Amp Marks : 10
Hours : 04

Block diagram, configurations and use of op amp as – Inverting, Non-inverting, Summing, differentiator, Integrator, Comparator

Chapter 5 Transducers Marks : 10
Hours : 04

Types of Transducers, Measurement of displacement (using LVDT), Temperature (using Thermocouple), Strain (using strain gauges) and Flow (using electromagnetic flow meter).

Chapter 6 Digital Electronics Marks : 10
Hours : 04

Number system – Decimal, Binary, hexadecimal, Study of logic gates, symbol, truth table and IC numbers – NOT, AND, OR, NAND, NOR, XOR, XNOR and NAND as universal gate.

IV TERM WORK:

List of Practical :

1. Use of multimeter (analog and digital) for current, voltage and resistance measurement (Use of colour code for resistors).
2. Study of front panel of CRO and measurement of frequency and voltage.
3. Testing of components like diode, FET, MOSFET, LED, SCR, diac, triac, Zener diode, inductor, capacitor using a multimeter
4. Line and load regulation of un-regulated power supply and regulated power supply.
5. To plot the frequency response of single stage RC coupled amplifier and calculate bandwidth.
6. Verify truth tables for logic gates – NOT, AND, OR, NAND, NOR, XOR, XNOR

Term work submission consists of practical write-up and assignments based on above mentioned syllabus. Minimum Experiments to be completed is 5.

IV REFERENCE BOOKS:

1. Principles of Electronics : *V.K. Mehta- S. Chand & Company Ltd., New Delhi*
2. Electronic Principles : *Paul Malvino – Tata McGraw Hill Publishers*
3. Electronic Devices & Components : *A. Mottershead- Prentice Hall of India*
4. Digital Electronics: *R. P. Jain – Tata McGraw Hill*

ENGINEERING MATHEMATICS-III

(Subject Code: 7302)

I **OBJECTIVES:**

1. To expose the students on rudimentaries of
   a. Integral calculus covering indefinite & definite integration & their application.
   b. Differential equations of 1st order & their application.
2. To improve in the students both numerical and analytical thinking and habit of mind searching.
3. To equip the students with tools and techniques to be applied in driving engineering solution to the problem.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Tutorial	: 1	Duration	:	3 Hours
Credit	: 4	Unit Test	:	20 Marks
Pre-requisite	: sub code 7202	T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III **DETAILS OF CURRICULUM:**

SECTION I
[S.C: 7302]

INTEGRAL CALCULUS:

Chapter 1 Integration — Marks : 20, Hours : 12

1.1 Definition of integration as anti derivative notation for integration.
1.2 Integration of standard functions (without proof).
1.3 Law of integration (sum and difference).
1.4 Methods of integration (simple example).
  1.4.1 Substitution method, integration by partial fraction.
1.5 Integration by parts.
1.6 Reduction Formulae.

Chapter 2 Definite Integral — Marks : 10, Hours : 06

2.1 Definite Integral (Definition).
2.2 Properties of Definite integral (without proof).
2.3 Problems based on properties of definite integrals.

Chapter 3 Matrices — Marks : 10, Hours : 06

3.1 Definition and types.
3.2 Sum, difference and multiplication of Matrices.
3.3 Inverse matrix (Adjoint, Row, Column Operation)
3.4 Solution of linear equations.

SECTION II
[S.C: 7302]

DIFFERENTIAL EQUATIONS:

Chapter 4 Differential Equations — Marks : 20, Hours : 12

4.1 Definition of differential equation.
- 4.1.1 Order and degree of differential equation.
- 4.1.2 Formation of differential equation.

4.2 Solution of differential equation of first order first degree.
- 4.2.1 Variable separable, homogeneous differential equation, linear and reducible to linear form and exact differential equation.

4.3 Application of differential equation to engineering problems.

Chapter 5 Application of Definite Integrals — Marks : 20, Hours : 12

5.1 Area under the curve & area between two curves.
5.2 Volume of solid formed by revolution.
5.3 Length of an Arc.
5.4 Surface Area.

III TERM WORK:

Sr. No.	Name of Topics	No. of Tutorials each of 1 hour
1)	Integration	3
2)	Definite Integration	1
3)	Matrices	1
4)	Differential equations	2
5)	Application of differential equations	1
6)	Application of Integration	2
	Total	10

IV REFERENCE BOOKS:

1. Mathematics for Polytech. Students :*S. P. Deshpande*.
2. Mathematics for Polytech. Students :*Patel & Rawal.*
3. Mathematics for Polytech. Students :*T. T. T. I, Bhopal.*
4. Calculus by Shaum's Publication.

APPLIED MECHANICS
(Subject Code: 7303)

I **OBJECTIVES:**

1. To enable the students to understand different types of system of forces and their effects on bodies which are in motion or at rest?
2. To improve the analytical approach in the students.
3. To help the students to apply the knowledge of forces and their effects in stress analysis and in engineering design.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: 2	Duration	:	3 Hours
Credit	: 5	Unit Test	:	20 Marks
Pre-requisite	NIL	T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III **DETAILS OF CURRICULUM:**

SECTION I
[S.C: 7303]

Chapter 1 Introduction to Mechanics — Marks : 04, Hours : 03

1.1 Fundamental concepts – Matter, body, particle, rigid body, body in motion, body at rest. System of units – fundamental & derived, MKS, CGS, SI units – Scalar & Vector quantities – Branches of mechanics – statics, dynamics, kinetics, kinematics.
1.2 Concept of force, definition, unit, characteristics, idealisation of mechanics through free body diagram. Graphical representation, Principle of transmissibility of force, Principle of physical Independence of force,
1.3 Systems of forces, coplanar & non-coplanar concurrent & non-concurrent, parallel & non-parallel force systems.

Chapter 2 Composition & resolution of forces — Marks : 06, Hours : 03

2.1 Resultant, definition.
2.2 Parallelogram law of forces for resultant, Triangle law of forces for resultant
2.3 Resolution of forces into two components, methods, Principle of resolution of forces, Simple problems

Chapter 3 Moment and couple of forces — Marks : 04, Hours : 02

3.1 Moment of a force, units, types, geometrical representation, Varignon's Principle of moment, simple problems.
3.2 Couple – concept, units, types, Characteristics of couple, Resultant couple.

Chapter 4 Parallel forces — Marks : 04, Hours : 02

4.1 Parallel forces like & unlike parallel forces resultant of parallel forces (analytical method), simple problems.

Chapter 5 Coplanar forces — Marks : 10, Hours : 06

5.1 Polygon law of forces for resultant
5.2 Resultant of concurrent forces, Resultant of non-concurrent forces (analytical method), simple problems.

Chapter 6 Equilibrium of Coplanar Forces — Marks : 12, Hours : 08

6.1 Concept, definition, relation between resultant & equilibrant.
6.2 Principles of equilibrium, Two force, Three force & four force principles, Triangle law of forces, Polygon law of forces, Lami's theorem, Law of moment.
6.3 Equilibrium of concurrent forces, Equilibrium of parallel forces
6.4 Conditions of equilibrium – Concurrent forces, Parallel forces, Non-concurrent forces
6.5 Types of supports, types of loads – Concentrated & uniformally distributed loads, reactions on simply supported beams with vertical supports only. (simple problems)

SECTION II
[S.C: 7303]

Chapter 7 Friction — Marks : 10, Hours : 06

7.1 Introduction – Types of frictions, laws of static friction, laws of dynamic friction, coefficient of friction, angle of friction, angle of repose, cone of friction.
7.2 Friction on inclined plane
7.3 Ladder friction (Simple problems)

Chapter 8 Rectilinear motion — Marks : 06, Hours : 04

8.1 Motion under uniform acceleration, equations of motion, Velocity – time graph Simple problems
8.2 Motion under gravity, equations of motion.
Simple problems

Chapter 9 Angular motion — Marks : 04, Hours : 03

9.1 Introduction – Circular motion under constant acceleration, relation between linear and circular motion, tangential velocity and tangential acceleration in circular motion

Chapter 10 Newton's laws motion — Marks : 10, Hours : 06

11.1 Newton's laws of motion
11.2 D' Alembert's Principle, simple applications like motion of lift, motion of body on inclined plane (simple problems)

Chapter 11 Work, Energy & Power — Marks : 10; Hours : 05

12.1 Introduction, work done by uniform force, work done by variable force, graphical representation of work.
12.2 Energy – Units, Potential energy & Kinetic energy, Law of conservation of energy, Work-energy principle
12.3 Power – power equations, units, hp and watts (simple problems)

IV TERM WORK (Internal):

a) List of Experiments: (Any Five)

1. Verification of Parallelogram of Forces
2. Verification of law of Polygon of Forces
3. Verification of Lami's Theorem
4. Verification of law of moments
5. The forces in the Jib Crane
6. Support reactions in beams
7. Friction on inclined plane

b) Assignments based on the syllabus (minimum five)

Term work includes the submission of journal based on the above mentioned practical and assignments.

V REFERENCE BOOKS:

1. A Text Book of Applied Mechanics: *Ramamrutham.*
2. Engineering Mechanics : *P.S. Sawhney.*
3. Applied Mechanics : *M.V. Panchanadikar*
4. Applied Mechanics : *B.G. Bhandarkar*
5. Applied Mechanics : *Sunil S. Deo.*
6. Applied Mechanics : *V. M. Bagul.*
7. Engineering Mechanics *: R. S. Khurmi*
8. Engineering Mechanics : *A. R. Basu*

COMPUTER AIDED DRAFTING

(Subject Code: 7304)

I **OBJECTIVES:**

To make ware, the students about the use of computer in drafting and to improve the productivity. With this student will be able to work with AutoCAD in research and development department.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 1 Hour	Practical Exam	:	80 Marks
Practical	: 3 Hours	Duration	:	3 Hours
Credit	: 4	Unit Test	:	20 Marks
Pre-requisite	: sub code 7204	T / W (External)	:	50 Marks
		Total	***:***	***150 Marks***

III **DETAILS OF CURRICULUM:**

Chapter 1

Hours : 06

1.1 Introduction about AutoCAD
1.2 Recommended Hardware
1.3 Different types of Menu systems used in AutoCAD : Pull Down, Button, Screen, Icon, etc.
1.4 Function Keys for AutoCAD
1.5 Co-ordinate Systems: Absolute, Polar, Incremental
1.6 File Menu
1.7 Quick Setup, Advanced Setup
1.8 Draw Menu: line, circle, arc, Ellipse commands
1.9 Modify Menu: Erase, oops
2.0 Drawing setting: Osnap, Grid, Snap
2.1 Basic exercises to include the above mentioned commands

Chapter 2

Hours : 06

2.1 Draw Menu : Polygon, Donut, point
2.2 Modify Menu : Move, copy, array, break, mirror, offset, scale, rotate, trim, extend, stretch
2.3 Exercises to include the above mentioned commands

Chapter 3

Hours : 06

3.1 Draw Menu : Text, Mtext
3.2 View Menu : Zoom, pan
3.3 Modify Menu : Properties, Match Properties, Layer and Layer Management
3.4 Exercises to include the above mentioned commands

Chapter 4

Hours : 08

4.1 Draw Menu: Hatch, Bhatch, Pline, Multiline
4.2 Modify Menu: Pedit, Fillet, Chamfer, Lengthen, Multilate Editing
4.3 Editing with grips, List, Dist, Area, Dimension Menu
4.4 Exercises to include the above mentioned commands

Chapter 5

Hours : 04

5.1 Plotting the drawings
5.2 Selection of printer / plotter, paper size, plot layout, plat area, plot scale, plot offset, plot preview

Chapter 6

Hours : 08

6.1 Drafting of a given details from the Term work List

Chapter 7

Hours : 08

7.1 Drafting of a given assembly from the Term work list

IV TERM WORK (EXTERNAL):

Any two sheets each of assembly and details from the following:

1. Assembly and details of Pipe vice
2. Assembly and details of Oldham's Coupling
3. Assembly and details of Screw Jack
4. Assembly and details of Cotter Joint
5. Assembly and details of Universal Coupling
6. Assembly and details of Lathe Tail Stock
7. Assembly and details of Clapper Block of Shaper
8. Assembly and details of Non Return Valve
9. Assembly and details of Tool Holder of Lathe
10. Assembly and details of Square Tool Post of Centre Lathe

V REFERENCE BOOKS:

1. AutoCAD Manual
2. Machine Drawing : *P.J. Shah*
3. Machine Drawing : *N.D. Bhatt*
4. Machine Drawing : *N.H. Dubey*

MACHINE TOOLS III
(Subject Code: 7305)

I **OBJECTIVES:**

This is a core subject. The objective of the subject is to teach the students about the various machining tool in manufacturing industry where chip forming processes are applied. This will help the students to understand the working principles and constructions of the machine tools and various process capabilities of the machine tools for manufacturing. This is also a prerequisite to workshop practice for doing hand on practice on machine tools.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: NIL	Duration	:	3 Hours
Credit	: 3	Unit Test	:	20 Marks
Pre-requisite NIL		T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III **DETAILS OF CURRICULUM:**

SECTION I
[S.C: 7305]

Chapter 1 Milling Machines — Marks : 32, Hours : 18

1.1 Introduction.
1.2 Classification & Types.
1.3 Size & Specifications.
1.4 Accessories & Attachments.
1.5 Milling cutters, their applications and specifications..
1.6 Set up & operations (Use of Clamps and Holding devices).
1.7 Indexing (Simple, Compound, Differential, Angular).
1.8 Cutting speed & feed machining time.

Chapter 2 Jig Boring — Marks : 08, Hours : 06

2.1 Introduction.
2.2 Accessories & Attachments.
2.3 Co-ordinate dimensioning of component drawing.
2.4 Jig grinding (Introduction).

SECTION II
[S.C: 7305]

Chapter 3 Gear Manufacturing — Marks : 16, Hours : 11

3.1 Gear tooth element.
3.2 Material for gear, types of gears.
3.3 Different methods of gear manufacturing.
(Gear milling, gear shaping, gear hobbing, gear grinding).
3.4 Gear milling (set up, type of cutters).
3.5 Gear shaping (Working principle of machine tool, gear cutter, speed & feed)
3.6 Gear hobbing (Working principle of machine tool, gear hob, speed, & feed)
3.7 Gear finishing (Gear shaping, grinding, burnishing, lapping).

Chapter 4 Micro finishing — Marks : 08, Hours : 05

4.1 Introduction.
4.2 Introduction to Honing Machine.
4.3 Introduction to Laping Machine.
4.4 Super finishing process (Burnishing, Polishing, Buffing).

Chapter 5 Unconventional Machining Process — Marks : 16, Hours : 08

5.1 Introduction.
5.2 Classification as per energy used.
5.3 Electrical discharge machine (EDM), (Machine element, working principle, Dielectric, Electrode, application)
5.4 Electro Chemical grinding. (ECG) (Only Introduction)
5.5 Electro chemical milling (ECM) (Only Introduction)
5.6 Laser beam machining (LBM), (Principle, Process application)

IV TERM WORK: Marks : 25

Term work (Internal) shall comprise of assignment (minimum five) based on above mentioned topics.

IV REFERENCE BOOKS:

1. Workshop Technology: *Hajra Chaudhary, Vol. 1 & 2*
2. Workshop Technology: *Chapman, Vol. I, II, III & IV*
3. Production Technology: *Jain & Gupta*
4. Production Engineering: *P. C. Shah*
5. Production Technology: *HMT*
6. Manufacturing Process: *Young*
7. Manufacturing Process: *Cambell*
8. Mechanical Technology: *Charnov*

WORKSHOP PRACTICE-III
(Subject Code: 7306)

I OBJECTIVES:

1. To equip the student with the knowledge of Machine Tools, Tooling and various Machining Operations.
2. To train the students to acquire skill on machining operation, like Straight Turning, Step Turning, Taper Turning, Grooving, Drilling, Grinding, etc.
3. To develop the skill to prepare Job Report File.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Machine Shop	: 6Hours	Practical	:	100 Marks
Credit	: 6	Duration	:	6 Hours
		T / W (Internal)	:	50 Marks
Pre-requisite NIL		T / W (External)	:	50 Marks
		Total	***:***	***200 Marks***

III DETAILS OF CURRICULUM:

To execute the following job:-
1. One job on plain turning and facing
2. One job involving plain turning, step turning, grooving and chamfering in between centers.
3. One job involving plain turning, step turning, taper turning, grooving and chamfering.
4. One job involving internal boring, reaming, chamfering.

IV TERM WORK

The term work submission shall include

1. Four exercise in lathe and Job Report File.

PROFESSIONAL PRACTICE - III
(Subject Code: 7307)

I OBJECTIVES:

1. To develop the skills to search for information from different sources.
2. To develop the skills and abilities to gather data and process them.
3. To develop the skills to prepare technical reports.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: NIL	Sem. Exam	:	No Exam
Practical	: 2 Hours	Duration	:	NIL
Credit	: 2	Unit Test	:	NIL
		T / W (Internal)	:	50 Marks
		Total	***:***	***50 Marks***

III DETAILS OF CURRICULUM :

Chapter 1 Importance of Subject Hours : 1.5

1.1 Introduction to subject
1.2 Importance in the present context
1.3 Application

Chapter 2 Information Search Hours : 03

2.1 Information Sources
2.2 Print and non-print, documentary
2.3 Library, exhibition, Government Departments
2.4 Internet Information search
2.5 Process of searching, collection of data
2.6 Preparation of questionnaire
2.7 Taking interview, observation

Chapter 3 Written Communication Hours : 1.5

3.1 Method of note taking
3.2 Report writing – concept, types, formats

ACTIVITIES

Chapter 4 Library Search Hours : 4.5

4.1 Visit your Institute's library and enlist the books available on the topics given by your teacher. Prepare a bibliography consisting of name of the author, title of the book, publication and place of publication.
4.2 Enlist the magazines, periodicals and journals available in your library for above topics
4.3 Present the topic selected

Chapter 5 Seminar / Guest Lecture (minimum two) Hours : 4.5

5.1 Attend a seminar or a guest lecture. Listen carefully and note down the important points and prepare a report of the same.

Chapter 6 Industrial Visit Hours : 4.5

6.1 Visit any one of the following arranged by your faculty and prepare a report of the same as a part of the term work.
- 6.1.1 Nearby pertrol pump
- 6.1.2 Automobile Service Station
- 6.1.3 Engineering workshop / small scale industrial establishment
- 6.1.4 Any other establishment approved by your faculty

Chapter 7 Information Gathering Hours : 03

7.1 The students in a group of 3 to 4 will perform anyone of the following activities (others similar activities may be considered)
- 7.1.1 Collect and study IS code for Engineering Drawing / Metrology, etc.
- 7.1.2 Collecting information from market : nomenclatures and specifications of engineering materials / engineering components / tools / engineering products etc.
- 7.1.3 Collect information from data books and handbooks of Design, Tool Design, Industrial Engineering, Materials, etc.

Chapter 8 Social Service Hours : 08

8.1 The student in a group or individually shall involve in some social service activities, prepare a report and submit. The area of activity may be:
- 8.1.1 Community Polytechnic
- 8.1.2 Environment
- 8.1.3 Service to any unit in the complex
- 8.1.4 Health
- 8.1.5 Education
- 8.1.6 Any other social service approved by the faculty.

IV TERM WORK: (Internal) Marks : 50

Term work includes the above mentioned activities and submission of Journal based on that.

V REFERENCE BOOKS:

1. Presentation Skills by *Michael Halton*, Publisher : *ISTE, New Delhi*
2. Working in Teams by *Harding Ham A.*, Publisher : *Orient Longman*
3. Design Data Book, *P.S.G. College of Technology*
4. Technical Report Writing Today : *Riordan, Daniel*

ENGINEERING MATERIALS
(Subject Code: 7400)

I OBJECTIVES:

The objectives of the subject Engineering Materials are to:

1. Provide basic knowledge of properties and applications of important metals, alloys and non metallic materials.
2. Provide knowledge of heat treatments given to steels.
3. Introduce students to Alloy Steels, Tool Steels and Cast Irons.
4. Introduce students to Powder Metallurgy & Non Destructive Tests.
5. Provide foundation for learning other related production engineering subjects.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Credit	: 3	Duration	:	3 Hours
		Unit Test	:	20 Marks
Pre-requisite NIL		T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III DETAILS OF CURRICULUM:

SECTION I
[S.C: 7400]

Chapter 1 Introduction to Engineering Materials — Marks : 08, Hours : 04

1.1 Engineering Materials and their classification
1.2 Properties of Metals: Strength, Elasticity, Ductility, Malleability, Plasticity, Toughness, Hardness, Brittleness, Wear Resistance, Mach inability, Fatigue, Creep and Corrosion Resistance
1.3 Selection criteria for materials.

Chapter 2 Plain Carbon Steels — Marks : 10, Hours : 06

2.1 Characteristics and applications of ferrous metals
2.2 Phase equilibrium diagram for Iron and Iron Carbide
2.3 Classification, composition and applications of low carbon steels, medium carbon steels and high carbon steels
2.4 Effects of C, S & P on steels

Chapter 3 Cast Irons — Marks : 06, Hours : 06

3.1 Properties of Cast Irons
3.2 Classification and applications of Cast Irons: Grey, White, Malleable, Chilled Cast Irons
3.3 Alloy Cast Irons and Meehanite Cast Irons

Chapter 4 Heat Treatment of Steels — Marks : 16; Hours : 08

4.1 Introduction to heat treatment processes such as Annealing, Subcritical annealing, Normalising, Hardening, Termpering – Principle, Advantages, Limitations and Applications
4.2 Hardenability and its measurement by Jominy End Quench
4.3 Surface Hardening : Methods of Surface Hardening (i) Case Carburising (ii)Nitriding (iii) Cyaniding (iv) Flame Hardening (v) Induction Hardening – Principle, advantages, limitations and applications
4.4 Martempering and Austempering : Principle, advantages and applications

SECTION II
[S.C: 7400]

Chapter 5 Non Ferrous Metals and Alloys — Marks : 10; Periods : 06

5.1 Properties and Applications of Cu, Al, Sn, Zn, Pb, Cr, Ni, Co
5.2 Properties, applications and chemical composition of:
- 5.2.1 Copper alloys – Muntz metal, Cartridge brass, Admiralty brass, Naval brass, Gun metal and Tin bronze
- 5.2.2 Aluminium alloys : y alloy and Duralumin

5.3 Bearing Materials: Desired properties, Composition of Cu, Sn, Pb & Cd bearing materials

Chapter 6 Alloy Steels — Marks : 05; Hours : 03

6.1 Advantages of Alloy Steels
6.2 Effect of alloying elements Ni, Cr, Mo, Mn, W and V on properties of steels
6.3 Stainless Steels
6.4 HSLA : Special features and applications

Chapter 7 Tool Steels — Marks : 05; Hours : 03

7.1 Properties of Tool Steels
7.2 AISI classification of Tool Steels
7.3 Shock Resistant, hot work and cold work tool steels
7.4 High Speed Steels (HSS) and their heat treatment

Chapter 8 Non-Metallic Materials — Marks : 08; Hours : 04

8.1 Properties, common varieties and applications of Adhesives, abrasives and rubbers
8.2 Thermosetting and Thermosoftening plastics : properties and uses
8.3 Composites : properties, varieties and applications
8.4 Special Cutting Tool Materials : Diamond, Stelites & Tungsten Carbide

Chapter 9 Powder Metallurgy — Marks : 06, Hours : 04

9.1 Advantages, limitations and applications of Powder Metallurgy
9.2 Principles stages of powder metallurgy, brief outline of process of powder metallurgy – powder making, blending, compacting, sintering
9.3 Production of Tungsten Carbide tip tools and porous bearings

Chapter 10 Non Destructive Tests — Marks : 06, Hours : 04

10.1 Scope and Importance
10.2 Non Destructive Testing Methods : Dye Penetrant, Magnaflux, Radiography (X-ray and Gamma ray), Ultrasonic and Eddy Current tests

IV **Term Work:** — Marks : 25

The term work will be the assignments based on the above topics given periodically on completion of the chapters.

IV **REFERENCE BOOKS:**

1. Material Science and Processes : *S.K. Hazra Choudhari*
2. Material Science and Metallurgy : *Dr. V.D. Kodgire*
3. A Text Book of Material Science and Metallurgy : *O.P. Khanna*

COMPUTER PROGRAMMING
(Subject Code: 7401)

RATIONALE:

In advanced age of computer, it becomes essential to understand how to give instructions to computers. This course intends to expose a student to the basic principles of programming through a structured programming language like 'C'. Study of this course would enable the students to develop fundamental programming logic for various problems.

I OBJECTIVES:

Students should be able to :
1. Break a given task into subtasks.
2. Enhance logical thinking
3. Develop 'C' programs for simple applications

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 2 Hours	Practical Exam	:	50 Marks
Practical	: 2 Hours	Duration	:	3 Hours
Credit	: 3	Unit Test	:	20 Marks
Pre-requisite NIL		T / W (External)	:	50 Marks
		Total	***:***	***120 Marks***

III DETAILS OF CURRICULUM:

Chapter 1 Introduction

Hours : 04

1.1 Problem, Definition and Analysis, Algorithm, Flow Charts, Tracing of Algorithms.
1.2 Introduction to 'C' programming, simple programs and their execution.

Chapter 2 Fundamentals of 'C'

Hours : 03

2.1 Character set, constants, data types, identifiers, key words, variable declarations, Library functions.

Chapter 3 Use of Control Statements

Hours : 05

3.1 Types of Operators – unary, binary, arithmetic, relational, logical, assignment.
3.2 Hierarchy of operators, expressions, library functions, Use of input / output functions viz. Printf(), Scanf(), getch(), Putch().

Chapter 4 Use of Control Statements

Hours : 06

4.1 If-else, while loop, do while loop, for loop, switch, break and continue.
4.2 Writing, Compiling, Executing and debugging programs.

Chapter 5 Introduction to subscripted variables

Hours : 04

Introduction to subscripted variables, arrays, defining and declaring one and two dimensional arrays, reading and writing an array.

Chapter 6 Concept of String

Hours : 05

6.1 Concept of String, string input / output functions
6.2 Defining and accessing a user defined functions, Passing of arguments, declaration of function prototypes

Chapter 7 Structures & Pointers

Hours : 05

7.1 Fundamentals of Pointers, Pointers and Character strings, concept of Structure & Unions.
7.2 Files & file operations on data files.
7.3 Advanced C features

IV TERM WORK :

Write simple programme having engineering application involving following statements.

1. Use of if-else statements
2. Use of for statement
3. Use of Do-While statement
4. Use of While statement
5. Use of break and continue statement
6. Use of multiple branching switch statement
7. Use of different format specifying using Scanf() and Printf()
8. Use of one dimensional array
9. Use of two dimensional array of integers
10. Defining a function and calling it in the main
11. Creation of database using structure
12. Various operations on data file

Term work submission consists of flowcharts and computer printouts. Minimum Experiments to be completed are 10.

IV REFERENCE BOOKS:

1. Introduction to 'C': *Byron Gotfried* - *Tata McGraw Hill Publication*
2. Let us 'C': *Yashwant Kanitkar* – *BPB Publications*
3. Programming in 'C': *Balguruswamy* – *Tata McGraw Hill Publication*
4. *Manuals / documentation files which comes with compliers*

ENGINEERING MATHEMATICS-IV

(Subject Code: 7402)

I **OBJECTIVES:**

1. To bring in students awareness regarding conclusion and decisions that can be based on analysing post-data.
2. To equip the students with tools and techniques that can be used in analysing the data.
3. To improve visualising and analytical approach in the students.
4. To help the students to understand subjects of higher semester levels requiring statistical approach specially the subject "Statistical Quality Control".
5. To enable the students to grasp techniques of handling data involving figure work.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Tutorial	: 1	Duration	:	3 Hours
Credit	: 4	Unit Test	:	20 Marks
Pre-requisite	: sub code 7302	T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III **DETAILS OF CURRICULUM:**

SECTION I
[S.C: 7402]

Chapter 1 — Frequency Distr. Measures of Central, Tendency& Measures of Dispersion — Marks : 20, Hours : 10

1.1 Basic definition - statistical and raw data, grouped and ungrouped data, variate, discrete and continuous variate.
1.2 Frequency distribution.
- 1.2.1 Discrete frequency distribution.
  - 1.2.1.1 Class interval, class limits, class boundaries, class marks and width of class intervals.
  - 1.2.1.2 Continuous and discontinuous grouped frequency distribution and their conversion.

1.3 Graphical representation of frequency distribution.
- 1.3.1 Histograms.
- 1.3.2 Frequency polygon and frequency curves.
- 1.3.3 Cumulative frequency curve (ogive)

1.4 Mean
- 1.4.1 Mean of raw data and discrete data.
- 1.4.2 Mean of grouped data (step deviation method).

1.5 Median
- 1.5.1 Median of raw data and grouped data.

1.6 Mode
- 1.6.1 Mode of raw data and grouped data.

1.7 Advantage and disadvantages of mean, median and mode.
1.8 Graphical method for finding median and mode.

1.9 Measures of dispersion
- 1.9.1 Range
- 1.9.2 Mean deviation.
- 1.9.3 Standard deviation
- 1.9.4 Variance and coefficient of variance.
- 1.9.5 Comparison of two sets of observations.

Chapter 2 Probability & Probability Distribution — Marks : 20, Hours : 10

2.1 Basic definitions- trial and events, exhaustive and favourable events, mutually exclusive and independent events, equally like events

2.2 Definition of Probability
- 2.2.1 Addition theorem for Probability
- 2.2.2 Conditional probability and multiplication theorem
- 2.2.3 Binomial Probability

2.3 Probability distribution
- 2.3.1 Binomial distribution
  - 2.3.1.1 Mean and variance of binomial distribution
- 2.3.2 Poisson's distribution
  - 2.3.2.1 Mean and variance of Possion's distribution
- 2.3.3 Normal distribution
  - 2.3.3.1 Characteristics of the normal distribution and normal probability curve
  - 2.3.3.2 Area property (Normal probability integral)

SECTION II
[S.C: 7402]

Chapter 3 Skewness, Moments & Kurtosis — Marks : 10, Hours : 05

3.1 Skewness definition.
3.2 Difference between dispersion & skewness.
3.3 Absolute measures of skewness.
3.4 Karl pearson's coefficient of skewness.
3.5 Correction & Regression (Interpretation of -1, 0, 1)
3.6 Concept of scatter diagram
3.7 Significance of 'r' values

Chapter 4 Linear Inequalities — Marks : 10, Hours : 05

4.1 Solution of linear inequalities in one variable.
4.2 Solution of linear inequalities in two variables.

Chapter 5 Numerical Methods — Marks : 20, Hours : 10

5.1 Solution of algebraic equations, Bisection Method, Rugulafalsi Method & Newton Method
5.2 Solution of simultaneous equations containing 2 & 3 unknowns Gauss Elimination Method Iterative Methods – Gauss Seidal & Jacob's methods

III **TERM WORK:**

Sr. No.	*Name of topics*	**No. of tutorials each of 1 hour**
1)	Frequency Distribution Measure of central Tendency	2
2)	Probability and Probability Distribution	3
3)	Skewness, Moments & Kurtosis	1
4)	Linear Inequalities	1
5)	Numerical Methods	3
	Total	10 Hours

IV **REFERENCE BOOKS:**

1. Statisitcal Methods : *S. P. Gupta*
2. Statistics : *Shaum's Publication*
3. Higher Engineering Mathematics : *B.S. Grewal*
4. Numerical Methods for Engineering : *Chapra*
5. Numerical Methods :*M.K. Jain & Others*

STRENGTH OF MATERIALS

(Subject Code: 7403)

I OBJECTIVES

1. To enable the students to understand different types of stress and strain and their application.
2. To improve analytical approach in students.
3. To equip student with tool & techniques that can be used in design analysis of machine components.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Semester Exam	:	80 Marks
Practical	: 2 Hours	Duration	:	3 Hours
Credit	: 5	Unit Test	:	20 Marks
Pre-requisite	: sub code 7303	T / W (Internal)	:	25 Marks
(Sub code)		***Total***	***:***	***125 Marks***

III DETAILS OF CURRICULUM:

SECTION I
[S.C: 7403]

Chapter 1 Introduction — Marks : 06, Hours : 05

1.1 Types of load-tension, compression & shear. Types of stress & strain-tensile, compressive and shear. Elastic limit, Hook's law, Young's modulus. State of simple shear.

1.2 Tension test on mild steel, stress – curve, salient features of the curve, % elongation, % reduction in area, Ultimate stress, safe stress and factor of safety.

Chapter 2 Simples stresses in Homogeneous bodies — Marks : 06, Hours : 03

2.1 Stress & strain in bars of uniformly varying sections, uniformly tapering circular sections under axial loading, Principle of superposition.

Chapter 3 Simples stresses in composite bodies — Marks : 04, Hours : 02

3.1 Composite bodies, stress & strain in composite bars under axial loading

Chapter 4 Thermal stresses in simple bar — Marks : 04, Hours : 02

4.1 Introduction – thermal stresses in bar of uniform body, uniformly varying body and uniformly tapering body (circular section). (simple problems)

Chapter 5 Elastic constants — Marks : 06, Hours : 04

5.1 Linear strain and lateral strain – Young's modulus, Modulus of rigidity, Bulk modulus, Poisson's Ratio, Relationship between elastic constants.
5.2 Change in dimensions and change in volume of a uniform body subjected to single axial loading.

Chapter 6 Thin cylindrical & spherical shells — Marks : 06, Hours : 04

6.1 Introduction – failure of thin cylindrical shell due to internal pressure, stresses in thin cylindrical shells (longitudinal and circumferential), change in dimensions of thin cylindrical shell subjected to internal pressure.
6.2 Thin spherical shells subjected to internal pressure, stresses induced, change in dimensions of a thin spherical shell.

Chapter 7 Centre of Gravity — Marks : 08, Hours : 04

7.1 Introduction to Centre of gravity & Centroid
7.2 Centroid of standard planes, cut out sections & composite sections

SECTION II
[S.C: 7403]

Chapter 8 Moment of Inertia — Marks : 10, Hours : 06

8.1 Concept, M.I. of planes, radius of gyration, M.I. of standard planes like rectangle, square, triangle, circle, semicircle & quarter circle about their centroidal axis.
8.2 Parallel axis theorem & perpendicular axis theorem, M.I. of composite sections hollow sections about their centroidal axis. Simple problems.

Chapter 9 Shear Force & Bending Moment — Marks : 10, Hours : 06

9.1 Types of beams & types of supports.
9.2 Concept & definition of shear force & bending moment, sign convention.
9.3 S.F. & B.M. diagrams for cantilever & simply supported beams (only) subjected to point load & uniformly distributed load (only) by analytical method.

Chapter 10 Bending Stress in Beams — Marks : 08, Hours : 04

10.1 Concept, Theory of simple bending, assumption in theory of bending
10.2 Neutral plane & Neutral axis, Moment of resistance, Bending equation, (Fixtual Formulae)
10.3 Section modulus, Strength of a beam (fluxtural strength), bending stress distribution diagram
10.4 Simple problems.

Chapter 11 Direct And Bending Stress — Marks : 06, Hours : 04

11.1 Introduction. Eccentric loading
11.2 Stress in eccentrically loaded members about one axis
11.3 Limit of eccentricity – core of section

Chapter 12 Torsion — Marks : 06, Hours : 04

12.1 Concept, Theory of pure torsion, Assumptions in theory of pure torsion, torsional stress
12.2 Torsion equation – polar M.I., polar modulus, torsional rigidity, Strength of a shaft, power transmitted, replacing a shaft, Shear stress distribution across circular solid and hollow sections.

IV TERM WORK:

a) List of Experiments (any five)

1. Tension test.
2. Compression test.
3. Transverse test on beam.
4. Shear test.
5. Brinell hardness test.
6. Rockwell hardness test.
7. Impact test.

b) Assignments based on the syllabus

Term work (Internal) includes submission of journal based on the above - mentioned practical and assignments.

V REFERENCE BOOKS :

1. Strength of materials : *R.S. Khurmi*
2. Strength of materials : *S. Ramamrutham*
3. Strength of materials : *B. R. Karnure*
4. Strength of materials : *R. C. Patel*
5. Theory of structures : *R. S. Biyani*

THEORY OF MACHINES

(Subject Code: 7404)

I OBJECTIVES:

1. To understand the making of a machine and its different parts (elements).
2. To realize kinematics relation of machine parts.
3. Orientation towards kinematics and functions of mechanisms and their variations (inversions).
4. To understand the working of simple mechanisms as sub-assembly / assembly of machine.
5. Understanding of causes and remedies for unbalancing and vibrations of machine parts.
6. Study of various mechanical drives for their merits / demerits and selection.
7. To understand the role of friction in machine parts.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Semester Exam	:	80 Marks
Practical	: 2 Hours	Duration	:	3 Hours
Credit	: 5	Unit Test	:	20 Marks
Pre-requisite	: sub code 7303	T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III DETAILS OF CURRICULUM:

SECTION I
[S.C: 7404]

Chapter 1 Kinematics — Marks : 09, Hours : 06

1.1 Introduction to theory of machines, kinematics, kinetics, Dynamics and statics.
1.2 Links / elements, kinematic pairs and their classifications.
1.3 Kinematic chains and classifications as mechanisms and inversions
1.4 Four bar chair, single slider chain and double slider chain with their inversions.

Chapter 2 Velocity and Acceleration in Mechanisms — Marks : 10, Hours : 06

2.1 Types of motions – angular and linear relative and absolute
2.2 Velocity – angular and linear for various elements and relation between them.
2.3 Velocity of a link using linear velocity vector diagram for simple mechanisms (upto four elements only).
2.4 Acceleration of a link using linear acceleration vector diagrams for simple mechanisms (without Corroli's component).

Chapter 3 Cam Drives — Marks : 10, Hours : 06

3.1 Introduction
3.2 Classifications of cam and followers.
3.3 Terminology used for cam profiles.
3.4 Type of follower, motions – uniform velocity, SHM, uniform (equal / unequal) acceleration and retardation.
3.5 Problem on cam profile design.

Chapter 4 Fly Wheels — Marks : 07, Hours (1 Hour) :

4.1 Working and function of flywheel.
4.2 Governors –working and function, classification & construction and working of dead weight and spring control governors (one for each)

Chapter 5 Vibrations — Marks : 04, Hours (1 Hour) :

5.1 Introduction to vibration and terminology.
5.2 Types of vibrations.
5.3 Causes of vibration in machines, their effects and remedies (no mathematical treatment).

SECTION II
[S.C: 7404]

Chapter 6 Belt Drive and Chain Drive — Marks : 12, Hours : 07

6.1 Working principle of belt drive and chain drive – area of application.
6.2 Types of belt drives – types of chains.
6.3 Calculations of belt length, velocity ratio with / without slip, considering / neglecting belt thickness
6.4 Calculations of working tension ratio, centrifugal tension, maximum power conditions, power transmitted, initial tensions etc. (for flat and grooved pulleys)
6.5 Concept of creep, crowning of pulleys and types of pulleys.

Chapter 7 Gears and Gear Trains (Drives) — Marks : 11, Hours : 07

7.1 Introduction
7.2 Gear Terminology(spur gear)
7.3 Types of gears and their applications, gear Trains & Types
7.4 Design of simple spur gear train for given module, velocity ratio and approximate C.T.C. for shaft axis.
7.5 Tabular methods for calculating speed of gears / arm for an epicyclic gear train.

Chapter 8	Friction in bearings	Marks	:	11
		Hours	:	07

8.1 Uniform wear and uniform pressure assumptions.
8.2 Friction in bearings.
8.3 Power loss due to friction in various types of bearings.
8.4 Antifriction bearings

Chapter 9	Balancing of Machine Parts	Marks	:	06
		Hours	:	03

9.1 Concept of unbalanced forces.
9.2 Balancing of rotating masses in same plane.
9.3 Effects of unbalancing and remedy by balancing.

Note: Mathematical derivations of formulae not included but application for problem solving by analyzing parameters in formulae.

IV TERM WORK:

List of Practicals:

1. Types of mechanisms and inversions.
2. Velocity and acceleration vector diagrams (Four problems).
3. Profile drawing of cams (4 problems).
4. Types of belt drives and types of chains (No mathematical treatment).
5. Types of gears and gear terminology.
6. Types of gear trains.
7. Problems on Balancing by graphical and analytical method

CNC MACHINE TOOLS

(Subject Code: 7405)

I OBJECTIVES:

This core subject is introduced after teaching the conventional machine tools. This explains the advantages of CNC technology in machine tools compared to the conventional one. It deals with the study of CNC machine tools, general components and their functions. It deals with the programming techniques related with the lathe and milling machines. It also deals with the servicing and maintenance of machine tool.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Semester Exam	:	80 Marks
Practical	: NIL	Duration	:	3 Hours
Credit	: 3	Unit Test	:	20 Marks
Pre-requisite	NIL	T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III DETAILS OF CURRICULUM:

SECTION I
[S.C: 7405]

Chapter 1 Introduction of CNC — Marks : 10, Hours : 06

1.1 Introduction to NC
1.2 Difference between conventional and CNC machine
1.3 Motion Control System
1.4 Principal of operation of servo system
1.5 Open loop and closed loop
1.6 Basic features of CNC system
1.7 Functions, Types
1.8 Advantages and Disadvantages of CNC
1.9 Application of CNC

Chapter 2 General components of CNC machine — Marks : 16, Hours : 12

2.1 Introduction
2.2 Power Units
2.3 Slideways and bearings
2.4 Recalculating ball screw and Nut
2.5 Tool Holder and Automatic Tool Changer and Tool Magazine
2.6 Work Holding Devices
2.7 CNC Tooling

Chapter 3 Fundamental of CNC Programming — Marks : 14, Hours : 06

3.1 NC co-ordinate System
3.2 Absolute and Incremental
3.3 Interpolation
3.4 Fixed and floating Zero
3.5 Tool Compensations
3.6 Pre and Post Processor
3.7 Canned Cycle
3.8 Preparatory and Miscellaneous codes
3.9 Speed and Feed and Tool Functions
3.10 Structure of CNC Part Program

SECTION II
[S.C: 7405]

Chapter 4 CNC Part Programming — Marks : 20, Hours : 14

4.1 Part Programming for CNC lathe : Step, Taper turning, Grooving, Drilling (simple exercises without tool change)
4.2 Part programming for CNC Milling : Face Milling, Slot Milling, Drilling, Tapping (simple exercises without tool change)

Chapter 5 Setting up of CNC Machine Tools — Marks : 12, Hours : 06

5.1 Setting up procedure floating zero
5.2 Setting Milling and Drilling machine
5.3 Setting milling and drilling tool to the Z datum
5.4 Tool Length Compensation
5.5 Setting X and Y Datum on milling and drilling machines
5.6 Cutter Diameter Compensation
5.7 Setting turning centre or lathe
5.8 Setting of lathe tool
5.9 Tool Offset
5.10 Tool Nose Compensation

Chapter 6 Service and Maintenance of CNC Machine Tool — Marks : 08, Hours : 04

6.1 Need for maintenance
6.2 Level of maintenance operation
6.3 Fundamentals of CNC maintenance
6.4 Training – Maintenance and Repair
6.5 Preventive maintenance program and maintenance contract

IV TERM WORK:

Assignments based on the following topics:

1. Assignment on general components of CNC machine.
2. Assignment on fundamental of CNC programming.
3. Assignment on CNC part programming. (At least two programs of turning and milling operation each)
4. Assignment on setting up of CNC machine tools.

   Assignment on service and maintenance of CNC machine tool.

V REFERENCE BOOKS:

1. Computer Numerical Control of machine tool: *G.E. Thyer*
2. CAD/CAM (Principles and applications): *P.N. Rao*
3. CAD/CAM : *Groover and Zimmers*
4. CNC Machines : *B.S. Pabla*

WORKSHOP PRACTICE IV
(Subject Code: 7406)

I OBJECTIVES:

1. To equip the student with the knowledge of machine tools like shaper, slotter, drilling machine, etc., their tooling and various machining operations.
2. To train the students to acquire skill on making assembly jobs involving lathe, shaper, milling machine, slotter, etc.
3. To develop the skill to prepare Job Report File.
4. To enhance the knowledge of CNC machines, its tooling, various operations and part programming skill
5. To execute part programme on CNC machine

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Machine Shop & CNC Lab	: 6 Hours	Practical	:	100 Marks
Credit	: 6	Duration	:	6 Hours
		Term Work Internal:		
Pre-requisite	: sub code7306	Machine Shop	:	40 Marks
		CNC Lab	:	10 Marks
		Term Work External:		
		Workshop	:	40 Marks
		CNC Lab	:	10 Marks
		Total	***:***	***200 Marks***

III DETAILS OF CURRICULUM:

1. Execute the following jobs:
   a. One assembly job (minimum 3 parts) involving plain turning, step turning, grooving, milling, external and internal threading, chamfering, etc. in between centers.
   b. One job involving shaping, slotting, drilling, grinding, etc.
2. To study about the CNC machine, its parts, operations, tooling and prepare a report.
3. To write part programs for CNC machines (3 in lathe and 2 in milling)
4. To execute part programme on CNC machine

IV TERM WORK

The term work submission shall include the following:-

1. Job Report File.
2. One assembly job involving turning, grooving, milling, external and internal threading and exercise on shaping, slotting, grinding and drilling.
3. CNC part programming exercises on CNC machine
4. One part program execution on CNC machine

PROFESSIONAL PRACTICES - IV

(Subject Code: 7407)

I OBJECTIVES:

Students will be able to:
1. Acquire information from different sources
2. Prepare notes for given topic
3. Interact with peers to share thoughts
4. Prepare a report on industrial visit, expert lecture

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 0 Hours	Sem. Exam	:	No Exam
Practical	: 2 Hours	Duration	:	NIL
Credit	: 2	Unit Test	:	NIL
		T / W (Internal)	:	50 Marks
Pre-requisite	NIL	***Total***	***:***	***50 Marks***

III DETAILS OF CURRICULUM:

ACTIVITIES:

Activity 1 Audio Visuals (Technical) Hours : 10

1.1 Audio Visuals to be organised and presented by teacher. Students are required to critically view them and answer specific questions given by teacher.

1.2 Industrial visit may be arranged in the following areas / Industries and prepare and submit a report of the same
- Foundry Techniques
- Computer Integrated Manufacturing
- Modern Toolings
- F.M.S.
- CAD

Activity 2 Lectures by Professional / Industrial Expert be organised from any of areas of the current interest (Minimum two) Hours : 10

2.1 Use of plastics in automobiles
2.2 Nonferrous Metals and alloys for engineering applications
2.3 Surface Treatment Processes like electroplating, powder coating, etc.
2.4 Industry & Environment
2.5 Computer aided drafting
2.6 Industrial hygiene
2.7 Composite Materials
2.8 Heat treatment processes
2.9 TPM
2.10 MIS
2.11 Any other topic

Activity 3 Individual Assignments Hours : 12
Any three from the list suggested:

3.1 Process sequence of any two machine components
3.2 Write material specifications for any two composite jobs
3.3 Collection of samples of different plastic material or cutting tools with properties, specifications and applications.
3.4 Preparing models using development of surfaces
3.5 Select different materials with specifications for at least 10 different machine components and list the important material properties desirable.
3.6 Select 5 different carbon steels and alloy steels used in engineering
3.7 Cutting tool materials and their properties
3.8 Make models of mechanisms and applications
3.9 Any other topic approved by the teacher

Activity 4 Social Service Hours : 08

4.1 The student in a group or individually shall involve in some social service activities, prepare a report and submit. The area of activity may be:
- 4.1.1 Community Polytechnic
- 4.1.2 Environment
- 4.1.3 Service to any unit in the complex
- 4.1.4 Health
- 4.1.5 Education
- 4.1.6 Any other social service approved by the faculty.

IV TERM WORK: (Internal) Marks : 50

Term work includes the above mentioned activities and submission of Journal based on that.

V REFERENCES :

1. Mechanisms in Modern Engineering Design, Artobolowsky
2. Plastics – Materials Handbook : A.S. Athalye
3. MIS
4. Materials Handbook
5. TQM : Bester Field, Dale

INPLANT TRAINING PHASE - I
(Subject Code: 7500)

I OBJECTIVES:

The sole purpose of Phase – I training placed almost at the stage of completing half the curriculum of the program is:-

1. The students should be able to understand, the various processes that are going on and collaborate the same with the theoretical knowledge that they have acquired so far at the institute.

2. The students should be able to dilute their anxieties and apprehension that they have imagined during learning theoretical aspect of the subject at the institute by direct observations of the processes that are going in the industries.

3. The students should be able to conceive in totality the meaning of "Factory" and should be able to understand the motivation that is existing and operating behind the execution of 'WORK' right from introduction of raw materials to completion of finished product.

4. The students must get a clear idea of the Production Centres that are responsible for completion of a product and the presence of need of various service centres like stores, maintenance functions, welfare function, factory services, quality function, planning function and others, that supplement the execution.

5. The student must at least be able to get the feel and need of interpersonal qualities required in a factory to understand conflicting forces that are operating in a complex industrial climate.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: NIL	Sem. Exam	:	NIL
Practical	: 22 to 24 weeks	Duration	:	NIL
	Industrial Training	Unit Test	:	NIL
Credit	: 40	T / W (Internal)	:	50 Marks
Pre-requisite NIL		T / W (External)	:	50 Marks
		Total	***:***	***100 Marks***

III PLACEMENT AND GUIDELINES:

At least two months prior to physical placement of students in industry they undergo assessment of their personality, knowledge and caliber by the concerned industries either as a campus interviews or by appointments at the industry premises and thereafter selection process is completed, which is statutory under the Apprentice Training Act. Students are paid monthly stipend during the training period. The Training and Placement Officer of the institute gives them all the preparatory guidelines including written and oral material, Daily Diary, Fortnight Report necessary for the students to enable them to properly report the progress of the training being conceived by them right from start till end.

IV MONITORING OF TRAINING AND ASSESSMENT OF PROGRESS:

The monitoring of the training being imparted at the hosting industries is continuously carried out by regular fortnightly visits of allotted faculty in the institute. He is expected to be a bridge between industry personnel and the student and learning what is expected from the maze of complex industrial activities going round him.

The concerned faculty is expected to visit the students in the industry fortnightly and monitor their training. The students are assessed under continuous assessment Head three times during the training by the concerned faculty.

V FINAL ASSESSMENT

The student is expected to submit duly certified report covering the background of the concerned industry properly structured to show the problem taken at hand, analysis thereof, various proposals and alternatives considered and final recommendation and summary thereof. He is also expected to show quantitatively the benefit that would accuse to the industry if the proposals are implemented and the financial implications that would be required for the processes of implementation. He is assessed at the end of training by internal and external examiners.

MACHINE DESIGN
(Subject Code: 7600)

I **OBJECTIVES:**

1. To enable the student to learn the design methodology and do the design of machine elements.
2. To make assembly and detail drawing of designed elements.
3. To expose them to the concept of production drawing involving various types of fits and tolerance.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: 3	Duration	:	3 Hours
Credit	: 6	Unit Test	:	20 Marks
		T / W (Internal)	:	50 Marks
		Total	***:***	***150 Marks***

III **DETAILS OF CURRICULUM:**

SECTION I
[S.C.7600]

Chapter 1 Introduction to Machine Design — Marks : 05, Hours : 03

1.1. Defintion – Design procedure – classification of design – principles of design – general consideration in machine design – system design cycle.
1.2. Cyclic stresses, fatigue and endurance limit, stress concentration (No analytical treatment).

Chapter 2 Welded Joints — Marks : 10, Hours : 07

2.1 Introduction
2.2 Strength of transverse and parallel fillet welded joints
2.3 Special cases of fillet welded joints
2.4 Stresses for welded joints
2.5 Stress concentration factor for welded joints
2.6 Axially loaded unsymmetrical welded sections.

Chapter 3 Keys and Couplings — Marks : 10, Hours : 07

3.1 Keys – types, failure of sunk keys, stresses induced, design of sunk keys.
3.2 Couplings functions & requirements, classification, design of muff coupling & flanged coupling.

Chapter 4 Shaft — Marks : 15 — Hours : 07

4.1 Introduction, materials used, types of shaft, standard sizes, failure of shaft (torsion and bending), stresses induced.
4.2 Design of shaft
- 4.2.1 Shafts subject to twisting moment only.
- 4.2.2 Shafts subjected to bending moment only
- 4.2.3 Shafts subjected to combined twisting moment and bending moment (simple problems involving single loading)

SECTION II
[S.C.7600]

Chapter 5 Power Screw — Marks : 15 — Hours : 09

5.1 Introduction, terminology, forms of thread, advantages and disadvantages.
5.2 Torque required to raise & lower the load in square threaded screw, efficiency, over hauling and self locking.
5.3 Stresses induced.
5.4 Design of simple screw jack.

Chapter 6 Springs — Marks : 15 — Hours : 09

6.1 Introduction, types, material, standard size of spring wire.
6.2 Helical spring (compression and tension) terminology, stresses induced.
6.3 Design of helical springs.
6.4 Eccentric loading, buckling and surge in springs.

Chapter 7 Gears — Marks : 10 — Hours : 06

7.1 Introduction
7.2 Design of spur gear (based on Lewis equation only)

IV TERM WORK:

1. 1 sheet on flanged coupling (assembly and detail)
2. 1 sheet on screw jack (assembly and detail)
3. 1 sheet on spur gear having involute teeth profile.
4. Assignment based on above mentioned syllabus ***(Minimum Five)***.

V REFERENCE BOOKS:

1. Machine Design by *P. C. Sharma and D. K. Aggarwal*
2. Machine Design by *R. K. Jain*
3. Machine Design by *R. B. Gupta*
4. A text book of Machine Design by *R. S. Khurani*

TOOL ENGINEERING

(Subject Code: 7601)

I **OBJECTIVES:**

1. To make the students conversant with types of cutting tools to enable their practical applications in industries.
2. To make students undergo the tool design practice.
3. To study the theories related to metal cutting.
4. To learn the various factors contributing to machinability and cost of machining.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: 2	Duration	:	3 Hours
Credit	: 5	Unit Test	:	20 Marks
		T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III **DETAILS OF CURRICULAM:**

SECTION I
[S.C: 7601]

Chapter 1: Cutting Tool Elements — Marks : 06, Hours : 03

1.1 Various tools
1.2 Tool signature.
1.3 International & American system designating tool angles.
1.4 Orthogonal & oblique cutting.

Chapter 2 Design of Single Point Cutting Tools — Marks : 06, Hours : 03

2.1 Types of solid & tipped cutting tools.
2.2 Chip breakers
2.3 Design of tool shank
2.4 Tool deflection

Chapter 3 Study of Drill — Marks : 06, Hours : 03

3.1 Elements of twist drill.
3.2 Rake & Relief angles of twist drill
3.3 Twist drill failure.
3.4 Twist drill grinding.

Chapter 4 Study of Milling Cutters — Marks : 06, Hours : 03

4.1 Elements of plain milling cutter, relief and rake angles.
4.2 Peripheral milling & face milling cutters, Types of milling cutters.
4.3 Problems on machining time & power requirement.

Chapter 5 Design of Broach — Marks : 08, Hours : 06

5.1 Elements of Broach.
5.2 Broaching allowance
5.3 Design of pitch of teeth, depth of cutting teeth, Tooth fillet radius & length of broach.
5.4 Cutting speed.
5.5 Power required for broaching.
5.6 Problems in broach design.

Chapter 6 Design of Form Tools — Marks : 08, Hours : 06

6.1 Introduction.
6.2 Types of form tool, tool holders for flat & circular form tools.
6.3 Determination of depth of tooth form on flat tools.
6.4 Determination of depth of tooth form on circular tools.
6.5 Determination of outside diameter of circular form tool.
6.6 Determining the profile of circular form tool. (Analytical & graphical method)

SECTION II
[S.C:7601]

Chapter 7 Cutting Tool Materials — Marks : 06, Hours : 03

7.1 Introduction.
7.2 Characteristics of tool material.
7.3 Various cutting tools materials.
7.4 Field of application of plain high carbon tool steel.
7.5 Field of application of plain high speed steels.
7.6 Field of application of carbide tools.
7.7 Field of application of ceramic tools.
7.8 Field of application of coated carbide.

Chapter 8 Theory of Metal Cutting — Marks : 14, Hours : 10

8.1 Mechanism of Chip formation & types of chips.
8.2 Determination of undeformed chip thickness.
8.3 Determination of shear angle.
8.4 Forces in metal cutting, Basic principles of Merchant theory, Merchant's circle. Relationship between various forces
8.5 Velocities & Energy consideration
8.6 Work & power in machining
8.7 Problems on cutting forces, shear angle, shear strain & power

Chapter 9 Machinability of Metals — Marks : 10, Hours : 07

9.1 Introduction to machinability & definition.
9.2 Machinability index.
9.3 Types of tool wear & tool failure.
9.4 Tool life & factors affecting tool life.
9.5 Relationship between cutting speed & tool life, tool life equations
9.6 Problems on tool life.
9.7 Methods of improving tool life.
9.8 Methods of improving tool life.

Chapter 10 Cost Analysis in Machining — Marks : 10, Hours : 04

10.1 Tooling cost, machining cost & non-productive cost, Labor cost & Overhead cost.
10.2 Relation between machining cost & tool cost for economical cutting speed.
10.3 Problems on economical cutting speed & tool life based on cost analysis.

IV TERM WORK:

Term work will consists of minimum seven assignments based on the above syllabus given periodically.

V REFERENCE BOOKS:

1. Tool design by *Donaldson*
2. Machine Tool Engineering by *G.R. Nagpal*
3. Production technology by *H. M. T.*
4. Production engineering design by *Sunder K & Umesh Chander*
5. Fundamentals of metal machinery & machine tools by *Geoffrey Boothroyd.*

MANUFACTURING PROCESSES I

(Subject Code: 7602)

I OBJECTIVES:

1. To impart basic knowledge of casting as a metal shaping process.
2. To provide basic knowledge of various joining processes.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: NIL	Duration	:	3 Hours
Credit	: 3	Unit Test	:	20 Marks
		T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III DETAILS OF CURRICULUM:

SECTION I
[S.C.7602]

Chapter 1 Casting Processes — Marks : 05, Hours : 03

1.1 Casting as a manufacturing process.
1.2 Advantages of casting
1.3 Products of casting
1.4 Stages in Casting process
1.5 Meaning of the terms: pattern mold, core, gating system and riser.

Chapter 2 Pattern making — Marks : 10, Hours : 06

2.1 Concept of a pattern and its use
2.2 Pattern allowances
2.3 Patten Materials: Requirements and relative merits of wood, metal and alloys, plastics and rubber as pattern materials.

Chapter 3 Mould and Core making — Marks : 10, Hours : 07

3.1 Moulding sands: Composition and properties
3.2 Core sand and preparation of cores
3.3 Moulding Techniques: Bench moulding and sweep moulding.
3.4 Machine moulding.

Chapter 4 Gating System and Riser — Marks : 10, Hours : 06

Elements of gating system viz. pouring basin, spruce runner gate and their significance.

4.2 Types of gates.
4.3 Pressurised and unpressurised gating systems.
4.4 Risering: Riser and its use, Types of risers and their merits.

Chapter 5 Casting Defects — Marks : 05, Hours : 02

Causes and remedies of casting defects viz. shifts, fins, blow holes, pin holes scabs, cold shut, shrinkage, cavity misrun and hot tears.

SECTION II

[S.C.7602]

Chapter 6 Fundamentals of Welding — Marks : 05, Hours : 04

6.1 Introduction to welding as a metal joining process.
6.2 Definition of welding and classification of joining processes
6.3 Weld ability
6.4 Metallurgy of weld and heat affected zone (HAZ)
6.5 Types of weld joints and grooves

Chapter 7 Welding processes — Marks : 20, Hours : 12

Principle, Advantages and applications of:

7.1 Gas welding
7.2 Manual metal arc welding
7.3 Submerged Arc welding
7.4 TIG and MIG welding
7.5 Atomic H_z welding
7.6 Resistance welding

Chapter 8 Soldering and Brazing — Marks : 10, Hours : 06

8.1 Soldering and brazing processes
8.2 Fluxes and their roles in soldering and brazing
8.3 Brazing atmospheres
8.4 Methods and techniques of soldering and brazing.

Chapter 9	Defects in Weld and Bend test of welding	Marks	:	05
		Hours	:	02

IV **TERM WORK:** Marks : 25

The term work will consist of assignment questions based on each chapter given periodically on completion of the respective chapter.

V **REFERENCE BOOKS:**

1. Workshop Technology by *Hazra and Chaudhary.*
2. Manufacturing Processes by *Rao.*

PRODUCTION MANAGEMENT
(Subject Code: 7603)

I **OBJECTIVES:**

1. To understand the concept and functions of production management and production system.
2. To understand PPC functions.
3. To understand recent technique to develop competiveness.
4. To be able to solve production problems in shop floor.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: NIL	Duration	:	3 Hours
Credit	: 3	Unit Test	:	20 Marks
		T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III **DETAILS OF CURRICULUM:**

SECTION I
[S.C.7603]

Chapter 1 Production Management — Marks : 10, Hours : 08

1.1 Defintiton, Objectives
1.2 Functions of production department
1.3 Relation between production and other, areas of organization
1.4 Production cycle and its procedure
1.5 Production systems

Chapter 2 Production Planning and Control — Marks : 15, Hours : 08

2.1 Need for PPC
2.2 Objectives of PPC
2.3 Functions of PPC, PPC functions to job, batch & continuous production
2.4 Information required for PPC
2.5 Organisation for PPC
2.6 Problems in PPC

Chapter 3 Planning — Marks : 15, Hours : 08

3.1 Capacity planning
3.2 Aggregate planning
3.3 Master production schedule
3.4 Material requirement planning
3.5 Process planning (machine requirements, process selection, line balancing)
3.6 Scheduling techniques.

SECTION II
[S.C. 7603]

Chapter 4 Design of Production System — Marks : 15, Hours : 10

Plant location
Plant / shop layout
Material handling
Maintenance systems
Plant safety – accidents causes, safety programmes
Standardisation, specialization, simplification.
Industrial waste control and disposal

Chapter 5 Advanced Manufacturing Technologies — Marks : 15, Hours : 08

5.1 Group technology
5.2 Flexible Manufacturing systems (FMS)
5.3 LEAN Manufacturing
5.4 Total productive maintenance (TPM)
5.5 Failure mode effect & critical analysis (FMECA)
5.6 Just in time Manufacturing(JIT)

Chapter 6 Computer Management — Marks : 10, Hours : 06

6.1 Documentation in production management
6.2 Computer application in production management

IV TERM WORK:

Term work will consist of assignments based on the above topics to be given periodically.

V REFERENCE BOOKS:

1. Industrial Engineering & Production management by *Martand Telsang*
2. Elements of production planning and control by *Samuel Eilon*
3. Production and operation management

INDUSTRIAL MANAGEMENT AND ENTERPRENEURSHIP
(Subject Code: 7604)

I **OBJECTIVES:**

1. To understand the importance of management process in business.
2. To understand the roles and responsibilities of a technician in an organization.
3. To acquire necessary management skill for effective co-ordination of shop floor activities.
4. To understand the concept of entrepreneurial process.
5. To prepare the project report for the enterprise.
6. To understand rules & regulations concerned with the business.
7. To understand activities of manufacturing industry, service sector.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: NIL	Duration	:	3 Hours
Credit	: 3	Unit Test	:	20 Marks
		T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III **DETAILS OF CURRICULUM:**

SECTION I
[S.C.7604]

Chapter 1 Overview of Industrial Development — Marks : 05, Hours : 04

1.1. Stages of scientific & technological revolution in India
1.2. Present status of Indian industry
1.3. Effect of liberalization & globalization on Indian industry

Chapter 2 Organisation — Marks : 10, Hours : 04

2.1 Definition
2.2 Necessity of manufacturing organization
2.3 Structure of an organization
2.4 Essential of an organization
2.5 Types of organization

Chapter 3 Types of Enterprises — Marks : 10, Hours : 04

Proprietorship
Partnership
Joint stock companies
Govt. Departments, Public corporations
Cooperative enterprises (consumers, producers)

Chapter 4 Industrial Acts & Regulation (Scope & provisions) — Marks : 15, Hours : 12

4.1 Need of Act
4.2 Factory Act
4.3 Industrial dispute Act
4.4 Boiler Act
4.5 Workmen's compensation Act
4.6 Indian electricity Act
4.7 Pollution control Act
4.8 ESI Act
4.9 Apprenticeship Act
4.10 Employee providend fund Act
4.11 Shop & Establishment Act
4.12 Sales tax Act, VAT
4.13 Income Tax Act

SECTION II
[S.C.7604]

Chapter 5 Management — Marks : 10, Hours : 06

5.1 Definition of Administration & Management
5.2 Levels of management
5.3 Principles of management
5.4 Function of management (planning, organizing, directing, coordination, controlling, communication, motivating, decision making leadership)

Chapter 6 Functions in Industry (Functions) — Marks : 10, Hours : 06

6.1 Material – purchase & store
6.2 Production – product, productivity, PPC, Product design & development
6.3 Inspection & quality control – concept
6.4 Marketing & sales, function of marketing
6.5 Human resource management – manpower planning, recruitment procedure, training – definition, methods, advantages
6.6 Finance – costing, sources of finance

Chapter 7 Small Enterprises — Marks : 10, Hours : 06

Definition, types
Characteristics
Industrial sickness – causes, preventive measures
Business Environment
Business Ethics
Problems faced by small scale industries
Procedure for setting up a small scale unit

Chapter 8 Entrepreneurship — Marks : 10 — Hours : 06

8.1 Definition – Entrepreneur, Entrepreneurship
8.2 Function of Entrepreneur
8.3 Qualities of Entrepreneur
8.4 Barriers to entrepreneur
8.5 Project Report – meaning of project, contents & utilities of project.

IV **TERM WORK:** Marks : 25

The term work will consist of assignment questions based on above topics to be given periodically.

V **REFERENCE BOOKS:**

1. Industrial Organisation & Management by *O. P. Khanna*
2. Industrial Organisation & Management by *M. S. Mahajan & S. G. Kanitkar*
3. Entrepreneurship development by *S. S. Khanka*

PRESS TOOL DIE DESIGN
(Subject Code: 7605)

I **OBJECTIVES:**

To understand principles of mechanics of sheet metal forming and tool design for processes using presses for sheet metal and slugs, with equal emphasis on concepts, procedures, practices and case studies.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: 3	Duration	:	4 Hours
Credit	: 6	Unit Test	:	20 Marks
		T / W (External)	:	50 Marks
		Total	***:***	***150 Marks***

III **DETAILS OF CURRICULUM:**

SECTION I
[S.C.7605]

Chapter 1 Shearing — Marks : 40, Hours : 24

1.1. Theory of shear action in metal
1.2. Cutting clearance
1.3. Cutting force
1.4. Stripping force
1.5. Energy Requirement
1.6. Shear on Press Tools
1.7. Strip layout for blanking
1.8. Construction of punch
1.9. Construction of Die Block
1.10. Selection of Die Sets
1.11. Construction of stripper
1.12. Method of fixing punches
1.13. Location of stock stopper
1.14. Types of Shearing operations
1.15. Piercing Die
1.16. Blanking Die
1.17. Perforating Die
1.18. Shaving Die
1.19. Trimming Die Compound
1.20. Die Design & Drawing of progressive Die involving shearing operations.

SECTION II
[S.C.7605]

Chapter 2 Drawing — Marks : 06, Hours : 05

2.1. Metal forming operations
2.2. Metal flow in drawing
2.3. Reduction factors
2.4. Drawing limits
2.5. Redrawing
2.6. Drawing pressure
2.7. Ironing pressure
2.8. Blank holding pressure
2.9. Clearance between punch & die
2.10. Wall thickening, thinning & ironing
2.11. Theory of defects in deep drawn part
2.12. Drawing test
2.13. Single and double action press
2.14. Drawing die
2.15. Combination Die

Chapter 3 Bending and Forming — Marks : 06, Hours : 05

Metal movement in bending and forming
Bend radii
Developments of blanks
Bend allowance
Spring back
Flaring
Bending and bottoming force
Press break dies
Bending dies
Forming dies

Chapter 4 Progressive Dies — Marks : 06, Hours : 05

4.1. Selection of progress dies
4.2. Stock guide
4.3. Lifters
4.4. Strippers
4.5. Pilots
4.6. Cam stage
4.7. Basic type bridges and carriers
4.8. Strip development of die around the strip design
4.9. Splitting the die for manufacturing
4.10. Basic layout practice
4.11. Various types of progressive dies

Chapter 5	Equipment	Marks	:	04
		Hours	:	05

5.1. Types of presses.
5.2. Effective utilization of presses
5.3. Load, torque and energy considerations
5.4. Feeding equipment
5.5. Safety in press working

Chapter 6	Miscellaneous Dies	Marks	:	05
		Hours	:	04

6.1 Horn type dies
6.2 Pinch trimming dies
6.3 Sub press dies
6.4 Single and double com action dies
6.5 Rubber dies
6.6 Bulging dies
6.7 Stretch forming dies
6.8 Hydro forming dies

IV **TERM WORK:**

Design and Drawing of:-
1. Blanking and pricing die.
2. Bending die.
3. Progressive die with mini. 3 stages.

V **REFERENCE BOOKS:**

1. Tool Design by *Crylin Donaldson*
2. Design Fundamentals by *J. R. Paquain*

PLASTIC DIE DESIGN
(Subject Code: 7606)

I OBJECTIVES:

1. To orient and familiarize the students to the plastic die design field.
2. To serve as a basis for pursuing higher education and career opportunities.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: 3	Duration	:	4 Hours
Credit	: 6	Unit Test	:	20 Marks
		T / W (External)	:	50 Marks
		Total	***:***	***150 Marks***

III DETAILS OF CURRICULUM

SECTION I
[S.C.7606]

Chapter 1 Plastics — Marks : 07, Hours : 04

1.1. Classification: Definition, Thermoplastics & thermo sets, crystalline & amorphous, Homo polymers and co-polymers, commodity, Engineering & specialty plastics.
1.2. Important thermoplastics and thermo sets – their properties, moulding characteristics and applications.
1.3. Introduction to additives, blends, alloys and composites.

Chapter 2 Processing Techniques — Marks : 11, Hours : 07

2.1. Compression & transfer moulding – constructional features & specifications of moulding equipment, principles of processing techniques.
2.2. Injection moulding – constructional features & specifications of moulding machine, moulding cycle and out line of moulding process.
2.3. Blow moulding – constructional features and specifications of blow moulding equipment, extrusion blow moulding – intermillant, continuous and accumulator device types, injection blow moulding and stretch blow moulding, processing methods (only basic coverage)
2.4. Extrusion Process – Constructional features, working and specifications of single screw and twin screw extruders – Extrusion lines for pipes, films (blown & east films) & sheets – processing principles.

Chapter 3 Extrusion Dies — Marks : 11, Hours : 06

Constructional features and general arrangement of extrusion dies for pipes, films (bottom fed and side fed)

Chapter 4 Manufacture of Moulds and Dies — Marks : 11, Hours : 07

4.1 Mould materials of construction: Types of tool and alloy steels, nonferrous materials and spiral alloys – properties and selection.

4.2 Mould fabrication: Revision of copy milling, CNC machining, EDM and wire cutting process, mould polishing techniques, mould surface treatments – heat treatment, hand chrome plating and mould etching.

4.3 Introduction to CAD/CAM for moulds – popular software packages and capabilities.

SECTION II

[S.C.7606]

Chapter 5 Design of Moulds — Marks : 40, Hours : 24

5.1 Design of compression moulds – general arrangement of flash, semi – positive and positive moulds.

5.2 Design of transfer moulds – General arrangement of integral pot and auxiliary ram transfer moulds.

5.3 Design of injection moulds – General arrangement of two plate mould, mould components and construction – feeding, cooling and injection systems. General arrangement of three plate moulds. Designing for undercuts – side cores, inserts, protrusions, threads, etc. - concepts of angled and sliding split moulds – sprit construction and activation techniques. Hot runner moulds – general arrangement, manifold blocks, flow ways and secondary nozzles. Advantages, limitations and area of applications, mould standardization and innovative mould components.

5.4 Blow mould design – principles of mould construction, pinch off, parting line and vents.

IV TERM WORK:

1. Design of Injection Moulding Die.
2. Design of Blow Moulding Die.
3. Case Study.

V REFERENCE BOOKS:

1. Moulding of plastics by *Bickales.*
2. Plastic Materials by *J. A. Brystom.*
3. Mould Engineering by *Sores.*
4. Mould Engineering by *Dubois.*
5. Extrusion Die Design by *M. V. Joshi.*
6. Injection Mould Design by *R. G. W. Pyre.*

PROFESSIONAL PRACTICES VI

(Subject Code: 7607)

I OBJECTIVES:

1. To attend the guest lectures and prepare reports based on it.
2. To speak on a given topic.
3. To conduct a survey and prepare a report based on it.
4. To enact a roll in a group, based on a given situation.
5. To involve in a social service.
6. To participate in a group discussion.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 0 Hours	Sem. Exam	:	No Exam
Practical	: 2 Hours	Duration	:	NIL
Credit	: 2	Unit Test	:	NIL
		T / W (Internal)	:	50 Marks
		Total	***:***	***50 Marks***

III DETAILS OF CURRICULUM:

Chapter 1 Guest Lecture Hours : 04

Guest lectures (minimum 2) of 2 hours duration each are to be arranged on engineering topics approved by the faculty. A brief report of the guest lecture are to be prepared and submitted by each student as part of the Term Work. The topics may be like

- Interview techniques
- Career planning
- CAD / CAM/ CIM
- Mechatronics
- Automobile Engineering
- Nano technology
- Prototyping
- Value education, moral and ethics in life
- Any other topics decided by the faculty

Chapter 2 Group Discussion Hours : 06

The student has to address the audience for 10 – 15 minutes on a given topic. The topic may be given in advance or just before the presentation.

Chapter 3 Speeches Hours : 04

The students shall be given the topic. Based on which he/ she has to give a speech of 5 minutes duration in front of audience. The topic may be given in advance / at the time of the speech.

Chapter 4 Enacting a situation Hours : 04

Group of 5 to 6 students may be formed. They will be given a situation to which the students have to play their role to depict it. The situation may be given by the faculty members. The topics for enacting may be

- Shop Floor
- Purchase
- Planning
- Design
- Marketing
- Administration
- Quality and Inspection
- Stores
- Tool Room
- Any other topic approved by the faculty member.

Chapter 5 Survey Hours : 06

Students in a group of 4 to 5 may engaged in a survey & prepare a report based on that. Students are required to prepare a questionnaire for the survey, collect the data based on the questionnaire, analysis of the data and conclusion. Topics for the survey may be

- Academics
- Facility available in the college
- Library
- Canteen
- Machine Shop
- Gymkhana
- Sports
- Any Engineering/ Marketing situation
- Public utility
- Any other topics approved by the faculty.

Chapter 6 Social Responsibility Hours : 08

The student in a group or individually shall involve in some social service activities, prepare a report and submit. The area of activity may be:

- Community Polytechnic
- Environment
- Service to any unit in the complex
- Health
- Education
- Any other social service approved by the faculty.

IV TERM WORK: (Internal) Marks : 50

Term work includes the above mentioned activities and submission of Journal based on that.

METROLOGY AND INSPECTION

(Subject Code: 7700)

I **OBJECTIVES:**

1. To understand the features to be inspected in engineering components.
2. To understand the measurements to be carried out in order to build quality.
3. To understand the measuring capabilities of instruments for their optimum selections.
4. Care and maintenance of standards and measuring instruments.
5. To understand the sources of errors in measurements.
6. To understand the methods of measurement using the instruments studied

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: 2	Duration	:	3 Hours
Credit	: 5	Unit Test	:	20 Marks
		Practical	:	50 Marks
		T / W (External)	:	50 Marks
		Total	***:***	***200 Marks***

III **DETAILS OF CURRICULUM:**

SECTION I
[S.C:7700]

Chapter 1 Introduction — Marks : 06, Hours : 03

1.1 Introduction, objectives of metrology.
1.2 Units of measurement –standards-line and end standards, wave length Standards.
1.3 Errors in measurement.

Chapter 2 Limits, Fits, Tolerances & Gauge Design — Marks : 14, Hours : 08

2.1 Interchangeability.
2.2 Indian standards on limits and fits - ISO system - Terminology.
2.3 Hole based and shaft based systems - clearance, transition and interference fits - classifications of fits based on assembly, calculations of limits of size.
2.4 Maximum and minimum material conditions – Types of gauges- Taylor's principles of gauge design- gauge tolerance - wear allowance – numerical examples of gauge design.

Chapter 3 Linear Measurements — Marks : 14, Hours : 08

3.1 General introduction to linear measurements and instruments, Standards for linear measurements, Slip gauges - surface plate.
3.2 Comparators - mechanical, electrical/electronic, pneumatic and optical comparators, construction, working, advantages and disadvantages.

Chapter 4 Geometric Features — Marks : 06, Hours : 04

4.1 Straightness, Flatness, Squareness, Parallelism, Roundness. Circularity, Concentricity and their measurements (only definitions and general introduction)

4.2 Wedge method, straight edge and its use.

SECTION II

[S.C:7700]

Chapter 5 Angle Measurements — Marks : 10, Hours : 08

5.1 Units - standards and instruments used for angle comparison.

5.2 Sine bar, sine centre, clinometers and spirit level -Auto collimator and angle dekkor, tool maker's microscope

Chapter 6 Surface Finish measurements — Marks : 08, Hours : 05

6.1 Surface characteristics and their importance.

6.2 Classification of surface irregularities.

6.3 Criteria used to specify surface finish.

6.4 Direct and indirect measurement of surface finish.

6.5 Stylus probe instruments (General features).

Chapter 7 Screw Thread Measurement — Marks : 10, Hours : 06

7.1 Pitch measurement.

7.2 Measurement of major, minor and effective diameters.

7.3 Flank angle measurement.

7.4 Instruments used for the above.

Chapter 8 Gear Measurement — Marks : 12, Hours : 06

8.1 Measurement of concentricity, tooth spacing, profile and tooth thickness.

8.2 Composite measurement of gears.

8.3 Instruments used for the above.

IV PRACTICALS:

1. Calibration of vernier caliper, micrometer, height gauge etc.
2. Composite inspection using slip gauges and accessories.
3. Measurements using optical instruments like tool maker's microscope, profile projector etc.
4. Study and use of comparators.
5. Use of microprocessor.
6. Angle gauges, sine bar, sine centre- use of the above.
7. Clinometers - study and use of the above.
9. Optical dividing head - one experiment using the above.
10. Measurement of screw threads - major diameter, minor diameter and effective diameter by three- wire methods.
12. Measurement of roundness, squareness.
13. Gear tooth measurements - thickness, run out, etc.
14. Depth micrometer and its use.
15. Surface comparison specimens and their use, study of stylus probe instruments for measurement of surface roughness.

V **TERMWORK:**

Term work consist of submission of journal based on the above mentioned practical (minimum 8) and 5 assignments based on the syllabus.

VI **REFERENCE BOOKS:**

1. Metrology by *R.K. Jain.*
2. Metrology by *I. C. Gupta.*
3. Metrology for Engineers by *Shotbolt*

CAD/ CAM
(Subject Code: 7701)

I. OBJECTIVES:

1. To expose the students to new technology in CAD.
2. To understand the role of computer in design
3. To understand different modeling concept.
4. To create an appreciation about mathematical treatment of computer graphics.
5. To introduce concept of group technology, FMS, CAPP & CAPC
6. To create an awareness about finite element analysis.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: 3	Duration	:	3 Hours
Credit	: 6	Unit Test	:	20 Marks
		T / W (Internal)	:	50 Marks
		Total	***:***	***150 Marks***

III DETAILS OF CURRICULUM:

SECTION I
[S.C: 7701]

Chapter 1 Fundamentals of CAD — Marks : 05; Hours : 03

The Product Cycle, The design process, The applications of computer in design, Benefits of CAD. CAD/ CAM Hardware and Software.

Chapter 2 Computer Graphics — Marks : 10; Hours : 06

Software configuration of graphics system, Function of graphics package, Raster scan graphics, DDA algorithm, Bresenham's algorithm, Antialiasing lines, co-ordinate system, Introduction of clipping, Window and viewport.

Chapter 3 Transformation ofGeometry and Geometric Modeling — Marks : 15; Hours : 09

3.1 Types of transformation (Translation, scaling, rotation), 2D & 3D transformations (problems), Homogenous representation, Mathematics of projection, concatenation of transformations.

3.2 Geometric Modeling: Types, features, Attributes, data structures. Different modeling techniques, Introduction to product data exchange format. Eg. IGES, STEP, DXF

Chapter 4 Customisation of CAD System — Marks : 10, Hours : 06

Need of customisation, customisation of Menu system, line type & hatch pattern. Auto lisp functions, simple auto lisp programmes for generating simple drawing.

SECTION II

[S.C : 7701]

Chapter 5 Group Technology — Marks : 10, Hours : 06

Need for group technology, attributes based on which part families are made, methods of family formation, PFA, coding and classification. Benefits of group technology.

Chapter 6 Computer Aided Process Planning — Marks : 10, Hours : 06

Process planning and its outcome – Needs for automation – Approaches, Variant type and generative type – composite component and general flow diagram of a variant type computer aided process planning system. General features of a generative type system – differences.

Chapter 7 Flexible Manufacturing System — Marks : 10, Hours : 06

FMS, definition and general features, Need and relevance of FMS, types of flexibility, components – FMS work statins and their general features – Material handling and FMS layout in FMS, functions of central computer in FMS – Benefits of FMS.

Chapter 8 Computer Aided Production Control — Marks : 10, Hours : 06

General overview of production planning and control – Aggregate planning, master production scheduling, capacity planning, BOM MRP, MRP logic & computations, outputs and Inputs of MRP, MRP – II, ERP – general overview and modules.

IV TERM WORK (Internal):

1. Solid models of machine parts (any two).
2. Assembly of machine component (any one).
3. Generation of exploded view of assembly (any one).
4. Assignments based on above mentioned syllabus (minimum five).

V REFERENCE BOOKS :

1. CAD / CAM : *Mike P. Groover.*
2. CAD / CAM : *P.N. Rao*
3. CAD / CAM : *Schaum's Series*
4. Autolisp & Customisation : *Oliver*
5. Automation Production Systems & Computer Integrated Manufacturing: *Mike P. Groover*

MECHATRONICS
(Subject Code: 7702)

I OBJECTIVES:

1. To understand the principle of working of sensors, transducers and actuators.
2. To study the applications of PLC.
3. To get exposure to the applications of mechatronics.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: 2	Duration	:	3 Hours
Credit	: 5	Unit Test	:	20 Marks
		T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III DETAILS OF CURRICULUM:

SECTION I
[S.C.7702]

Chapter 1 Introduction to Mechatronics — Marks : 05, Hours : 02

1.1. What is mechatronics
1.2. Systems
1.3. Measurement systems
1.4. Control systems
1.5. Microprocessor based controllers
1.6. Mechatronics approach

Chapter 2 Sensors and Transducers — Marks : 10, Hours : 08

2.1 Sensors and Transducers
2.2 Performance Terminology
2.3 Displacement, position and approximity
2.4 Velocity and motion
2.5 Force
2.6 Fluid pressure
2.7 Fluid flow
2.8 Fluid Level
2.9 Temperature
2.10 Light sensors
2.11 Selection of sensors
2.12 Inputing data by switches

Chapter 3 Pneumatic and Hydraulic Actuation systems — Marks : 13, Hours : 08

Actuation systems
Pneumatic and hydraulic systems
Directional control valves
3.4 Pressure control valves
3.5 Cylinders
3.6 Process control valves
3.7 Rotary actuators

Chapter 4 Mechanical Actuation Systems — Marks : 12, Hours : 06

4.1. Mechanical systems
4.2. Types of motion
4.3. Kinematic chains
4.4. Cams
4.5. Gear trains
4.6. Ratchet and pawls
4.7. Belt and chain drives
4.8. Bearings
4.9. Mechanical aspects of motor selection

SECTION II
[S.C.7702]

Chapter 5 Electrical Actuation Systems — Marks : 08, Hours : 05

5.1. Electrical systems
5.2. Mechanical switches
5.3. Solid state switches
5.4. Solenoids
5.5. DC motors
5.6. AC motors
5.7. Stepper motors

Chapter 6 Programmable logic Controller (PLC) & microprocessor — Marks : 12, Hours : 07

6.1. Introduction, PLC definition
6.2. PLC block diagram
6.3. Difference between relay panel and PLC
6.4. Power supply, input/ output modules (analog, digital)
6.5. Concepts of sink/ source, set/reset, latch/unlatch
6.6. Advantages and disadvantages.
6.7. Introductory treatment to microprocessor
  6.7.1. Control
  6.7.2. µp (microprocessor) system
  6.7.3. Microcontroller
  6.7.4. Application

Chapter 7	Selection of PLC programming	Marks	:	14
	Equipment, programming formats	Hours	:	10

7.1. Ladder diagrams and sequence listing
7.2. Large process ladder diagram construction, flowcharting as a programming method
7.3. Basic PLC functions – Register basics, timer functions, counter functions, Intermediate functions – Arithmetic functions, number comparison and number conversion functions. Data handling functions – SKIP, Master control relay, Jump, Move, Block move, Table to register and register to table move functions, FIFO and LIFO functions, File Arithmetic and Logic functions.

Chapter 8	Applications in Mechatronics	Marks	:	06
		Hours	:	02

8.1 Various applications of mechatronics
8.2 Electro pneumatic systems
8.3 Electro hydraulic systems
8.4 Electro mechanical systems
8.5 Case study for above applications (Any two).

IV TERM WORK:

Term work shall consist of below mentioned activities and submission of journal based on that:

1. Identification and demonstration of different sensors and actuators
2. Development of ladder diagram, programming using PLC for minimum. (Any two application)
   a. measurement of speed of a motor
   b. motor start and stop by using two different sensors
   c. simulation of a pedestrian traffic ontroller
   d. simulationof four road junction traffic controller
   e. lift/ elevator control
   f. washing machine control
   g. tank level control
   h. soft drink vending machine control.
3. Trace, interpret and demonstrate working of at least two electro pneumatic systems.
4. Trace, interpret and demonstrate working of at least two electro hydraulic systems.
5. Trace, interpret and demonstrate working of at least two electro mechanical systems.
6. Experiment based on microprocessor kit.

V REFERENCE BOOKS:

1. Mechatronics by *Shri. R. K. Rajput*
2. Mechatronics by *Bolton*
3. Mechatronics System Design by *Devdas Shetty and Richard Kolk.*
4. Introduction to Mechatronics and Measurement System by *David Alciatore and Michael B. Histand.*

MANUFACTURING PROCESSES II
(Subject Code: 7703)

I **OBJECTIVES:**

1. To introduce students to some widely used special casting and welding techniques
2. To provide fundamentals metal working.
3. To impart basic knowledge of the four basic knowledge of the four basic metal working processes viz. rolling, forging, Extrusion and wire drawing.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: NIL	Duration	:	3 Hours
Credit	: 3	Unit Test	:	20 Marks
		T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III **DETAILS OF CURRICULUM:**

SECTION I
[S.C.7703]

Chapter 1 Special Casting Processes — Marks : 10, Hours : 06

Principle stages and applications of

1.1. Carbon dioxide Moulding
1.2. Shell Moulding
1.3. Gravity Die Casting
1.4. Pressure Die Casting
1.5. Investment Casting
1.6. Centrifugal Casting

Chapter 2 Special Welding Processes — Marks : 07, Hours : 06

Principle and applications of

Thermit Welding
Electroslag Welding
Electron beam Welding
Plasma Arc Welding

Chapter 3 Fundamentals of Metal Working — Marks : 08, Hours : 04

3.1 Metal working as a manufacturing process and its advantages
3.2 Strain hardening
3.3 Elimination of strain hardening by Recrystallisation Annealing and recrystallisation temperatures of commercial pure metals using $T_r = a. Tm.p$
3.4 Hot Working and Cold Working

Chapter 4 Rolling — Marks : 15, Hours : 08

4.1. Principle stages in rolling of metals
4.2. Rolling stand and classification of rolling mills on the basis of number of rolls on each stand.
4.3. Rolling load, draught and spread
4.4. Rolled products
4.5. Roll passes
4.6. Break down passes
4.7. Tube rolling by Mannesmann and pilger process
4.8. Defects in rolled products viz. Internal lamination, fibering, alligatoring, wavy edge and edge buckle, edge cracking, overlap.

SECTION II
[S.C.7703]

Chapter 5 Extrusion — Marks : 15, Hours : 09

5.1. Extrusion as a manufacturing process, its advantages.
5.2. Direct and Indirect extrusion
5.3. Extrusion ratio
5.4. Extrusion processes: Conventional hot extrusion, cold extrusion, tube extrusion and hydrostatic extrusion.
5.5. Extrusion parameters viz. billet preparation, heating temperatures pressure requirement, extrusion speeds and lubrication.
5.6. Extrusion equipment : Dies and toolings for hot extrusion and tube extrusion.
5.7. Extrusion defects: Funnel formation, fir tree cracking, chevron marks

Chapter 6 Wire Drawing — Marks : 10, Hours : 06

6.1. Principle stages in wire drawing using bull block and multiple die machines.
6.2. Patenting of wires.
6.3. Wire drawing dies: Die Zones, materials and die lubricants

Chapter 7 Forging — Marks : 15, Hours : 09

7.1. Introduction to Forging as a metal shaping process and its merits.
7.2. Forging processes: Open die forging close die forging and upset forging
7.3. Types of forging hammers and press (working principle only)
7.4. Forging defects : Flash line crack, overfill, under fill, cold shuts

IV TERM WORK: Marks : 25

The term work will consist of assignments given periodically based on each chapter.

V REFERENCE BOOKS:

1. Workshop Technology – Volume I by *Hazra Chaudhary.*
2. Engineering Metallurgy by *Higgins.*

INDUSTRIAL ENGINEERING & QUALITY MANAGEMENT
(Subject Code: 7704)

I OBJECTIVES:

1. To inculcate in students the concept and importance of productivity and its benefits to industry and society at large.
2. To equip students with concepts & techniques of work study and enable them to apply them in practical life to improve labour and material productivity.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: NIL	Duration	:	3 Hours
Credit	: 3	Unit Test	:	20 Marks
		T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III DETAILS OF CURRICULUM:

SECTION I
[S.C: 7704]

Chapter 1 Productivity and Industrial Engineering — Marks : 08, Hours : 04

1.1 Objectives of Industrial engineering.
1.2 Functions of Industrial engineering.
1.3 Techniques of Industrial engineering.
1.4 Industrial engineering in service sector.
1.5 Systems approach.
1.6 Productivity measures.
1.7 Productivity improvement techniques.

Chapter 2 Introduction to Work Study — Marks : 07, Hours : 03

2.1 Definitions
2.2 Work study procedure.
2.3 Work simplification and work study.
2.4 Concept of work content

Chapter 3 Method study — Marks : 10, Hours : 05

3.1 Objectives of method study.
3.2 Critical examination
3.3 Development and selection of new method

Chapter 4 Work Measurement — Marks : 15, Hours : 12

4.1 Objectives
4.2 Techniques
4.3 Steps in conducting time study
4.4 Meaning of allowances and their types
4.5 Computation of standard time
4.6 Ergonomics and principles of motion economy.

SECTION II
[S.C: 7704]

Chapter 5 Inspection & Quality Control — Marks : 06, Hours : 03

5.1 Definition, types, procedure, advantage of inspection, planning of inspection.
5.2 Definition, advantages, procedure, planning of Quality control.
5.3 Quality control – meanings and objectives
5.4 Organisation for inspection of quality control.

Chapter 6 Statistical Quality Control — Marks : 12, Hours : 08

6.1 Introduction
6.2 Benefits
6.3 ND charts
6.4 Control charts

Chapter 7 Sampling Plans — Marks : 10, Hours : 05

7.1 Sampling plans.
7.2 Single and double sampling plans.
7.3 OC curves
7.4 Process capability
7.5 Acceptance sampling

Chapter 8 TQM — Marks : 12, Hours : 08

8.1 Definition, Concepts, Philosophy
8.2 Assurance, Quality circles, Kaizen, Pokayoke, quality audit.
8.3 ISO – 9000 series

IV TERM WORK (Internal):

1. A case study on methods improvements.
2. A case study on methodology of development of time standards.
3. A case study on ISO- 9000 or Total Quality Management.

V REFERENCE BOOKS:

1. Work study by *I.L.U*
2. Work study by *O.P. Khanna*

ELEMENTS OF COSTING AND FINANCE

(Subject Code: 7705)

I OBJECTIVES:

1. To make the student understand the cost and cost elements to be able to arrive at cost of product and be able to control overhead cost.
2. To help the students understand the basis of material control and stores management to effect economics in inventory and wastages.
3. To strengthen the students on marginal cost concept to be able to decide on alternatives of product mix and be able to understand fixed cost concept.
4. To make them aware of finance, its availability and sources of profit and loss account and balance sheet and alternatives on investment so as to be able to stand as self sufficient entrepreneur.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: NIL	Duration	:	3 Hours
Credit	: 3	Unit Test	:	20 Marks
		T / W (Internal)	:	25 Marks
		Total	***:***	***125 Marks***

III DETAILS OF CURRICULUM:

SECTION I
[S.C.7705]

Chapter 1 Fundamentals — Marks : 10, Hours : 06

1.1. Concept of cost and costing. Need for financial and cost accounting and their limitations.
1.2. Classifications and elements of costing
1.3. Material costing: Purchasing, receiving store keeping and controlling
1.4. Pricing of stores issues and different methods thereof
1.5. Meaning of materials management and control.

Chapter 2 Labour and Overhead Costing — Marks : 15, Hours : 09

2.1. Labour cost and control
2.2. Determination of daily rate, payroll procedure, gate time keeping and recording of labor time
2.3. Direct and Indirect labour cost and their examples in various industries
2.4. Meaning of over heads and their concept
2.5. Allocation, apportionment and absorption of overheads

Chapter 3 Marginal cost and Marginal costing — Marks : 15, Hours : 09

Meaning of total cost and its segregation into fixed, variable and semi-fixed costs.
Marginal cost and marginal costing and its use in management decisions making.
Break even point and charts and is use in management decision making.
P/V charts and marginal cost statements and accounts

SECTION II
[S.C.7705]

Chapter 4 Types of Costing, Cost Planning & Control — Marks : 15, Hours : 09

4.1. Job costing, contract costing, unit costing and operating costing
4.2. Cost control and cost reduction
4.3. Standard costing and budgetary control, zero based budgets.
4.4. Variance analysis and types of variances wage, material and overhead variances.

Chapter 5 Basic of Business Investment & Finance — Marks : 15, Hours : 09

5.1. Role and need and sources of finance in business
5.2. Balance sheet and profit and loss accounts
5.3. Fixed and working capital
5.4. Financial ratios and their use

Chapter 6 Financial Analysis — Marks : 10, Hours : 06

6.1. Simple and compound interest
6.2. Normal and effective rate of interest
6.3. Continuous compounding
6.4. Meaning of EMI, Sinking fund and Annuity
6.5. Conventional methods of comparison of investment – payback, period, rate of return and discounting methods.
6.6. Meaning of N.P.V, yield, annual capital charges and DCF.

IV TERM WORK:

Term work will consists of assignments based on the above syllabus given periodically.

V REFERENCE BOOKS :

1. Lectures on Costing by *Swaminathan.*
2. Cost and Management – Accountancy by *Arun Prasad, Ray Choudhary and Amitav Bhattacharya.*
3. Finance for Non Finance Managements by *S. Thomus*.
4. Financial Accountancy, Costing and Management – Accountancy by *S. N. Maheshwari.*

PROCESS PLANNING AND TOOL DESIGN

(Subject Code: 7706)

I OBJECTIVES:

1. To enable the student to understand the use of jigs and fixtures in the manufacturing of engineering components in batch and mass productions.
2. To create an idea in the students how various operations are being done in the industry by taking case studies (machined components).
3. To make the student aware of the importance of tolerance chart and its applications in the course of processing of components.
4. To make the student understand processing of engineering components in batch/ mass production.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Practical	: 3	Duration	:	4 Hours
Credit	: 6	Unit Test	:	20 Marks
		T / W (External)	:	50 Marks
		Total	***:***	***150 Marks***

III DETAILS OF CURRICULUM:

SECTION I

[S.C.7706]

Chapter 1 Introduction to Jigs and Fixtures and Elements of Jigs and Fixtures — Marks : 15, Hours : 10

1.1 Introduction to jigs and fixtures, difference between jigs and fixtures, principles of design and construction with reference to interchangeability, simplicity, ease of operation, economy of motion, rigidity, durability, swarf disposal.

1.2 Locating elements: Principle of location, locating methods, type of locators, material for locators

1.3 Clamping elements: Principle of clamping, type of clamps, strap clamping, pivot clamping, pinch clamping multiple clamping, power clamping, cam clamping.

1.4 Setting and guiding elements: Drill and tool guide bushes, cutter setting devices, material and treatment for guide bushes and cutter setting devices.

1.5 Indexing methods: Linear indexing, rotary indexing, different methods for indexing and its applications.

Chapter 2 Types of Jigs and Fixtures Case Studies — Marks : 25, Hours : 10

2.1 Plate Jig, Latch type Jig, Box type Jig, Turn over Jig, Indexing type Jig, Template Jig.

2.2 Milling Fixture, Turning Fixture.

2.3 Case study on design of different types of jigs and fixtures, construction aspects of jigs and fixture (fabricated types, welded types, cast types)

SECTION II

[S.C.7706]

Chapter 3 — Marks : 11, Hours : 08

3.1 Introduction to process & product engineering : Introduction to process engineering, definition of process engineering, design for production (product design and process design), steps in product design (design-to-manufacture, design-to-cost, design-to-assemble), functions of product engineering department, role of process engineering department, functions of process engineering department, engineering release.

3.2 Preliminary part print analysis: Reading part drawing, nine steps in part print/ drawing analysis

- 3.2.1 General characteristics
- 3.2.2 Visualization of the part
- 3.2.3 Principal process
- 3.2.4 Alternate process
- 3.2.5 Functional surfaces
- 3.2.6 Areas for processing
- 3.2.7 Specifications in the drawing
- 3.2.8 Nature of work done
- 3.2.9 Finishing and identification operations.

Chapter 4 Tolerance Analysis and Tolerance Chart — Marks : 03, Hours : 03

4.1 Need for manufacturing tolerance, tolerance calculation, unilateral and bilateral tolerances, graphical representation of manufacturing operations, concept of tolerance chart and preparation to tolerance chart for a typical component.

Chapter 5 Work Piece Control and Classification of Operations — Marks : 07, Hours : 05

5.1 Concept of work piece control, technique for work piece control with practical examples, case study to explain work piece control, classification of manufacturing operations into basic, principal, major, auxiliary and supporting operations and case study to illustrate.

Chapter 6 Detailed Process Planning — Marks : 15, Hours : 09

6.1 Detailed process planning of components through case studies. Process planning details consisting of sequence of operations, means of production, machining parameters, special and standard tooling, measuring gauges, cutting tool specifications, tool layout process pictures and tool layout.

Chapter 7 In Process Gauging and Computerized Process Planning — Marks : 04, Hours : 03

7.1 In-process gauging principles, in-process gauging practice in grinding, fine turning and fine boring operations. Advantage of computerized process planning, variant and generative methods, case study for computerized process planning.

IV **TERM WORK (Internal):** Marks : 50

SECTION I

1. Location and jig bushes (one sheet)
2. Different types of clamps (one sheet)
3. Assembly and details of one jig. (two sheets)
4. Assembly and details of milling fixture (two sheets)

SECTION II

1. Tolerance chart for one component
2. Process planning in detail for the machining of one component from un-machined blank (forging or casting or bar stock)

V **REFERENCE BOOKS :**

SECTION I

1. An introduction to Jig and Fixture Design, *Kempster, IIIrd Ed,ELBS,1985*
2. Jigs and Fixtures, *P.H. Joshi, TMH, 1988*
3. Tool Design, *C. Donaldson, TMH, 1980*
4. Jig and Fixture Design Manual, *Erik. K. Henrikson, Industrial Press, 1973*
5. Jigs and Fixtures – Non-Standard Clamping Devices, *H. E. Grant, TMH, 1989*

SECTION II

1. Process Engineering for Manufacturing, *Eary & Johnson, Prentice Hall*
2. Fundamentals of Manufacturing Engineering, *V. M. Kovan, MIR Publications, 1979*
3. Modern Manufacturing Process Engineering, *Benjamin W. Niebel, Mc. Graw Hill, 1988*
4. Computer Aided Process Planning, *Allen & Smith, CAM Lab, Provo, Utah, 1980.*

ADVANCED MATHEMATICS
(Subject Code: 7707)

I OBJECTIVES:

Mathematics, no doubt, is a tool in the hands of an engineer. But to make it effective, it is imperative for him/ her to know clearly how the tool works. This, in turn, requires clear understanding of the concepts and methods of higher / advanced mathematics.

The syllabus contains topics related to calculus, matrix theory, etc. Since 80% engineering applications are governed by the above topics, this syllabus gives elaborate emphasis and conceptual clarification of these topics.

Students, who are keen to go for higher studies, can very well understand and enjoy the usage of advanced mathematical techniques in practical applications by studying this syllabus.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 3 Hours	Sem. Exam	:	80 Marks
Tutorial	: 3	Duration	:	3 Hours
Credit	: 6	Unit Test	:	20 Marks
		T / W (Internal)	:	50 Marks
		Total	***:***	***150 Marks***

III DETAILS OF CURRICULUM:

SECTION I
[S.C: 7707]

Chapter 1 Complex Numbers — Marks : 20, Hours : 12

1.1. Review of complex numbers. Cartesian, Polar and Exponential form of a complex number.
1.2. De Moivre's Theorem (without proof, only problems). Powers and roots of complex numbers.
1.3. Circular and Hyperbolic functions, Inverse circular and inverse hyperbolic functions (only formulae & problems).
1.4. Logarithms of complex Numbers (only problems).

Chapter 2 Vector Algebra & Vector Calculus — Marks : 20, Hours : 12

2.1. Vector triple product and product of four vectors (only formulae) (no proof).
2.2. Differentiation of a vector function of a single scalar variable. Theorems on derivatives (without proof) (only problems). Curves in a space concept of a tangent vector (without problems).
2.3. Scalar point function and vector point function. Vector differential operator del. Gradient, divergence and curl-definitions, Properties (without proof) and problems. Applications – Normal, Directional derivatives, Solenoidal and Irrotational fields.

SECTION II
[S.C: 7707]

Chapter 3 Application of Derivatives — Marks : 20, Hours : 12

3.1. Partial derivatives of first and higher order, total differential coefficients, total differentials, differentiation of composite and implicit functions.
3.2. Euler's theorem on Homogeneous function with two and three independent Variables (without proof), deductions from Euler's Theorem (no proof) (only problems).
3.3. Errors and approximations, maxima and minima of a function of two or three independent variables. Direct method and also using lagrange's method of undetermined Multipliers.

Chapter 4 Expansions of Functions and Definite Integral — Marks : 20, Hours : 12

4.1. Expansion of functions of one variable using Taylor's series and maclaurin's series (without proof) (only problems).
4.2. Definition of Beta and Gamma functions and properties, Relation between Beta and Gamma functions (without proof), duplication formula (with proof), differentiation under the integral sign with constant limits of integration (only problems).

IV TERM WORK (Internal): Marks : 50

Tutorial No.	Topics	Marks
1	Complex Numbers 1.1 & 1.2 upto De Moivre's Theorem	05
2	Complex Numbers Powers & roots, circular & hyperbolic functions	05
3	Complex Numbers Powers & roots, Inverse circular & Inverse hyperbolic functions and 1.4 ($\log^m$ of Complex numbers)	05
4	Chapter 2 -2.1 and 2.2	05
5	Chapter 2 -2.3	05
6	Chapter 3 -3.1	05
7	Chapter 3 -3.2	05
8	Chapter 3 -3.3	05
9	Chapter 4 -4.1	05
10	Chapter 4 -4.2	05

V REFERENCE BOOKS :

1. Applied Mathematics I by *G. V. Khumbhojkar*
2. Applied Mathematics II by *G. V. Khumbhojkar*
3. Engineering Mathematics *by Bali, Saxena, iyengar*
4. Engineering Mathematics by *Wartikar, Grewal*
5. Advanced Mathematics by *H. R. Dass*
6. Applied Mathematics by *Sai Subramanian, B. V. Ramana*
7. Applied Mathematics II by *Bhatia & S. S. Prabavathy*
8. Applied Mathematics II by *Srinivas & Ramana*

PROFESSIONAL PRACTICES VII

(Subject Code: 7708)

I OBJECTIVES:

1. To attend the guest lectures and prepare reports based on it.
2. To participate in a group discussion.
3. To attend a mock interview.
4. To prepare a seminar report and do a presentation.
5. To work on a mini project
6. To involve in a social service

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Lecture	: 0 Hours	Sem. Exam	:	No Exam
Practical	: 4 Hours	Duration	:	NIL
Credit	: 4	Unit Test	:	NIL
		T / W (Internal)	:	50 Marks
		Total	***:***	***50 Marks***

III DETAILS OF CURRICULUM:

Chapter 1 Information Search Marks : 05
Hours : 06

The activity (in a group of 2 – 3 students) can be done through Manufacturing Catalogue, website, magazine, books, etc. and submit the report. Following topics are suggested.

- Machine Tools and machine tools parts.
- Inspection/ Measuring, gauges / Computer Aided Inspection, gauges.
- Rapid prototyping
- Gear manufacturing
- Lubricants
- Bearings
- Coupling & Joints (welded, riveted & Threads)
- Engineering materials
- Heat Treatment
- Any other topic approved by the faculty.

Chapter 2 Guest Lecture Marks : 05
Hours : 04

Guest lectures (minimum 2) of 2 hours duration each are to be arranged from engineering topics approved by the faculty. A brief report of the guest lecture is to be prepared and submitted by each student as part of the Term Work. The topics may be like

- Six sigma system
- TQM
- Pollution and Pollution control
- Mechatronics
- Emerging Technologies
- Value Education, Moral and Ethics in life
- Management
- Any other topics decided by the faculty

Chapter 3	Group Discussion	Marks	:	05
		Hours	:	04

A group of 6 to 8 students may be formed. Based on the topic given by the faculty member, the students shall discuss in the group and assessed by the faculty.

Chapter 4	Mock Interview	Marks	:	05
		Hours	:	06

An interview session may be conducted for students in a group of 2 – 3 and performance is evaluated by the faculty.

Chapter 5	Seminar	Marks	:	10
		Hours	:	18

Students in a group of 3- 4 are supposed to select a topic (engineering and related) approved by the faculty member. They are supposed to prepare a report based on the topic. They have to deliver the seminar (mini. 30 minutes for a group).

Chapter 6	Mini Projects	Marks	:	15
		Hours	:	18

Students in a group of 4 – 5 are required to do some mini projects and submit the report. The project topics may be selected from the following (Any one):

- Design and drawing of Jigs and fixtures.
- Process Planning of a job
- Electronics kits
- Working models
- Plant layout / workshop layout/ layout of any SSI unit / factory.
- CNC part programming
- CAD drawings and modeling.
- Computer programming
- Metrology
- Any other topics approved by the faculty.

Chapter 7	Social Responsibility	Marks	:	05
		Hours	:	08

The student in a group or individually shall involve in some social service activities, prepare a report and submit. The activities may be related to:

- Community Polytechnic
- Environment
- Service to any unit in the complex
- Health
- Education
- Any other social service approved by the faculty.

IV **TERM WORK (Internal):** Marks : 50

Term work includes the above mentioned activities and submission of Journal based on that.

INPLANT TRAINING PHASE - II

(Subject Code: 7800)
Credit - 40

I OBJECTIVES:

The sole purpose of Phase – II training placed at the final stage of curriculum in the last semester is that:-

1. The students having understood all the processes by Phase I Training and the backup theoretical inputs by way of lecturers and practical after Phase I training would now be able to go hand in hand with people on shop floor in the industry to identity, analyse and resolve various practical problems that are existing there.

2 The students would choose a live problem of the industry of his choice, get approval of his on the job Training supervisor as well as his guide from institute and would apply his knowledge and blend the same with that of supervisor and the guide to makeup a project of acceptable quality.

3. The students would be able to organize his entire allocation of data and put it in the order that would impress upon the person to whom he is submitting the same in so far as in term of OBJECTIVE, ANALYSIS, INFERENCE, SAVINGS, PROPOSAL AND SUMMARY.

4. The students should fee free to take a single problem or a number of assignments in the following areas:
   a. Study of technologies, processes and industrial engineering.
   b. Engineering technologies and their relevance to existing practices.
   c. Productivity improvements.
   d. Cost reduction and cost control.
   e. Quality improvement.
   f. Computer application.
   g. Design improvements.

II

SCHEME OF INSTRUCTIONS		SCHEME OF EVALUATION		
Duration of		T/W (Internal)	:	50 Marks
Training	: 22 – 24 Weeks	T/W (External)	:	50 Marks
Credit	: 40	***Total***	***:***	***100 Marks***

III PLACEMENT AND GUIDELINES:

At least two months prior to physical placement of students in industry they undergo assessment of their personality, knowledge and caliber by the concerned industries either as a campus interviews or by appointments at the industry premises and thereafter selection process is completed, which is statutory under the Apprentice Training Act. Students are paid monthly stipend during the training period. The Training and Placement Officer of the institute gives them all the preparatory guidelines including written and oral material necessary for the students to enable them to properly report the progress of the training being conceived by them right from start till end.

IV MONITORING OF TRAINING AND ASSESSMENT OF PROGRESS:

The monitoring of the training being imparted at the hosting industries is continuously carried out by regular fortnightly visits of allotted faculty in the institute. He is expected to be a bridge between industry personnel and the student and learning what is expected from the industrial activities taking place round him.

The concerned faculty is expected to visit the students in the industry fortnightly and monitor their training. The students are assessed under continuous assessment Head three times during the training by the concerned faculty.

V FINAL ASSESSMENT

The student is expected to submit duly certified report covering the background of the concerned industry properly structured to show the problem taken at hand, analysis thereof, various proposals and alternatives considered and final recommendation and summary thereof. He is also expected to show quantitatively the benefit to the industry if the proposals are implemented and the financial implications that would be required for the processes of implementation. He is assessed at the end of training by internal and external examiners.