Curriculum
for
Diploma in Production Engineering

(I TO III SEMESTER)

Implemented from 1995-96
(Based on Semester System)

Curriculum revision work done by

Polytechnic Development Unit
(Under Indo-German Project)

In assistance with

Curriculum Development Centre
M.P. Board of Technical Education, Bhopal
Office Complex, Block A/IV, Gautam Nagar, Bhopal -462-023 (M.P.)

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Curriculum

for

First Semester

Diploma in Production Engg.

(Under Indo-German Project)

Implemented from 1995-96
(Based on Semester System)

M.P. Board of Technical Education,
Office Complex, Block A/IV, Gautam Nagar, Bhopal - 462-023

M. P. BOARD OF TECHNICAL EDUCATION, BHOPAL

FIRST SEMESTER DIPLOMA IN PRODUCTION ENGG. **(REVISED, IMPLEMENTED FROM 1995-96 AT BHOPAL & INDORE)**

S. No.	Name of Subjects	Scheme of study			Scheme of Examination										
					SESSIONALS		PROGRESSIVE ASSESSMENT		BOARD EXAMINATION						REMARK
		THEORY	LAB	TOTAL	TERM WORK	Lab. WORK	I	II	THEORY PAPER	DUR-ATION	MARKS	PRACT.	DUR-ATION	MARKS	
1.	Communication Skill (Common to CME) (P.C. 0014)	4(64)	-(-)	4(64)	20	-	10	10	I	3HRS	100	-	-	-	
2.	Applied Science (P.C. 2051) (Physics + Chemistry)	4(64) 4(64)	4(64)	12 (192)	20	30	10	10	I	3HRS	100	I I	3HRS 3HRS	50 50	
3.	Basic Electrical Engg. (P.C. 2052)	4(64)	4(64)	8 (128)	20	30	10	10	I	3HRS	100	I	3HRS	50	
4.	Workshop Practice & Safety	2(32)	10 (160)	12 (192)	20	50	-	-	-	-	-	I	3HRS	100	
	TOTAL	18 (288)	18 (288)	36 (576)	80	110	30	30	3	-	300	4	-	250	

NOTE:

1. No. of theory paper: 03
2. Total theory marks: 300
3. No. of Practical: 04
4. Total Practical Marks: 250
5. In-plant Training Marks: Nil
6. Total marks of Sessionals, Prog. Assessment, Pract. & In-plant training: 500 (80+110+30+30+250=500)
7. Ratio of theory marks and total of: 300:500 sessional, Prog. Assess., Pract. and 1:1.67 In-plant training
8. Total marks: 800
9. Passing marks for
   a. Theory: 33%
   b. Practical : 40%
   c. Sessional: 60%
   d. In-plant training: 50%

MADHYA PRADESH
BOARD OF TECHNICAL EDUCATION

DIPLOMA IN ENGINEERING
(FOUNDATION COURSE)

CURRICULUM
IN
COMMUNICATION SKILL
FIRST YEAR

DEVELOPED AT
TECHNICAL TEACHERS' TRAINING INSTITUTE, BHOPAL
1989

PROGRAMME: DIPLOMA IN PRODUCTION ENGG.
SCHEME: REVISED, IMPLEMENTED FROM 1995-96
SEMESTER: FIRST
COURSE: Communication Skill (P.C. 0014)
(Common to CME)

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MADHYA PRADESH

BOARD OF TECHNICAL EDUCATION

DIPLOMA
IN
ENGINEERING
(FOUNDATION COURSE)

CURRICULUM
IN
COMMUNICATION SKILLS
FIRST YEAR

DEVELOPED AT

TECHNICAL TEACHERS' TRAINING INSTITUTE
BHOPAL

1989

SUBJECT: COMMUNICATION SKILL

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Rationale

Place of English in our curriculum and its value is seldom called into question. However, teaching of English for students before stepping into the portab of polytechnics has been rather general and haphazard. The knowledged of English at last can be called basic. As a consequence, we perceive yarning hiatus between their needs and actual attainments. We must admit that the teaching of English at various levels, goes on in much the same manner as it used to be earlier. An attempt must be made to remove the imperfections of its foundations. There is a growing necessity for a more scientific and pragmatic approach, since teaching as a whole in diploma stage is carried on in English medium. English being medium of instruction of large number of books, magazines, research journals in English language are procured every year in polytechnics. Therefore it is rightly called library language all over the world.

The language requirements of technical courses are of a different nature. "Communication skill" as a subject is introduced to enable students to properly understand text books on science and technical subjects written in English. Hence, emphasis must be gradually shifted from General English to specialized scientific and technical literature. In the total operation of language syntax and levies form the most vital components. Due care has to be taken in their selection to achieve aims of the course.

Aims of the course:

The course aims at enabling the students -

a) to acquire among other words of general use, words from the register of sciences to the extent of about 600 words.

b) to develop ability to read and comprehend.

c) to understand and use grammatical structures which occur in the prescribed units.

d) to compose guided and free paragraphs.

To achieve these objectives the following books are prescribed:

1- A course in Technical English, Book-1
Revised Edition, 1984 (Somaiya Publication, Bomb

2- Living English Structures, by W.Stannard Allen

3- Stories from Home and abroad (Ravindra Prakashan, Gwalior)
Selected and Edited by A.N.Kapoor.

SUMMARY OF CONTENTS

Sl.No.	TOPIC	NAME OF THE BOOKS	LECTURE HOURS
1.	Passeges for comprehension	A course in Technical English Book-1, Somaiya Publications, Bombay (Prescribed unit: 1,2,4,5,7,8,9,10, 11,17)	
2.	Grammar.	Living English Structures (A practice book for foreign students) by W.S.Allen (Prescribed Exercises: 1 to 5,7,8,26 to 29,76,78,79,81,83, 85 to 88, 93,94, 136,115,116, 145,229,230,232, 243 244A, 262 to 265.	
3.	Short stories	Stories from Home & abroad(Ravindra Prakashan Patankar Bazar, Gwalior) Selected & Edited by Dr.A.N.Kapoor. (Prescribed Stories: 1,2,5,6,7,8)	1
4.	Unseen passages for comprehension	-	
5.	Paragraph writing on topics of general interest.		

1. Passages for comprehension (A course in Technical English, Book-1)

S.No.	Topics	Content details	Scope	Lecture hours
	(Unit-1) Minor goes to work	1. The unit deals with the life of a miner using simple present tense for habitual action & also offers ideas about safety measures in mines/differents types of works to be developed into paragraphs and single sentence answers to the questions. 2. Concept words: pit props, 3. Phrasal verbs hold up, go through, to look for, to be on the look out, 4. Compound words. Sports fields, loading machine coad face,	Various meanings of the phrasal verbs: go through.	

2	3	4
Unit-2.Telex	It deals with the general principle of telex, its superiority over letters and telephone calls and its various uses. It offers ideas to be developed into paragraphs and single sentence answers to questions.	
	(2) Linguisitic points.	
	(a) Use of prefix - Telex, inter transquants	Prefixes like tele, trans auto to be taken up for word formation.
	(B) Participle Incoming call, receiving order	
	(c) Compound words dial button; business people etc.	
	(d) Comparative degree.	Superior to juniot to inferior to etc. tobe taken up.

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2	3	4
8. Unit No.4 Baird & Television	It deals with the biography of Baild and describes the invention of television The unit offers ideas for writing short composition and short answer question.	Television in mass communication.
	II) Linguistic points	
	a) <u>Participle</u> talking pictures, moving parts etc.	Grammar unit 9 on modifiers to be taken with this unit, linguistic situation for teaching of participles.
	b) <u>Use of phrases</u>. in order tom to keep in time etc.	

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2	3	4	5
Unit No.5 Brick laying	1. It deals with the work of a mason i.e.laying of bricks using various tools and offers ample scope for writing short compositions on the ideas such as cavity, wall, and other forms of walls, bad weather conditions & less of man hours in cold countries as compared & contrasted with tropical countries like India. 2. Linguistic points I. Concept words Cavity wall, setting out, lay cut, pointing, plate level. II. Compound words Load bearing walls, metal ties etc.		2 hours

2	3	4	5
Unit-7 Wealth from the ground.	1. It deals with exploration refining and transportation of oil, offers ideas to be developed into paragraphs and single sentence answers to questions. 2. Linguistic points. (a) Use of phrases such as: look for, at sea, give out, turn into. 3. Modifiers: Impure & Unpurified 4. Concept words: distillation, refining.	Different modifiers/ adjectives from the same item 'pure'	2 hours

2	3	4	5
Unit 8 Road making.	1. It deals with the making of a road, the spadework, needed, the planning etc. and offers ideas which can be developed into short paragraphs and short answers to questions 2. Linguistic It also offers the following linguistic points: a) concept words cut and fill, tender. b) Phrasal verbs. to decide to devide on: to make through, to scrope off, to mark off. c) homonyms: higher, hire; petrol, patrol route, root; later, latter; price, prize	Strictly speaking the sound is not the same; it has to be explained.	2 hours

1	2	3	4	5
7.	Unit No.9 Solar energy	1. It deals with what is widely known as alternative sources of energy to overcome the world wide crisis paragraphs on solar driver, solar cooker etc. It also offers ideas to be developed into short paragraphs, some of these can be answered in single sentences. 2. Linguistic points. a) Preportional phrases. at the rate of, to come to rescue, in a few minutes, in a year's time, to result in, in the near future. b) Phrasal verbs devoid of, consist of c) Concept words strinking, warping, bending, cracks etc.	Distinction between prepositional phrases and phrasal verbs needs to be emphasized by giving suitable examples.	2 hours

1	2	3	4	5
8.	Unit 10 Flight No.631	1. It is a unit on a holiday flight of two English children and explains their thrill and joy. It offers ideas to be developed into composition exercises and single-sentence questions. 2. Linguistic material a) Compound words. mediterranean - shore, giant hand, anvil shape etc. b) distinguish between quite - quiet; land-lend; cease-sieze; draught-draft c) Phrases. to make one's way, to keep an eye on, come into view, d) Phrasal verbs read out, roll by pick up.	Distinction of sound in phirs has to be explained.	3 hours

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1	2	3	4	5
9.	Unit-11 Non-destruction testing.	It defines the concept of 'Non-destructive Testing' which is very useful in industry. a) It offers ideas which can be developed into short composition exercises. b) Linguistic material (1) Phrases. Instead of, in addition to, of course; depend on etc. (II) Distinguish between pairs of words, break-brake, measure-major, sale-sell, sale-sail, and coll affect-effect. c) <u>Compound words</u> Production failure machine components, material structufe production process.	Grammar unit on Modifiers with special reference to 'Ncuns' as modifers.	3 hours.

Unit-17
Designing a car

a. It deals with the idea of designing a car and offers ideas for composition exercises. 2½ hours.

b. Linguistic material compound words.

1) Compound words, scale model, road test, bench test, assembly line, fashion trend, mass-production transmission engineers.

2) Distinguish between pairs of words artist-artistic; proceed-procede; check-cheque, eliminate-illuminate etc.

3) Concept words, bucks, prototype, transmission.

4) Phrases.

to work on, to concentrate on, to divide into etc.

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1	2	3	4	5
1.	Countables and uncountables.	For different topics following exercises from 'Living English Structure' by W.S.Allen have been prescribed:- Exercises: 1 to 5,7,8,26 to 29.	Rules for use of á/an/the' with countable Words used as comtable or unfauntable acco:ding to context, Omission of articles whenused in general sense- to go to bed, at school Similarly with: prision, college, hospital, market, church etc. 'Some' in affirmative statements, and carry in negatives & questions.	
2.	The Present Tense	Exercises: 76 to 79,81	For Serial No.2 to 8	
3.	The Present Perfect	Ex:83, 85(Elementary & Advance)	Conception of the tense scheme as a whole and its general mechanism. Fundamental distinction between the simple present and present continuous. Verbs of condition or behaviour not strictly under human control, are practically never used in the Present Perfect and Simpast past, present continuous and present perfect continuous.	
4.	The Present Perfect Cont.	Ex.86 to 88		
5.	The past tense	Ex:93,94		
6.	The Past Perfect	Ex:136	Expression of three important ideas with'if'	
7.	'Shall-will' and 'going to'	Ex:115,116	1. Main clause-future;"f".....present 2. Main clause- conditioned; 'if'....past 3. Main clause-conditional perfect."if"... .....past perfect.	
8.	Conditions & unreal past.	Ex: 145		
9.	Reported speech.	Ex:229,230,232	When the reporting verb is in the present ~~perfect~~ present perfect or future tense. When the reporting verb is in the past, post perfect or conditional tense. Reported speech(Questions).	

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1	2	4	5
10.	Passive voice	Ex: 243,244A	Used to emphasize the facts or ideas or whem itis not necessary or desirable to state the agent. Changes in verb while changing from Active to Passive. When the verb in the Active voice taken two objects.
11.	Prepositions & Adverbial particles	Ex: 262 to 265	Prepositions indicating time. Prepositions indicating position. Prepositions indicating direction. Verbs + Adverbial particles/Prepositions to form idiomatic compounds.

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3.Short story("Stories from Home & abroad" by Dr.A.N.Kapoor)

Sl.No.	Topic	Content	Scope	Lecture hours
			A short story contains a germinal idea There is unity of purpose, action and impression. In it these may be a dramatic incident or situation; a telling scene; a clearly coordinated series of events; a phase of character a bit of experience; an aspect of life; a moral problem - any of these, and immumerable other motives. All these and others must be carefully understood and explained. While testing the comprehension of students asking of stock-in-trade Summary type question should be avoided. Short questions on humorous situations, important incidents, series of events or moral-if any may be asked, Brief character-sketch may also be asked.	

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.No.	Topics	Content	Scope	Lecture hours.
.	Home coming	A story of childs psychology, Phatik sent to his maternal uncle to curve his mischief does not find his tay in Calcutta congenial to his naturne; is taken ill & flees back home very much disturbed. These aspects can be developed into composition exercises.	'Rabindra Tagores penchant for child psychology. 2. Consequences of bringing up children without level. All these aspects of human nature are to be put up in the class and put through as convincingly as possible.	2½ hours

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Sl. No.	Topic	Content	Scope	Lecture hours.
2.	The lost child	A story of a child's instinctive thrill and attraction towards landscope, flowers, butterflies and bees etc. has keen desire to possess toys, eat sweets, play swings and soundabouts, his lingering and lagging behind; the fear of refusals by the parents; his request to the parents to go on the sound about and finally finding himself lost in the crowd and separated from his parents. The things which attracted him must did not interest him at all after his seperation from parents. All these points can be developed into paragraph writing and short composition exercises.	(1) Mulk Raj Anand's message that a man in this world cannot be happy if separated from parents (God). 2. A child's natural behaviour & his psychology. 3. Justification of the title.	2½ hours

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2	3	4	5
The selfish giant	A story of Giants selfishness and cruelty. He drives away children, puts up a was around his garden and lives within it alone. This results in the departure of spring permanently and a spell of everlasting winter hail, storm etc. prevails. When children steal into the garden spring returns. The giant realises his mistake and begings to love the title child. The little child who has wounds on his body takes the giant of heaven. All these points offer material for writing paragraphs, compositions, & similar story writing.	Oscar Wilders message to the people, significance of pure and simple love for the innocent children are to be properly emphasised.	2½ hours

2.3

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2	3	4	5
4. The refugee	A story about the extremely pitible condition of flood hit refugees wardering in strange places in search of food, work shelter etc. Their sufferings, hard work, to sudden rise of the number of working class people resulting in sudden full of wages. These points offer ideas for composition, character & paragraph writing.	Pearl.S.Buck's point of views about refugees and other down trodden people should be pointed out in order to arouse feeling of helping the needy.	2½ hours

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1	2	3	4	5
5.	The fortune teller	The story is about a fradulent fortune teller - a lady who tells sweet things to please her customers. Fortune telling is nothing but practice of deceit. Because of perpetration of fraud a case is registered against her. The fortune letter is fined. The story offers ideas about such fradulent human behaviour. The story offers several such ideas for paragraph writing; character sketching and short compositions.		2½ hours

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1	2	3	4	5
6,	The luncheon	The story deals with a humorous situation resulting from actual actions of an imposing lady which were incongruous with her words. While reading the study, the following salient features must be carefully bocked into: a. Character-sketch of the lady. b. mental condition of the host. c. the most amusing part of the story.		

4. Unseen passage for comprehension
5. Paragraph writing on given ideas

1	2	3	4	5
	Unseen passage for comprehension.	A comprehension exercise consist of a passage upon which questions are set to test the students ability to understand the content of the given tent and to infer information and meanings from it. A number of unseen passages, within the linguistic competence of X class passouts, may be selected by the teacher from the purpose of testing students comprehension.		10 hours
	Paragraph writing on given ideas,	An idea, an argument, or a short passage has to be enlarged into a paragraph of about 150 words. For paragraph writing:- a) a conclusion may be stated and the students asked to trace the steps by which this ~~thxxxxgh~~ thought has been arrived at. (b) a metaphor, could be given, so that the students may explain its full meaning in plan language and give reasons to support it, (c) Students may be asked to study a picture and give an account of what the picture suggests. (d) students may be asked to relate incidents from their experience.		14 hours

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Marking Scheme

Distribution of marks for various components is as follows:-

1. A course in Technical English, Book.1	30
2. Grammar	25
3. Short stories	18
4. Unseen passage for comprehension	12
5. Paragraph writing on given ideas	15
Total marks	100

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PROGRAMME: DIPLOMA IN PRODUCTION ENGG.
SCHEME: REVISED, IMPLEMENTED FROM 1995-96
SEMESTER: FIRST
COURSE: Applied Science (Physics + Chemistry) (P.C. 2051)

RATIONALE

Physics forms a foundation for all engineering courses. The syllabus in applied physics for the students of first year of three years diploma programme in Mechanical Engineering (Production) has been developed to attain the following objectives

- To develop habit of Scientific enquiry
- To understand basic phenomena of physics which are used in engineering
- To comprehend the required pre-requisite knowledge for technical subjects.

The different topics in physics for the course have been identified on the following basis.

(a) The attained level of students in physics at entry level in this course.
(b) Reference to various subjects of Production Engg
(c) Continuity of sequence for logical development of the course.

Curriculum for Mechanical Engineering Production

Applied Physics

S.no.	Topics	Hours	Pr.Hours
1.	S.I.Units	2	
2.	Motion	4	
3.	Physics of liquid's surface tension, viscosity	7	8
4.	Simple Harmonic motion and waves	2	
5.	Ultrasonics	2	
6.	Heat and internal energy	3	
7.	Expansion of solid,liquid and gases	3	6
8.	Heat and work	3	
9.	Measurement of high temperature	4	
10.	Reflection of light at plane and spherical surf	4	8
11.	Refraction of light at plane and spherical surface	4	-
12.	Dispersion of light	4	
13.	Natural and artificial magnets, Electromegnet	6	6
14.	Modern Physics: Radio Activity Photoelectric Effect,x-rays,Laser	8	-
	Total	56 Hrs.	28 Hrs

Topic		Intended learning Outcomes (I.Os)	Remarks
1. SI UNITS AND MEASUREMENTS (2 hrs.)		Understand units' systems - Define fundamental units. - Derive units for simple physical quantities. - State base S.I.Units	
- Fundamental Units - Derived Units			
- S.I.Units and their importance and notation - Measurement of length		Know how to use the vernier micrometer, screw gauge and spherometer for taking measurements - Explain importance of S.I.Units. - Indicate symbols for important physical quantities and their S.I.Units	
- Principle of (a) vernier (b) micrometer screw gauge (c) spherometer		- Define least count - Calculate least count of a given vernier or screw gauge. - Explain the method of measurement with the help of a vernier, micrometer, screw gauge and spherometer - Measure dimensions accurately using the above	Relevant laboratory work to be incorporated
- Measurement of mass, use of physical balance		Understand how to use physical balance. - Explain the method of using physical balance. - Measure mass using a physical balance.	
- Measurement of time with stop watch, electronic watches and atomic clock.		Understand the use of different devices for the measurement of time. - Enumerate the time measuring devices - Measures time durations with stop watch (time of rotation, time period of a pluab bob etc.)	Relevant laboratory experiment should be designed
2. MOTION	- Linear motion : speed, velocity, acceleration	Understand the concepts related with linear motion. - Define velocity and acceleration	
2.1 Linear motion (2 hrs.)	- Speed-time graph	- Differentiate between velocity and speed. Sketch time displacement and time speed graphs.	
	- Displacement-time graph. - Equations of motion - Laws of motion	- State equation of motion - Apply equation of motion in solving numerical problems - Solve simple problems of motion	
	- Motion under gravity - Concept of mass and	under gravity. Understand the concept of mass, weight and weightlessness.	
	weight, weightlessness	- Differentiate between mass and weight - Explain gravitational [illegible]	

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2.2 Circular motion

- Motion of a particle on the circle with constant speed
- Angular velocity and angular acceleration
- Relation between linear and angular velocities
- Centripetal and centrifugal forces
- Relation between degrees and radians

Understand the concepts related with circular motion.

- Define angular velocity and angular acceleration
- State relation between linear velocity and angular velocity
- Define centrifugal and centripetal forces and indicates their points of application
- Relate time period with frequency.
- Derive relation between degrees and radians.

2.3 Rotary motion

- Axis of rotation
- Moment of inertia
- Radius of gyration
- Kinetic energy of rotation

(2.2,2.3 - 2 Hrs)

Understand the concept of rotary motion
- Define axis of rotation.
- Explain the phenomena of separation of liquids of different densities by rotation method.
- Justify the position of mud guard on cycle wheels.
- Define moment of inertia about an axis of rotation.
- Define radius of gyration.
- Derive on equation for K.E. of a rotating body
- Compare mass in translational motion with M.I. in rotational motion.

3.	PHYSICS OF FLUIDS	- Buoyancy, Archemede's Principle - Laws of floatation	Understand the concept of buoyancy and Archemede's principle. - Define Buoyancy - State Archemede's Principle - Verify Archemede's principle experimentally Understand the laws of floatation - State laws of floatation - Enumerate practical applications of this phenomenon. - Explain why iron piece dips in water while it floats in mercury - Explain underlying principle of swimming.	
3.1	Upthrust (2 Hrs.)	- Pressure in liquids Pascal's law, Hydraulic Jacks	Understand Pascal's law - State Pascal's law - Prove Pascal's law - Differentiate between presure and force. - Explain the working of Bramah's hydraulic press	Relevant laboratory experiment
3.2	Atmosphere (1 Hr.)	- Pressure of fluids - Atmospheric Pressure its units and measurement in terms of height of mercury column (simple Barometer)	Understand the principle of barometer - Explains the reason for about 70 - 75 cms. of heigth of mercury column in a simple barometer. - Give reason for change in barometer Pressure at different altitude Understand the reasons for using mercury in barometer. - Explain why mercury is used as barometeric substance - Estimate length of the glass tube required, if water is taken in place of Hg. - Measure absolute Pressure and pressure difference.	
		- Atmospheric pressure and altitude - Manometer - Pressure gauge	Understand the working of pressure gauge. - Describe the construction of pressure gauge - Explain working of pressure gauge - List at least five situation where pressur gauges are used.	

AP23A

3.3 Surface Tension

- Molecular force, cohesive and adhesive force
- Definition of surface tension
- Surface Energy
- Examples showing existence of surface tension
- Convex and convave meniscus of liquids
  Angle of contact
  Relation between surface tension and capillary rise
- Factors that affect surface tension

(2 Hrs.)

Understand the concept of surface tension.

- Define cohesive and adhesive force
- Explain why free surface of a liquid behaves like a stretched membrane
- Define surface tension and indicate its direction
- Define angle of contact

Understand the relation between surface tension and capillary rise

- Derive relation between surface tension and capillary rise.
- Give examples of existance of surface tension
- Explain the phenomenon of formation of droplets of water
- Give reason why surface tension decreases with temperature
- State factors which affect capillary rise.
- Sketch angles of contact for concave and convex meniscus
- Determine surface tension by capillary rise method.
- State how is the knowledge of surface tension helpful in practical life & engineering situations

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3.4	Viscosity - Streamline and Turbulent flow - Velocity gradient - Viscous drag and coefficient of viscosity - Stokes law (statement) - Flow of liquids through narrow tubes. Poiseuille's law - Method for determining of coefficient of viscosity	Understand the concept of viscosity - Differentiate between streamline and turbulent flow. - Define velocity gradient - Derive relation for coefficient of of viscosity Understand stokes law - Give the statement of stokes law - Define coefficient of viscosity - State stoke formula and explain its notations Know the method of determining coefficient of viscosity - Explain method of experimentally determination of coefficient of viscosity Understand effect of pressure and temperature on coefficient of viscosity. - State effect of pressure and temperature on coefficient of viscosity - Describe the application of knowledge of viscosity	Relevant experiment
4.	SIMPLE HARMONIC MOTION AND WAVES - Periodic motion - Simple Harmonic motion as a projection of uniform circular motion - Characteristics of S.H.M - Definition of time period amplitude and frequency - Examples of simple pendulum, loaded springs, stretced strings Waves on the surface of water and sound waves - Longitudinal and transverse waves Mechanism of wave propogation - Knowledge of reflection, refraction, interference and diffraction of sound waves	Understand the characteristics of S.H.M. and its importance. - Define S.H.M and - State its importance - Define phase, amplitude and frequency - State characterists of S.H.M. - State & use relation between time, length & gravity (giving time period for a pendulum bob) Understand principle of formation of transverse and longitudinal waves - Explain formation of transverse waves on the surface of water - Explain formation of logitudinal waves in air - Differentiate movement of medium in two types of waves - Derive relation V=n.(lambda) - Explain that it is the disturbance which is transmitted, not the medium from one place to other. Understand the phenomena of reflection refraction, interference and diffraction in case of sound, light and x-rays. - Explain qualitatively the existance of reflection, retraction, interference and diffraction of sound - Predict the same effects for light and x-rays due to their wave nature Know about ultrasonic waves and its uses in the engineering field.	Develop the topic treatment to explain the same for high waves also.
5.	ULTRASONICS - Audible frequencies, infrasonics and ultrasonics - Production of ultrasonic waves magnetosriction and Piezo electric generators. - Uses of ultrasonics in industry specially in cold welding, drilling and etching, [illegible] welding, cleaning of narrow [illegible] measuring small thickness etc.	- State audible range of sound - Define ultrasonic waves - Explain production of ultrasonics - State applications of ultrasonics - State its importance in non-destructive testing	

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6.	HEAT AND INTERNAL ENERGY - Concept of heat as molecular motion - Heat capacity and specific heat - Calorimetry - Latent heat (3 Hrs.)	Understand the concepts related with heat energy. - Explain that heating increeses internal energy of molecules - Relate temperature with heat energy - Define specific heat and thermal capacity - etc. Know to find out heat lost or gained during a process. - Calculate heat lost and heat gained - Explain change of state due to heat energy - Define the term latent heat - Calculate latent heat quantity in transformation of state of water - Practical use of latent heat information - State that quantity of heat is measured by calorimetry - etc.
7.	EXPANSION OF SOLIDS, LIQUID AND GASES - Definitions of coefficients of linear and volume expansions. Real and apparent expansions of liquids. - Anamolous expansion of water - Boyel's law and charle's law - Standard temperature and pressure (3 hrs.)	- Define coeff. of linear and volume expansion - Differentiate between real and apparent expansion of liquids Know about changes in size due to application of heat. - Appreciate the anamoly in expansion of water as a boon of nature. Understand Boyle's and charles' law. - State Boyel's law and Charle's law. - Define standard temparature & pressure - State how knowledge of standard temperature and pressure are useful in engineering situation

AP251

8. HEAT AND WORK

- First law of thermodynamic
- Mechanical equivalent of heat
- Specific heat of gases
- Relation (CP-CV = R/J
- Isothermal and adiabatic changes

(8 Hrs.)

Understand first law of thermodynamic

- Explain the relation between work and heat energy
- Define mechanical equivalent of heat

Justify two specific heats of gases.
- Name two specific heats of gas
- Give reason for two specific heats of gases
- Describe why specific heat at constant pressure is more

Know about isothermal and adiabatic changes.

- Distinguish between isothermal and adiabatic changes
- State engineering applications where concept of CP, CV, adiabatic & isothermal expansion are used to understand underlying phenomena

9. MEASUREMENT OF HIGH TEMPERATURE

- Gas thermometer
- Platinum resistance thermometer
- Seeback effect and thermoelectric thermometer thermo couple. Thermopile.
- Optical pyrometer
- Comparative study for range and accuracy of above thermometers (4 Hrs.)

Know the relation between temperature and pressure.

- State the relation between pressure and temperature
- Calculate temparature from pressure measurements

Understand the principle of resistance thermometer

- State the principle of resistance thermometer
- Write the formula for temperature measurement using electrical resistance

Understand the working principle of thermocouple.

- Define temperature of inversion and neutral temperature
- Relate thermo e.m.f. with temperature

Know about optical pyrometer

- Explain working of optical pyrometer
- State the situation in which different thermometers may be used
- Compare merits and demerits of different thermometer.
- Compare range & accuracy of gas, liquid, thermo-electric and optical thermometers
- State the fields of uses for each type of thermometer

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Light

10.	REFLECTION OF LIGHT AT PLANE AND SPHERCIAL SURFACES - Laws of reflection,rotation of mirror,Definition of centre of curvature,radius of curvature, principal axis. Principal focus and focal length. - Geometrical construction of ray diagram for the formation of images in concave and convex mirror magnification,sign convention, uses of mirrors. (4 Hrs.)	Understand laws of reflection at plane & spherical surfaces. - Distinguish plane,concave and convex mirrors - Define focal length - State laws of reflection - State the application of laws of reflection in practical life & engineering application - Verify laws of reflection on plane mirrors - etc. Know the method of geometrical construction of ray diagrams. - Draw ray diagrams for the formation of image in concave and convex mirror - Solve numericals,if any two quantities out of u,v,f are given - Identify real and virtual image	- Mirror formula 1/f = 1/v + 1/u (Derivation not required)
11.	REFRACTION OF LIGHT AT PLANE SPHERCIAL SURFACE - Refraction at a plane surface - Laws of refraction - Refractive index and its difinition on the basis of speed of light - Critical angle and total internal reflection of light - Formation of images in convex and concave lens - Lens maker's equation - Combination of lenses - Power of lens - Simple and compound microscope (Magnification without proof) (4 Hrs.)	Understand the laws of refraction at plane & spherical surfaces. - State the laws of refration - Define the refractive index - Explain the phenomena such as, mirage,brilliancy of diamonds - State that light velocity is maximum in vacuum - Explain the deviation due to change in velocity of light know about the working and magnifying power of simple and compound microscope - Draw ray diagrams for simple and compound microscope - Calculate magnifying power for given eyepiece and objective - Sketch a compound (Metallurgical) microscope - Describe construction of metallurgical microscope - State range of magnification of optical-metallurgical microscope - Describe how different magnifications are obtained) - etc	Derivation of equation is not required

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12. DISPERSION OF LIGHT

- Refraction through prism, angle of minimum deviation and their relation
- Dispersion and spectrum dispersive power, pure and impure spectrum
- Electromagnatic spectrum and its visible range (4 Hrs.)

Understand the phenomenon of dispersion of light -
- Determine the angle of minimum deviation with the help of graph
- State the orders of colours in a pure spectrum
- Distinguish between ultraviolet and infra red light
- State visible range of wave lengths and frequencies.

13. MAGNETISM

13.1 Natural and Artificial magnet
- Magnetic materials
- Behaviour of earth as a huge magnet

- Molecular Theory of magnetism
- Coulomb's inverse squars law
- Magnetic lines of force
- Magnetic Induction
- Magnetic induction due to a bar magnet in two standard positions
- Uniform and non-uniform magnetic field
- Behaviour of a magnet placed in a uniform
- Magnetic field (3 Hrs.)

Know about magnetic and non-magnetic materials
- Distinguish between magnetic material and non magnetic material
- List two magnetic materials
- State the direction of Earth magnetic field

Understand the molecular theory of magnetism and Coulombs inverse square law.
- Explain the magnetism on molecular theory
- State coulomb's law
- Define pole strength
- Give reason why magnetic lines of force do not cross each other

Understand the concepts of magnetic induction
- Calculate magnetic induction due to a bar magnet in standard positions
- Represent uniform field with the help of lines of force

Analyze the couple formed due to a uniform magnetic field.
- Derive the expression for couple due to a uniform magnetic field on a magnet placed in it

- = Relevant demonstration in lab desired

13.2 Electromagnetism

- Magnetic induction of a solenoid
- Effect of placing soft iron cone inside solenoid
- Magnetic permeability
- Relation between Magnetic field developed and strength of electric current in a solenoid
- Magnetic particle test
- Magnetic Arc Blow (3 Hrs.)

Know about magnetic effect of electric current and the factors which influence magnetic field.
- Indicate the direction of magnetic field with the direction of current
- State the factors which influence magnetic field
- Compare the permeability of iron with other materials

Know about magnetic particle test and arc blow.
- Suggest non-destructive testing method for a finished job
- Explain the term magnetic arc blow.

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14. MODERN PHYSICS

14.1 Radio activity

- Radio active substances.
- Properties of Alpha, Beta and x-rays
- Radio activity a nuclear phanogena
- Simple disintegration equation products
- Half life and decay constant and their relation
(2 Hrs.)

Understand the phenomenon radio activity

- Give names of at least four radio active substances
- Distinguish particle as Helium nucleus and 'Beta' electron and 'Gamma'-rays as very hard x-rays (light of very-very high frequency)
- Write expression for Alpha, Beta disintegrations
- Define half life
- State relationship between half life and Decay constant (without derivation)

14.2 Photo electric effeect

- Photo sensitive material
- Photo electron photo electric effect
- Photo cell
- Plank quantum law
- Einstein photo electric equation
- Threshold frequency

Understand photo electric effect

- State names of few photosensitive materials
- Explain photo emmission
- Draw circuit diagram for photo cell

Understand Plank's quantum law

- State Plank's quantum law
- Write photo electric equation
- Explain existance of threshold frequency

Know use of photo cell

Understand the phenomenon of x-rays

- State uses of photo cell

14.3 X-rays

- Accidental discovery of x-rays
- Production of x-ray Coolidge tube
- Properties of x-rays
- Idea of x-rays diffraction photograph
- Use of x-rays in destructive testing in industry (metal castings welding joints etc.)
(2 Hrs.)

- State that x-rays are electro megnetic radiations like visible light of very hight frequency
- State properties of x-rays
- Distinguish soft and hard x-rays wave lengths
- Explain that x-ray diffraction gives very fine details of inner structure

Know use of x-rays in engineering field

- Explain use of x-rays in detecting defects in metal castings and welding joints

14.4 Laser

- Description of Maser and laser Definition of laser
- Out line of the method of Production of laser
- Use of laser in engineering cutting, making holes in ceramics and super hard metals etc.
(2 Hrs.)

Know about Laser and its uses in the field of engineering

- Explain abbreviations of the terms maser and Laser
- Define Laser
- Appreciate the enormous energy possessed by coherent highly parallel (channelised) light in same phase
- State situations in which Lasers are used

LIST OF EXPERIMENTS

Heat - 1. To determine specific heat of solid by the method of mixture

2. Determination of latent heat of steam.

3. To verify Boyle's law

4. To determine J by searle's method (friction-cone method)

Light - 5. To find focal length of a concave mirror by u-v method

6. To calculate refractive index of glass with respect to air by drawing ray's in a glass slab

7. To calculate focal length of convex less by u-v method.

8. To determine refractive index of glass with respect to air by angle of incident and angle of deviation curve method.

Magnetism - 9. To locate neutral points by drawing lines of force of a bar magnet in two standard positions

10. To study the pole strength developed in an electromagnet with current

11. To determine time period for various lengths of simple pendulum and hence calculate 'g'

12. To measure capillary-rise and hence calculate surface tension with the help of a travelling microscope

13. To determine coefficient of viscosity of water by capillary flow method (using Poiseuille's formula).

Reference-Book

1. Applied Physics Vol.I & Vol.II — Prof.H.C.Saxena, Prof.Prabhakar Singh

2. Physics — T.T.T.I, Bhopal Publication

3. Physics Part I & Part II — Halliday D. & R.Resnick

4. Physics Part I & Part II (for 10 + 2 students) — Dash S.K, M.L.Sisodia, P.K.Meher & C.M.Kachhawa

5. Engineering Physics SI Version — Rao, B.V.N

6. Modern Physics Part I & Part II — Rao, B.V.N

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LIST OF EXPERIMENTS

Heat -
1. To determine specific heat of solid by the method of mixture
2. Determination of latent heat of steam
3. To verify Boyle's law
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APPLIED - CHEMISTRY

TIONALE :

As the knowledge of Chemistry is essential for a chnician, the syllabus in applied chemistry for the students of ree years diploma programme in Mechanical Engineering Production) has been developed in view of the following orities required to be developed in the students.

- Develop habit of Scientific enquiry.
- Understand the changes in structures, properties of matters and processes involved.
- Enable students to develop essential ability to investigate cause - effect relationship.
- Develop ability to predict results in different engineering applications under given conditions.
- Comprehend the required prerequiste knowledge for understanding technical subjects.
- Understand the chemistry of essentials for various engineering materials.
- Topics like alloys, adhesives, polymers lubricants have been incorporated with special reference to the requirement of production engineering students.

Cuuriculum for Production Engineering:

Applied Chemistry.

Topics	Theory Hours	Practical Hours
Atomic Structure	6	-
Periodic Classification of Elements.	5	-
Heavy Metals	6	2
Alloys	6	2
Redoximetry	6	6
Electro' - Chemistry	3	2
Corrosion	8	4
Polymer	3	-
Chemistry of Paints & Varnishes.	4	4
Lubricants	5	4
Chemical - Bonding and Adhesives.	4	4
Total Hours	56	28

S.No.	Topics/Sub-Topics	I.L.Os.	Remarks
1.	Atomic Structure: 1.1 Discovery of Electron, Proton & Neutron. 1.2 Rutherford model and modification of Bohr's. 1.3 Bohrburry scheme of distribution of electron in various orbits. Sommerfeld relativistic atom model. 1.4 Idea of S,P,d,f subshells. 1.5 Electron cloud concept.	Understand the atomic structure. - Write the fundamental particles of atom. Know about the different experiment research experiments conducted in the field of atomic structure. - Explain the discovery of fundamental particles electron, proton and neutron of an atom. - Explain arrangement of electrons around the nucleus. - Explain the concept of the capacity of S,P,d,f orbitals. - Explain the concept of electron cloud.	- Film or Chart to be shown in the class. Home Assignment to be given for drawing the electronic structure of few atoms.
2.	Periodic classification of elements: - Introduction to periodic table - Periodic Law based on atomic numbers. - Brief description of periodic table, groups and periods. - Periodicity and electron affinity. - Classification of elements based on S,P,d,f orbitals.	* Understand the classification of elements. - Describe the history and prediction about the undiscovered elements - Define the term atomic number. - State periodic law based on atomic number. - Identify difference between groups and periods. - Explain arrangement of elements in periodic table - Explain the terms electronaffinity & periodicity. - Identify the names of elements which have electrons in S,P,d,f orbital blocks.	Charts be shown depiciting - Outermost orbit is full. - Outermost incomplete orbit. - Next to the outer most orbit incompl - etc. - Seminicro and spot test analysis of these metals in laboratary.

Heavy Metals: - Occurence - Properties and engineering uses of Heavy Metals with special reference to Cu,Fe,Zn,Pb and Al. Alloys: - Properties and Engineering uses of common alloys like Brass, Bronze,German Silver,Duralumine, Solder,Stainless steel,Pressure die Casting Alloy.Bearing Alloy.	Know the physical and chemic. properties of common metals. - Write the physical and chemical properties of Heavy Metals. - Correlate property variation with atomic number & placing of these elements in periodic table. Know the properties and uses of common alloys. - Enumerate properties of common alloys - State uses of common alloys in the field of engineering. - Deduce variation of engineering properties by the addition of different elements in an alloy.	- Chart and model to be shown. - Emphasis should be laid on the Chemical reactions taking place during various stages. - Various samples of the alloys may be demonstrated in the class room.
Redoximetry: - Redoximetry with special reference to oxidising action. - and properties of cyanide,nitride, oxide,epoxide,carbonate,hydroxides and hydrides.	Understand the concept of Redoximetry. Explain the process of oxidation and reduction. - State the effects of the oxidising and/or reducing of the salts like Cyanides,Nitrides,Oxides,epoxides, Carbonates,hydroxides and hydroxides and hydrides used in the treatment of metals. - Describe the engineering application of salts. - State atleast 4 methods of protection of metals against formation of salts. - Explain the phenomenon of protection of metals against salts formation.	

6.	Electrochemistry: - Process of Electrolysis. - Laws of Electrolysis. - Electrolysis with special reference to Electroplating and Electrolysis . - Introduction to Electrochemical series.	Understand the process of electrolysis - Explain the process of electrolysis. - State the law of Electrolysis.	Numerical examples to be given in the class.
8.		- Name atleast 5 commonly used electroplating processes - State the fields of engg. application of each of these electroplating processes - Apply the principles of electrolysis in the process of electroplating. - Suggest the ingredients and the conditions of Electroplating such as time ,voltage , safety etc. for required thickness. - Explain the effect of reactions among the metals present in the electrochemical series.	- Film on the principles of Electrolysis and the process of Electroplating be shown in the class. - The chart of the Electrochemical series must be displayed inside the class room.
7.	Corrosion: - Meaning of corrosion - Types of corrosion. - Protection against corrosion.	Understand the process of corrosion. - state the definition of corrosion. - correlate that to oxidation.	
		is one of the most important process of corrosion. - state that corrosion can be due to stress concentration, erosion,electrochemical direct chemical etc. - Infer that corrosion can be inter-granular or grain boundary corrosion without change in concentration or chemical composition. - Give the examples of each type of corrosion in practical field. - State the methods of controlling corrosion due to environmental effects.	Practically verify in laboratory the corrosion on metal parts by different mechanism.

- Protective coatings:
  (A) Inorganic coating
    - metal coating
    - cladding
    - Electrodeposition
    - nonmetalic coatings

  (B) Organic coatings:
    - Paints and
    - varnish
    - enamles etc.

Know about protection against corrosion.

- state the different types of protective coatings on the surface.

- explain the procedure of the preparation of surface for hot dip galvanizing and tinning.

- Describe the process of hot dipping in molten metal, cladding, metal spraying cementation processes & vapour deposition, non-metal coating etc.

- Explain the process of electro-deposition.

- state the fields of application of each.

- Explain the process of applying coatings of vitrumenous and porcelain enamles.

- Enumerate various types of pigments resins, solvent and thinners used for coatings.

- state the purpose of applying or using priwers, thinners etc.

- state that these non-metallic coatings are usually renewed at regular intervals under corrosive environment

Perform corrosion protection on metal parts by atleast one method in the laboratory.

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8.	Polymers: - Polymerisation and condensation. - Properties & uses of - Styrenes flouro carbons, properties and uses of ethene, ethylene, PVC, Polythene, Polyester, Polyamides and Bakelite cellulose.	Understand the process of Polymerisation and condensation. - Define polymerisation and condesation. - Explain the process of preparation of various polymers. - state the properties of various polymers. - state the engineering uses of polymers such as styrenes, flourocarbons polypropeelene, polyester, etc.	Student should be made conversant with the fastly expanding list of plastics and their uses.
9.	Chemistry of paints and varnishes: Definition of paints - Requisites of good. - Constituent of paints. - Definition of varnish. - Types of varnish - constituents of varnish.	Know about the paints and varnishes. - List the various ingredients of various polymers. - state the process for the preparation of various polymers - Give the functions of paints and varnishes. - Name the ingredients used for the preparation of paints and varnishes. - Enumerate at least five types of paints and varnishes. - state the characteristics of a good paint and a varnish. - Describe atleast two methods of applying paints. - Give reasons for need of renewing paint coats at predetermined intervals of time - State at least three engineering applications of varnishes - Compare paint protection with metal coating protection methods.	A visit to plastics Industry. - Experimentally verify the metal protection by paint and/or varnish. - Practically do painting on a metal part in systematic manner noticing the chemical process and impact of each step.

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10.	Lubricants: - Definition of lubricant. - orientation of molecules of lubricating oil. - Types : fluid & boundry - Properties of lubricants - Significance of properties - Semisolid lubricants,Greases - Solid lubricants graphite. - Selection of lubricants.	Know the functions and properties of lubricants. - Define the lubricant. - Define the viscosity,flash point fire point viscosity index etc. - List the properties to be looked into the selection of a proper lubricant for a particular set of machine parts assembly part. - Classification of lubricants into liquid,semisolid & solid lubricants. - state at least 3 engg. application of each type of lubricant. - List different types of commercially available greases and lubricant oils. - Name the ingredients of these greases & lube-oils. - Describe the function of these ingredients. - Identify situation where lube oils are prefered over greases & vice-versa.	Experiments must be performed on the properties of lubricating oil such as - Flash point - fire point - cloud and pour point. - Emulsification etc.
12.	Chemical bonding & Adhesives: - Combining capacity of an atom. - Valency - Types of chemical bonding - metallic bonding - Definition of Adhesives. - Types of Adhesives - Engineering application of adhesives. - Condition affecting the binding power of adhesive. - Commercially available adhesive for metal to metal & non metals.	* Understand the cconcepts related to chemical bonding - Explain the term combining capacity of an atom. - Explain the term valency. - List the types of valency - Give the examples of different types of chemical bonding in compounds. - Explain the metallic and hydrogen bonding. * Know about adhesives and their applications in engineering fields. - Explain the term adhesive. - List the types of adhesives. - select the proper adhesives on the basis of their binding power. - Enumerate commercially available adhesives for metal to metal and metal with non-metal applications.	Perform adhesive joining of thin metal sheet & assess/find out its peel-strength.

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List of Practicals/Experiments

1. Identification of one cation and one anion in a given sample of ore/Powder/Mixture.
2. To determine percentage of copper on a given sample of brass iodometrically.
3. To determine the percentage of iron in a iron salt by Redoximetry.
4. Colourimetric estimation of metals in a given sample of an alloy.
5. To set up a denial-cell and interprete the electrochemical theory of corrosion.
6. To prepare common plastics such as Bakalite.
7. To find out flash point of dry and non-drying lubricating oil.
8. To find out fire point of dry and non-drying lubricating oil.
9. Determination of viscosity of lubricating oil By Red-wood viscometer.

List of Books

Applied Chemistry

1. Applied Chemistry
   By : P.C.Jain
2. Engineering Chemistry
   By: Rao & Agrawal
3. Engineering Chemistry
   By: Uppal
4. A text book of Chemistry of Engineering materials
   By : M.A.Aalgar/R.Paul
5. Material Science
   By : B.S.Narang
6. Chemistry of Engineering material
   By : C.L.Agarwal
7. Systematic Inorganic Chemistry
   By : Niranjan Singh/Joginder Singh
8. Physical Chemistry by Glasstone
9. Applied Chemistry
   By : Shrivastava & Shrivastava (Chandra Prakshan)
10. Modern Text Book of Applied Chemistry
    By : Dr.M.C.Saxena (Jain Prakashan Indore)
11. Polytechnic Chemistry
    By : Shrivastava & Shrivastava (PBS Publishing House Bhopal)

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PROGRAMME: DIPLOMA IN PRODUCTION ENGG.
SCHEME: REVISED, IMPLEMENTED FROM 1995-96
SEMESTER: FIRST
COURSE: Basic Electrical Engg. **(P.C. 2052)**

Rationale

In present World electrical engineering is occupying a nucleus position,a focal point from which every activity of human life is activated.
All the industrial production is dependent on the availability of electrical power for the continuous operation of the machines and equipments. Hence it becomes imperative that a technician in production engineering field be acquainted with the fundamentals of electrical engineering and the basics of electrical devices and equipments which one comes across in the practical life.

Keeping this in view the curriculum has been designed to include the basics of electrical engg., working principle and construction of electrical machines, their operation and preventive maintenance.To overcome the phobia of electrical shocks,and hesitant attitude for operating electrical devices, a trained mental set to observe safety precaution is very much desired. To cope up with this requirement due consideration has been given to include safety aspects in the curriculum.

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Diploma in Mechanical Engineering (Production)

Sub - Basic Electrical Engineering

CONTENTS

S.No.	Topic	Theory	Practical	Total
1.	Fundamentals of Elect.Engg.	8	4	
2.	Electrical circuits	8	6	
3.	Electromagnetism	8	4	
4.	A.C. fundamentals	12	6	
5.	D.C. Machines	12	6	
6.	A.C. Machines	15	10	
7.	Elect. Measuring instruments	5	8	
8.	Electrical wiring	8	8	
9.	Electrical safety	8	4	
	TOTAL	84	56	

Sl.No.	Topic/Sub topic	Objective/ILO	Remarks
1.	Fundamentals of Electrical Engg:	Student will be able to :	
		* Understand the fundamentals of electrical engineering.	
1.1	- Introduction - Electrical phenomena & their causes - Electrical properties of atoms - Electric current - Electric potential - Voltages	describe the role of electrical phenomena in technical appliances and in natural environment	the discovery of electricity and the method of producing the electricity may be explained
		define the electric current voltage and their units.	Simple electric cuts may be used to describe voltage current
		* Understand the principle of voltage generation.	
1.2	- Generation of voltage - Principle of voltage generation	describe the mechanical and electric processes involved.	
	- Methods of voltage generation	name the devices with which voltage can be generated	models of generator may be demonstrated or explained in the lab.
	- Voltage measurement	draw a circuit for the measurement of voltage	
		* know what must be taken into consideration when connecting up a voltmeter	Simple circuit may be used measure the voltage in the circuits in the lab.
	- Types of voltages	differentiate between direct and alternating voltages.	graphically demonstration may be given.

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Electric Current - Circuit & current direction - Current strength - Current measurement - Types of current - Effect of electric current	Know about the flow of electric current through a circuit, its parameters give formula , symbol and the unit of electric current strength. - measure the current in a simple circuit using Amp. meter. - state the effects of current flowing through a circuit a like heating, light, magnetic, chemical, (an overview.) only.	Simple circuit may be demonstrated. Connection of ammeter may be shown in lab. Given several practical example of the effect of electrical current.

S.No.	Topic/Sub topic	Objective/ILO	Remarks
2.	Electrical circuits:	Know to setup simple Electric circuits.	V=IR may be verified in the lab with the help of simple circuits.
2.1.1	Ohm's law - Resistance of conductors - Specific electrical resistance - Types of resistor	- State & verify the ohm's law - define resistance, resistivity of materials. - list the factor which ~~affect~~ affect the resistance of conductors. - list the types of resistors - state advantages & disadvantages of various types of resistors etc.	R may be measured with multimeter & may be calculation using formula : $R = \frac{\rho l}{A}$
2.1.2	Connections of Electrical resistances. - Series Connection's - Parallel connection	Understand the behavior of current & voltage in series and parallel connection. - measure and calculate the equivalent or total resistance of simple series/parallel circuits.	Simple series, parallel resistance circuit may be used by students and analysed by them in lab.
	- Kirchoff's voltage law (KVL) - Kirchoff's current law (KCL)	- state Kirchoff's voltage & current law. - solve the problems related to simple Electric circuits.	Voltage & current in real practical circuit calculated using KVL, KCL

2.1.3	Electrical Power & Energy : - Electrical Power - Measuring Electrical Power	Know about the electrical power and energy and their measurements. - define Electrical power - derive formula/unit for Electric power. - Carry out the current measurement in Electric circuit.	Relation may be derived in term of V,I,& V,R & I,R. Simple resistive circuits may be used in the lab and measurement of power with wattmeter can be demonstrated in the lab in various circuits.
2.1.4	Electrical Energy: - measurement of Electrical Energy.	- Define electrical energy. - state formula and its unit - connect energy meter in a circuit & measure the KWH etc.	Energy meter connection may be shown, practice by student in lab/Elect. workshop.

Electromagnetism phenomena, quantities and units. 8 + 2 Hrs.	Understand the phenomena of electromagnetism. - state the significant role of of magnetism in important areas of electrical engg.etc. - draw the magnetic field of a live conductor.	Elect.motor & generator are the example of Electromagnetic effect. The pattern of field lines of a electromagnet may be demonstrated & shown.
- Magnetic field of a coil - straight condr.	- know the effect of magnetic field in the vicinity of current carrying straight conductor and a conductor loop. - explain the effect of current flow through a straight and a loop conductor as regards to the magnetic field.	Two dimensional pictorial representation of pattern may be shown.
- Right hand screw rule	- identity the direction of current in a current carrying conductor. - state the right hand screw rule etc.	

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S.No.	Topic/Sub topic	Objective/ILO	Remarks
	- Magnetic flux & flux density - Magnetic field strength - Magnetomotive force (mmf)	Know about the parameters related to electromagnetism. - define flux, flux density & field strength. and state their relationship with each other. - state the change in magnetic flux density and magnetic field strength when the current through the coil changes.	$H = \frac{I.N}{l}$, ... No derivation.
	- Faraday's laws of Electomagnetic Induction.	Understand the importance of Faraday's laws of electromagnetic induction. - state Faraday's laws of electromagnetic induction $e = d\phi/dt$ understand the Lenz's law - state the lenz's law $e = -N.d\phi/dt$	Practical application of Faraday's laws may be explained.

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4.1 demon-	A.C. fundamentals: - Generation of sine wave (8 + 6) Hrs.	Understand the basic concepts related to AC fundamentals. - draw a sine wave and explain how it is generated by moving a coil in a closed mag. field. - $v(t) = V_m \sin \omega t$ (generated voltage as a function of time)	- Concept may be started on graph paper.
	- Terms related to A.C. Cycle time period, frequency	know about the terms related to A.C. cycle. - define and relate time period & frequency.	- No derivation, give formula only. - Demonstration charts and real AC wave form should be demonstrated on CRO.
	- Max.value (peak value) root mean square (R.M.S.) value Average value.	define peak RMS and average voltage/current in AC. - derive relation among r.m.s., peak and average value. - Indicate these values on sinusoidal wave form.	CRO, multimeter may be used to explain in reality these three values.
	- Single phase & three phase A.C. voltage.	- Draw the 3-phase voltage wave form.	

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4.1.2	RLC Series & parallel circuits: - Pure resistive circuit - R-L series & parallel circuit - R-C series & parallel circuit - R-L-C series & parallel circuit	Understand the RLC series and parallel circuits - draw the vector diagram. - define phase difference. - define & calculate power factor. - state lag and lead concept in A.C. - Calculate total impedance.	- Different combination of circuits may be demonstrated in lab / class. - CRO should be used to explain/show the phase difference.
	- Power in AC circuit	Know to calculate power in A.C. circuit. - Explain the relationship between voltage, current and power factor for finding power in A.C. circuit. ($P = VI \cos\phi$)	- Practical demonstration on simple circuit may be given in the lab. - Simple circuits may be given to the student to practice them in the lab.
4.02	- Generation, Transmission and distribution of electrical energy.	Understand - Basic concept of Generation, transmission and distribution of electrical energy. - Draw single line diagram of a complete power system etc.	- No derivation - Visit of substation & Industries may be arranged for practical demonstration.

S.No.	Topic/Sub topic	Objective/ILO	Remarks
5.1	D.C. Machines: - Construction of D.C. motor.	- understand constructi.n, working and use of D.C. machines (motor + Generator) - Sketch and name the main parts of a D.C. motor. - explain the function of each parts.	- Motor module or DC motor duly opened may be demonstrated in lab.
	- Working principle of a D.C. motor.	- explain force action upon a line conductor in a magnetic field. - state/explain Fleming's left hand rule.	Describe the rotary movement of a line coil in a magnetic field using a field line diagram.
	- Significance of electromotive (e.m.f) in DC motor.	- state relation for induced emf in Armature.	$E = \frac{P\phi NZ}{60\ A}$ $E = V_t - I_a R_a$
	- Types of DC motor	- classify the different types of DC motor on the basis of field winding and excitation.	- Charts of different types of motors may be shown. - Demonstration may be given on actual machines.

- Characteristic of DC series & shunt motor.	- plot the characteristic of series & shunt DC motor.	The importance of characteristic may be explained in the selection of motor for the specific purpose.
- Application of Dc motor	Know the application of D.C. motor. - state the applications of DC motors in Industries, domestic	Example: Traction motor factory visit may be arranged for student to show them the practical applications of DC motor
DC motor - starters	- state the necessity of D.C. motor starter. - describe different types of starter.	starter may be shown.
- Speed control of DC motor - efficiency	Understand the importance of control of D.C. motor. - state the necessity of speed control. - describe methods used for speed control.	- methods can be practically demonstrated in lab.
5.2 D.C. generator:	Understand and the concept of efficiency of D.C. motor. - describe various losses in D.C. motor - efficiency = output/output+losses	Simple numerical problem may be exercised.
- Construction of DC generator	Know the construction of D.C. generator. - state line function of each parts in line generator.	D.C. generator should be shown may be asked to identify line vari-

Working principal of a d.c. generator.	Understand the working principal of a d.c. generator. - explain the working principle of a d.c. generator. - explain the action of moving conductor in a magnetic field.	- practical demonstration of voltage generation may be in lab.
	- describe right hand rule.	- find the direction of current.
- emf generation	Understand the relationship between generated e.m.f and terminal voltage. - state the relationship between generated e.m.f and terminal voltage.	- compare the generated emf and terminal voltage. E = Vt + Ia.Ra
- Types of D.C. generator	- Classify the different types of d.c. generators.	Charts & old generators in the lab may be used for demonstration.

generator.

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- Application of D.C. generators	Know the application of d.c. generators. - state few important use of d.c. generator in industries/domestic.	
- efficiency	- state various losses - relate of efficiency = output/output+losses	few simple numerical problems may be given to exercise.
5. A.C. Machines:	Acquainted with an overview of construction, working and uses of static and dynamic AC machines.	
5.1 Transformer:	Understand the construction, working principle and uses of transformers.	
5.1.1 Construction	- Sketch and explain core type & shell type transformer.	Different small transformers may be opened and demonstrated.

6.1.2	Working principle:	- state static induction (transformer principle) - define induced voltage - state $e = -N.d\phi/dt$ - define transformation ratio and state $E1/E2 = N1/N2 = I2/I1 = K$ may be proved practically. - describe step up & step down transformer.	Practically demonstration in the lab with a small transformer. may be shown in live factory / substations.
6.1.3	Efficiency	- describe various losses in transformer. - determine the efficiency - perform the open circuit & short circuit test.	Simple numerical problem may be given for exercise practice on real circuits should be given in the lab.
6.1.4	Auto transformer	- describe the main parts and their function. - Compare the two winding transformer & Auto transformer	may be shown in the lab. few simple numerical example may be solved to compare.

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6.1.5	Application of transformers	- state various important application of transformers r Industries / domestic use.	Visit to a substation and factory may be arranged.
6.2	A.C. Motor / Generator:	Understand construction, working principle and application of AC motor / generator.	
6.2.1	Construction of AC motor and AC generator (Single phase only)	describe and draw the constructional details of synchronous and induction motor (1 phase only) - give an overview of constructional details of various AC motors & generator. - describe types of motors on the basis of construction . - name the main parts of a.c. motor & generator. - give the function of each parts. - Compare the motor and generator on the basis of construction.	A.C. motor & Generator may be shown to the student in the lab.

6.2.2	Working principle of - a.c. motor - a.c. generator (alternator)	- Explain the principle of energy transfer in rotating AC machines. - find the torque in case of motor - find the generated emf in case of generator. - Compare AC motor and alternator on the basis of operation principle. - Compare synchronous & induction motor.	Single phase ac motor generator may be analysed with the help of numerical problems.
6.2.4	Types of alternator:	- list the different types of alternators (1 phase)	Available alternator may be demonstrated in lab.
6.2.3	Synchronous speed, slip in Induction motor.	- describe the synchronous speed. - describe the slip in Induction motor.	

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6.2.4	Speed control of Induction motor.	- list the various types of speed control methods. - describe in brief the frequency control, voltage control and V/F Voltage/frequency control method of speed control.	Experiment may be performed on speed control of AC motor voltage control and V/F control method may be demonstrated in lab.
6.2.5	Application of AC Single phase motors.	- give various applications of induction and synchronous motor for industries/domestic purpose.	
6.2.6	Selection of motors	- Select the motor for specific purpose to meet the desired need.	Characteristic matching concept should be given to the student.

6.3	AC 3 phase motor	- Compare the 1 phase induction with 3 phase induction motor. - state application of 3 phase a.c. machines (Synchronous + induction motor)	Industrial application may be shown at the site in the premises of factory.
7	Electrical measuring Instruments.	- Know commonly used electrical measuring instruments and their used.	
7.1	Types of electrical measuring	- state types of Ammeter, voltmeter wattmeter, Energymeter. - describe in brief the working principle - Compare the different types of Ammeter, voltmeter.	Instruments may be shown to the student in measurement lab.

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7.2	Measurement of current, voltage power and energy.	- Connect ammeter, voltmeter, wattmeter, energymeter in elect-ical circuits. - Understand the correct use of Ammeter, voltmeter, wattmeter and energymeter.	Exercise may be performed by the student like situation.
7.3	Multimeter	- know the use of multimeter - handle the multimeter for resistance measurement voltage measurement continuity testing.	Analog & digital multimeter may be used during all electrical exercises in the lab. Student may be given the ideas of range selection. Selection of multimeter for measurement of various quantities.

8.	Electrical Wiring:	- Know the basics about house hold and Industrial electrical wiring.	
8.1.	Domestic wiring:	- describe & identify the types of wiring for domestic use.	Types of domestic wiring shall be shown.
		- draw the wiring diagram of simple utility item.	Student may be asked to make the connections for several domestic appliances like fan, Tube light lamp - with single circuit - with multiswitch circuit
		- identify the conductors their types and use for domestic lighting purpose.	

8.1.	Industrial wiring circuits:	- give the types of conductor and their applications in industries. - draw the wiring layout of a single phase motor. - draw and connect 3 phase s.. motor with the supply throu.. starter, ICTP, fuses etc. - find the size of wire by s.. gauge. - select proper wire/cable fo given task. - name the commonly used acce.. aries and their uses for va.. ous purpose in electrical jobs.	factory visit may be arrang.. for practical demonstrations. may be exercised in lab by the students. Different size/types of wire cable may be demonstrated with their application in Electrical workshop.

5. Electrical Safety (6+4) Hrs.		
- Safety precautions	explain the various safety precautions while working with electricity	- Explain hazards of electricity on human body
- Effect of electrical current on human body	- State the safe limit of electrical current on human body	- Explain use of safe current value in on-line maintenance and repair work
	- Demonstrate artificial respiration method as first-aid	- Show charts and demonstrate art of artificial respiration in the lab
- Artificial respiration	- List various devices used for protection of circuit & electric machine, equipment	- Visit may be arranged to any nearby substation industry/workshop
- Current protection fuse, switches relays MCB, MCCB	- State the necessity of earthing	- Need of earthing giving some examples
- Earthing	- List and sketch two methods of earthing	- Charts & sketches may be demonstrated

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Suggested list of Experiments Demostration & Visits

I
(1) Varification of OHM's laws.
(2) Varification of kirchhoff"s laws
(3) Experiment on series & parallel connections of resistances.
(4) Measurment of power in simple circuit.
(5) Measure resitance of Various cross section & length of wire of same material

II
(1) Study of various electromagnets,relays contactor, solenoid
(2) Operate them at to rated current and see the effect on pulling force visualise chattering phenomenon

III
(1) Calculate AC.and DC.resitance in R & L series ckt.
(2) Measure I, V in series R.L.C. ckt.and calculate power factor. Draw vector diagram.
(3) Measure V,I in parallel RLC circuit and calculate p.f.

IV
(1) Study of various parts of DC machine.
(2) Study of motor starters.
(3) Speed control of DC shu motor by
(i) flux control & (ii) armature voltage control
(4) Reversal of DC motor

AC machines -
(1) Study construction of a transformer
(2) To find transformation ratio of a given transformer
(3) Study construction of AC machine (motor & geneater) Name main part also study of various types of enclosures.
(4) Study of various types of AC starters.
(5) Connections of single phase capacitor motoer.

Measuring instruments -
(1) Connection of ammeter, voltmeter and wattmeter in AC ckt.
(2) Connection of energy meter
(3) Measure current by clip on ammeter.

I (1) Study of standand wire gauge and to find gauge number of a given wire therby finding the current from table
(2) Connection of tube light controled by switch.

II Safety, protection & maintenance
(1) Demonstration of various types of faults (open ckt, short ckt, earth fault)
(2) Demonstration of artificial respiration (By charts etc.)
(3) Explain the importance of maintenance on actual machine

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Reference Books

1. Electrical Engineering
   basic technology (GIZ book)

2. Fundamentals of electrical Engineering
   by Deltoro (Printice Hall Publisher)

3. Estimating and costing (electrical)
   by S.L.Uppal

4. Electric Machines
   (Vol-I by P.S.Bhimbra)

5. Electrical Machines
   by Deltoro (Printice Hall Publisher)

6. Electrical installation and workshop technology
   (Vol-I & II by Thomson)

7. Electrical Engineering measurement
   by E.W.Goldine (Willey Eastern Publisher)

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PROGRAMME: DIPLOMA IN PRODUCTION ENGG.
SCHEME: REVISED, IMPLEMENTED FROM 1995-96
SEMESTER: FIRST
COURSE: Workshop Practice & Safety

Diploma in Mechanical Engineering with specialization in Production Engineering is a manufacturing processes know-how -- intensive course leading to employment primarily in metal component processing,producing industries. An approach to realize difficulty in learning or performing activities involving some basic skills and developing a `Feel' for these is the key to this curricula. It is visualized that it shall greatly help the students to appreciate difficulties & work-problems of their fellow workers and thus be sensible technicians.

The work-experience would also help them to understand the intricacies of industrial working in relatively shorter period of time. Moreover the contents of this curricula forms a basis & link for study of manufacturing processes in second & third year.

The students are advised to undergo each skill experience with an understanding of know-how with special emphasis on know why for the various instructions imparted to them in each shop.

Workshop Practice

	Rationale	Theory	Practicle	Page
1.	Introduction to workshop	1	-	-
2.	General Safety rules	2	-	-
3.	Fitting shop	9	44	-
4.	Carpentary shop	8	34	-
5.	Black smithy & forging	6	18	-
6.	Sheet metal	8	36	-
7.	Revision	4	-	-

NOTE -

1. Theoretical inputs will be provided on shop floor during workshop practice
2. Shop safety should also include `First aid' training for shop-specific hazards such as burns in black-smithy,cuts in sheet metal, swelling in fitting etc.

LIST OF REFERENCE BOOKS

Work shop technology - Hazra & Choudhary

Production technology Vol.I & Vol.II - R.C.Patel & C.G.Gupta

Work shop technology - Raghuvanshi

Technology of metal trade - GTZ (Available at PDU)

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1.	Introduction to institutional workshops (1 Hrs.)	The students will be able to	
1.1	Location of various workshops in institution	Know location of various shops shops - Identifies faculty members and their roles	
1.2	Organogram of workshop & introduction to workshop staff		
1.3	Type of material used in each shop and nature of jobs performed with special reference to black smithy, sheet metal, carpentary and fitting shops.	Understand the types of jobs done in each shop and materials used there in. - Identify the types of jobs which are performed in different shops. - Identify the type of materials normally used in different shops. Know broadly the interlinkages of jobs performed in each shop.	
2.	General safety rules of workshops (2 Hrs.)	Understand the importance of following general safety rules in workshops - State the general safety measures to be observed in workshops - State the general house-keeping activities - Prepare a list of general safety rules to be followed by him in workshops.	Suitable sketches & charts depicting unsafe & safe situations, safe practices in workshops and examples of poor good house keeping.

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3.	Fitting shop (45 hrs pract + 9 hrs theory)		
3.1	Fitting shop layout (1/2hr + 3 hrs.	Know the shop layout - sketch & label the details of shop layout - describe the purpose of each facility Understand the functions of fitting shop - state that purpose of fitting shop is to correctly & properly assemble the machine components - comprehend that machine/item mass jobs have size variation.	
3.2	Type of jobs done in fitting shop (1/2 hr.(Demonstration)		
3.3	Commercially available metal/alloys & the sections	Know commonly used metal/alloys used in fitting shop & their commercially available sections - list the commonly used metals/alloys - state at least five section's shape & size of metals/alloys used in institution workshop	Use relevant IS. Introduce commonly used materials with their samples of different cross-sections.
3.4	Basic information required by a fitter about a job	Know the basic information required by a fitter i.e.drawing with tolerances,type of required fit, metal used etc. - state the necessity of drawing and tolerances mentioned on it - name the types of fit - state use of each type of fit - infer that different metals have different hardness & strength.	
3.5	Fitting operations	Use fitting tools,inspection & measuring instruments to produce given jobs with high degree of skill - choose correct shape and size of blanks for a given job drawing - do marking as per drawing using correct method, tools & sequence - select correct operations for the job e.g. sawing,filing,scraping,drilling etc. - select correct type and size of tool & inspection/measuring instrument - clamp the job in correctly chosen clamping device with proper vice clamps [illegible] at correct height. - saw,file and or scrap the job with correct body posture,method and precision, exercising personal judgement of the need of the force. - inspect the job as frequently as necessary - remove burns before finally submitting the job Observe safety procedures - follow safety rules applicable to fitting operations - arrange tools at work table in proper manner - report safety - hazards, if any existing in shop Know use of fitting tools - sketch various tools - label their parts - describe their type & size - describe the use of each tool - classify fitting tools as marking tools, clamping devices, striking tools cutting tools etc. Know the marking out & inspection instruments - sketch and name various instruments for marking out & inspection - state use of each one of these.	Prepares 4 jobs satisfying evaluation criteria. N.B.- Mention criteria for evaluation of each job while assigning the jobs. The criteria should be gradually difficult from job 1 to 4 so that on fourth job desired skill level is attained by the students. Surface plate marking block, striber,tri-square,bevel protractor etc.

3.6	Screw threads 2 hrs.Pract + 1 Th.	Use different screw threads depending upon application - assemble different components with matching threads by listing use of each set of assembled components e.g.screw jack for lifting, nut-bolt for tightening - select proper type of screw thread for given application of general nature - produce screw threads of acceptable quality by using tap and die - inspect the screw threads by using screw gauge. Observe safety procedures. - follow safety rules as applicable to tap & die application Know common types of screw threads and the terminology used - sketch & label details of a. metric thread b. whitworth thread.	Refer IS. Hand made threads, use of taps & dia
3.7	Specification of fitting tools, measuring & inspection instrument & marking out equipment (2Th + Demo)	Know to specify the tools, instruments and equipment used in fitting shop - state need for complete & correct statement of specifications in purchase - list the factors to be considered in specification of fitting tools and measuring instruments - specify at least three fitting tools and two measuring instruments	- Detailed catalogues of fitting tools are recommended for instructions - students may be advised to visit & enquire from some shop keepers that if they wish to purchase fitting files what details should they write.
4.	Carpentry shop. 34 pract + 8 theory		
4.1	Carpentry shop layout 1/2 hrs.	Know the general layout of shop - sketch & label details of shop layout - describe the use of each available facility	Proportionate sketch be emphasised
4.2	Type of jobs produced in carpentry 1/2 hrs.	Understand the function of carpentry & know the types of job produced therein. - state at least ten different products of carpentry - comprehend that basic raw material used is timber - name & specify commercially available forms of timber such as plywood, Mumood etc.	Students may be asked to collect catalogue, and study the details of specification.
4.3	Basic information required by a carpenter about the job. 1/2 hrs.	Know the basic information required by a carpenter - state that the basic information includes purpose of job,drawing giving shape, size, required, timber/raw material to be used etc. - identify the type of joints to be made - state if the joints are to be secured using screws nails etc.	

4.4	Commonly used raw material. 1hr.	Know the commonly used raw material and their commercially available shape & size - name the various types of raw material used such as timber as planks,battens etc.ply boards,sunmica etc. - list the application and use of each type of raw material - selection of timber among variety of commercially available timbers & their sections.	Sample of each type of raw material may be used for demonstration. students may be advised to visit some timber merchants and collect details and report.
4.5	Carpentry operations	Use the carpentry hand tools,machines, inspection & measuring instruments - demonstrate the correct use of various carpentary tools - selects proper tool for different carpentry operations Perform carpentry operations and produce given jobs with acceptable level of skills as per stated criteria. - choose correct shape,size & type of timber blank for a given job drawing. - do marking out as per drawing using correct method,tools and sequence - select correct operations for the job e.g.sawing,chiselling,planning etc. - select correct type and size of tools & measuring and/or inspection instruments - clamp the job correctly in chosen clamping device with proper clamping force at correct height - saw, plane, chisel etc. the job with correct body posture,method & precision exercising personal judgement of the required force. - inspect for size and quality of finish during operation and on completion of operation in proper manner using right instrument & personal judgement - assemble the components produced - inspect for proper joint quality & take remedial steps.	Machines like carpenter's lathe,jig saw,circular saw,wood planer to be introduced as per their availability in the institution. Otherwise catalogues may be used with advantage over text books. Prepare 4 jobs satistfying evaluation criteria. Refer suitable book for assigning jobs and stating evaluation criteria. N.B.- Mention criteria for evaluation of each job while assigning the jobs. The criteria should be gradually difficult from job 1 to 4 so that an fourth job desired skill level is attained by the students. a. Refer suitable book for job selection. b. Mention criteria for evaluation of each job while assigning the job. c. The criteria should be gradually more stringent so that the last job has finally desired out put level
4.6	Finishing & polishing of carpentry products	Polish a job made of timber - follow safe practices as applicable to polishing - respond to first aid need of peers,if any - volunteer and assist in first aid Know the finishing and polishing of carpentry job. - name & describe commonly used finishing & polishing methods - name the polishing materials used	

4.7	Specification for carpentry tools	- State the need for complete & correct specifications - list the factors to be considered in finalising specifications - specify carpentry tools like saws, planes, chiesels, vice, hammer etc.	Detailed catalogue from reputed suppliers are recommended for instruction.
5.	Black smithy & forging shop. 10 hrs. Practicle 6 hrs. theory	Know the general layout of shop	
5.1	Layout of black smithy & forging	- sketch & label the shop layout. - describe the use of each available facility on the shop layout	Proportionate sketch is emphasised.
5.2	Type of jobs produced in a. black smithy shop. b. forging shop.	Understand the function of black smithy & forging shops and know the type of jobs produced there in - list at least 5 jobs produced in a. black smithy shop b. forging shop - distinguish between black smithy and forging shop on the basis of type of furnace, method of application of force, job size & accuracy. - name the commercially used raw materials in these shops. - state that size variation permitted on forged jobs is less than black smith jobs	
5.3	Basic information required for jobs to be made in these shops	Know the basic information required by a. black smith is purpose, general shape weight, material & heat treatment b. forgemen is shape, size, material & finish quality. - state that the black smith/forgemen must know the desired weight shape, size & heat treatment required & one with metal/alloy name - conclude that every metal/alloy can not be forged and/or heat treated i.e. hardened & tempered. - different material need to be healed to different temperature for forging - infer that all materials loose strength as its temperature is increased	Demonstrate a few jobs produced in a. smithy shop & b. forging shop

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5.6	Forging operations	Know some forging operations - observe furnace operation & type of heating system used - observe forging operations carried out on shop floor - observe the quality of finish and extent of details attainable on forged components.	A visit to a small forging shop and a large forging shop is required for this purpose.
5.7	Safety	Know the safety regulation in black smithy & forging shop - state & observe safety measures - demonstrate use of first aid in case of minor burns on body.	
5.8	Specification of furnaces, smithy & forging tools	Understand the method of specifying the black smithy & forging tools & facilities - state the factors to be considered in selection of furnace specifications. - specify furnace & major smithy as well as forging tools.	
6.	Sheet metal shop 36 hrs. Pract & hrs. theory		
6.1	Sheet metal shop layout	Know the shop layout - sketch & label details of sheet metal shop layout. - described the purpose of each facility	
6.2	Types of jobs produced in sheet metal shop	Understand the function of sheet metal shop and the type of job made there in. - state at least five different products of sheet metal shop. - comprehend that the sheet metal is basic raw material - commercially available metal/alloys and the sections Know commonly used material and their commercially available sizes - commonly used material are G.I.sheets, hot rolled iron steel sheets and non-ferrous sheet metal - state commercially available sizes and thickness of G.I.& Iron sheets	
6.3	Basic information required by sheet metal worker	Know the basic information required by a sheet metal worker before performing a job - state that the requisite information include drawing, purpose, type of joint, material and quantity to be produced. - state that type of joint determines the allowance and quantity helps determining job layout on sheet - state and appreciate that ability to determine development of sheet is a must for a sheet metal worker	Demonstration of some simple sheet metal job alongwith its finish-drawing.

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6.4 Sheet operations

Job sheet metal shop tools, inspection gauges and instruments in making a given job with high degree of skill

- choose correct shape and size of sheet for a given job-drawing considering the allowance for joint or seam
- mark out as per drawing using correct method tools & sequence.
- select correct operations in preparing the job e.g. shearing, chisel cut deburring folding, bending, strengthening (wired edge/beaded edge/grooved edge etc) welding/rivetting
- select correct type and size of tool & inspection means
- clamp or hold the job appropriately for various operations
- perform the chosen operations using correct method & precision applying individual judgement
- perform hand riveting operation with acceptable quality of finish
- inspect the job in progress as and when necessary using correct instrument/gauge

Measuring tools like folding steel rule, thickness gauge vernier, micrometer bevel protractor etc lay out tools like steel square dividers scriber punches etc. tools like chisels shears snips, pliers, tongs etc. & folding machine bending machine rooing machine etc.

6.5 Safety

Observe safety precautions & procedures.

- follow safety rules applicable to sheet metal shop.

Arrange tools at work place in proper manner

Know the sheet metal tools & operations

- sketch & label parts of sheet metal shop tools
- state use of each tool and the operation that can be performed using the tool
- state names of at least 5 operations in sheet metal shop
- calculate allowance for seam or joint.

6.6 Specification of sheet metal tools

Know to specify the sheet metal tools

- state the factors to be considered in selection of tool
- specify at least five commonly used sheet metal tools

6.7 Painting of sheet metal products

Paint a sheet metal job

- describe the steps in painting sheet metal product
- apply primer, putty and paint at least on one job
- apply paint by hand brush to achieve a good finish

7. Consolidation & revision

- understand the difference in quality, nature of job & functions of basic shops
- compare the type of jobs difficulty level & skills required in different basic shops
- recapitulate names & uses of types of tools operations

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Curriculum

for

Second Semester

Diploma in Production Engg.

(Under Indo-German Project)

Implemented from 1995-96
(Based on Semester System)

M.P. Board of Technical Education,
Office Complex, Block A/IV, Gautam Nagar, Bhopal - 462-023

M. P. BOARD OF TECHNICAL EDUCATION, BHOPAL

SECOND SEMESTER DIPLOMA IN PRODUCTION ENGG. **(REVISED, IMPLEMENTED FROM 1995-96 AT BHOPAL & INDORE)**

S. No.	Name of Subjects	Scheme of study			Scheme of Examination										
		THEORY	LAB	TOTAL	SESSIONALS		PROGRESSIVE ASSESSMENT		BOARD EXAMINATION						REMARK
					TERM WORK	Lab. WORK	I	II	THEORY PAPER	DUR-ATION	MARKS	PRACT.	DUR-ATION	MARKS	
1.	Engineering Mathematics-(P.C. 1327)	4(64)	-(-)	4(64)	20	-	10	10	1	3HRS	100	-	-	-	
2.	Basic Engineering Drawing (PC. 2053)	-	12 (192)	12 (192)	50	-	10	10	1	4HRS	100	1	3HRS	50	Viva-voce
3.	Mechanical Engineering Science-I (P.C. 2054)	6(96)	4(64)	10 (160)	20	30	10	10	1	3HRS	100	1	3HRS	50	
4.	Mechanical Engineering Science-II (P.C. 2055)	6(96)	4(64)	10 (160)	20	30	10	10	1	3HRS	100	1	3HRS	50	
	TOTAL	18 (288)	18 (288)	36 (576)	110	60	40	40	4	-	400	3	-	150	

NOTE:

1. No. of theory paper: 04
2. Total theory marks: 400
3. No. of Practical: 03
4. Total Practical Marks: 150
5. In-plant Training Marks: Nil
6. Total marks of Sessionals, Prog. Assessment, Pract. & In-plant training: (110+60+40+40+150=400)
7. Ratio of theory marks and total of: 400:400 sessional, Prog. Assess., Pract. and i.e.1:1 In-plant training
8. Total marks: 800

Total marks of I and II semesters=800+800=1600

9. Passing marks for
   a. Theory: 33%
   b. Practical : 40%
   c. Sessional: 60%
   d. In-plant training: 50%

NOTE: All students have to undergo TCPC training of FOUR weeks immediately after second semester examination.

Amendment for Phase-I training as approved in the Board of Studies meeting held on 6/6/2000:

All students have to undergo **TCPC training of TWO weeks** immediately **after second semester examination.**

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Mathematics forms backbone for all analysis of problems and design of products in engineering fields and hence it occupies an important place in the curriculum of technical education. The subject is equally important for the future self-development of polytechnic students. In designing the curriculum for first year the admission level to polytechnics has been considered as 10th Board examination and mathematical needs of Technical subjects have been given due consideration.

~~Mathematics I~~ Engineering Mathematics

Topic	Theory Hours
1. Algebra	20
2. Trigonometry	10
3. Mensuration	8
4. Co-ordinate Geometry	10
5. Statistics	12
6. Differential calculus	07
7. Integral calculus	08
8. Vector Algebra	08
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1. ALGEBRA

S.no.	Topic/sub topic	Objective/I.L.O.	Remarks
1.1	Simultaneous equations for 3 unknowns (4 Hrs.)	The student will be able to solve simultaneous equation - solve simple equations by elimination method - solve the equations by cross multiplication method - arrange given information in terms of simultaneous equation	
1.2	Quadratic equation (5 Hrs.)	Understand the concepts of quadratic equation. - state standard form of quadratic equation - compute roots of quadratic equation by factorisation method and quadratic formula - compute the nature of roots - state the discreminant of equation - form the quadratic equation - apply the quadratic equation to solve simple engineering problems	stress may be given on use of formula rather than deriving those

Rationale

Mathematics forms backbone for all analysis of problems and design of products in engineering fields and hence it occupies an important place in the curriculum of technical education The subject is equally important for the future self-development of polytechnic students. In designing the curriculum for first year the admission level to polytechnics has been considered as 10th Board examination and mathematical needs of Technical subjects have been given due consideration.

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5. Statistics	12
6. Differential calculus	07
7. Integral calculus	05
8. Vector Algebra	08
	80

1. ALGEBRA

S.no.	Topic/sub topic	Objective/I.L.O.	Remarks
1.1	Simultaneous equations for 3 unknowns (4 Hrs.)	The student will be able to solve simultaneous equation - solve simple equations by elimination method - solve the equations by cross multiplication method - arrange given information in terms of simultaneous equation	
1.2	Quadratic equation (5 Hrs.)	Understand the concepts of quadratic equation. - state standard form of quadratic equation - compute roots of quadratic equation by factorisation method and Quadratic formula - compute the nature of roots - state the discriminant of equation - form the quadratic equation - apply the quadratic equation to solve simple engineering problems	stress may be given on use of formula rather than deriving those

1.3	Partial fractions (4 Hrs.)	Understand tne term partial fraction - differentiate the proper and improper fractions. - compute the partial fractions, when the denominator contains non-repeated linear and repeated linear factors - resolve into partial fractions when the denominator contains non-repeated quadratic factor		
1.4	Complex numbers (3 Hrs.)	Understand tne term complex numbers - state examples of the imaginary quantity - state exarples of real and complex numbers - compute modulus of complex numbers - reduce a given simple mathematical expression in the form (a+ib).		
1.5	Graph (4 Hrs.) Straight Line Graphs	Understand construction and the use of graphs - construct straight line graphs. - reduce equation of the form y = a (x raise to the power n) to linear forms.	- Axes and quadrants - Deducing the equation of straight line graph - Reducing equation of the form y = a.(x raise to the power n) to linear form.	
	Graph with logarithmic scales	Know the use of logarithmic scales - construct graphs with log-log scales and semi-log-scales. - illustrate the use of such graphs in engg.applications.	- Reducing equation of the form y = a.(x raise to the power n) to linear form using log-log graph paper - Reducing equations of form y = a.ie raise to the power k.x) linear form using log-linear graph paper.	

S.no.	Topic/sub topic	ILO	Remark
2.	TRIGONOMETRY		
2.1	Trigonometrical ratios (6 Hrs.)	Know the trigonometrical ratios - state the trigonometrical ratios of allied angles - state the sum, difference and product formulae of trigonometrical ratios - state multiple and sub-multiple angles and their formulae - solve simple problems related to direct use of above formulae	
2.2	Properties of triangles (4 Hrs.)	Know the properties of triangles - state the relations between sides and angles of a triangle - compute the area of triangle when the sides of traingle are given	
3.	MENSURATION	Know to compute the areas of circular bodies and surface area and volume of regular solids	
3.1	Circular areas, - circle, sector, circular ring (4 Hrs.)	- calculate areas of a circle, sector, circular ring.	Refer exercises given on page 47 and 49 of "Technical Mathematics for metal trade."
3.2	Area and vloume of cylinder, prism, Pyramid, cone and sphere. (4 Hrs.)	- compute the surface area of regular solids - compute the volume of regular solids	Refer exercises given on page 51 and 53 of "Technical Mathematics of metal trade."
4.	COORDINATE GEOMETRY	Know mathematical procedure to find out distance between two points - define, origin, axes and coordinates of a point. - compute the distance between two points	
4.1	General coodinates	Know to find out the coordinates of the points which divides a straight line in a given ratio. - compute the coordinates of the point which divides a straight line in a given ratio - define pole, radius vector and vectorial angle, - state relation between Cartesian and polar coordinates - compute the conversion of Cartesian to polar coordinate and vice-versa	

4.2	Straight lines (5 Hrs.)	Know about differant forms of equation of a straight line. - state slope of a straight line - state the different standard forms of a straight line - state general equation of a straight line - compute slope of a straight line - reduce the general equation of a straight line to standard forms - use the equation of a straight line passing through one point - use the equation of a straight line passing through two points - solve the probleas relating to standard forms, point slope form and passing through two points - compute the angle between two straight lines - state the conditions when the two straight lines are i) perpendiculer and ii) parallel
5.	STATISTICS	
5.1	Measures of Central Tendency (5 Hrs.)	Understand the concepts about central tendency - recapitulate mean,median for grouped and ungrouped data - state the formula for mean - compute mean for grouped and ungrouped data
5.2	Measures of dispersion (4 Hrs.)	Know about different measures of dispersion. - state the formula for standard deviation for grouped and ungrouped data - compute standard deviation for grouped and ungrouped data - state the coefficient of variance - compute mean deviation for grouped and ungrouped data - define coefficient of skewness and chi-test
5.3	Presentation of statistical information - - Data classification and frequency distribution, Histograms, Frequency polygons, Pie charts, Distribution curves and problems. (3 Hrs.)	Know to present statistical information in the the form of charts. - classify data - find out frequency - plot histograms,polygons etc. - plot Pie-charts from the given data - raw distribution curve - solve simple problems using normal distribution curve information

S.No.	Topic/sub topic	Objective/ILO	Remark
6.	DIFFERENTIAL CALCULUS		
6.1	Introduction meaning of limit x approaches a	Understand the concept of limit - define constant, variable and functions - state concept of limit - etc.	
6.2	Differentiation (7 Hrs.)	Know to find out derivatives of algebraic and trigonometric functions. - state the standard forms of derivatives of algebraic and trigonometrical functions - compute the differential coefficient of product and quotient of two functions - determine the derivative of a function of a function - determine the derivatives by logarithmic differentiation - state implicit function - determine first and second derivative of simple algebraic trignometric functions	
7.	INTEGRAL CALCULUS		
7.1	Introduction (1 Hrs.)	Know application of differentiation - Derive expressions for velocity, acceleration, maximum and minimum values. - solve simple problems	
7.2	Methods of integration (3 Hrs.)	Know the methods of integration. - define integration as the reverse process of differentiation - state standard forms - integrate the functions by substitution method - integrate the product of two functions by product formula - integrate a function by breaking into a sum of functions	
7.3	Definite Integral (2 Hrs.)	Know to solve problems on definite integral - state lower and upper limit - evaluate the definite integrals by substitution	
7.4	Application of integration to areas and volumes - Area between a curve, the x-axis and given co-ordinator - Area between two curves - Volume of solids of revolution.	Know the applications of integration in finding out areas and volume - correlate the use of integration in engineering applications.	

VECTOR ALGEBRA

8.1	Scalar and vector quantities (1 Hr.)	Know about scalar and vector quantities - state scalar and vector quantities - define equal, collinear, coplaner, unit and null vectors. - define i,j,k. unit vectors - state the components of a vector - write the vector in terms of coordinates and i,j,k - state the modulus of a vector - find the vector when the position vector of two point are given - compute the angle between two vectors. - etc.
8.2	Operation of vectors (2 Hrs.)	Know about different vector operations. - state triangle rule - solve the problems on triangle rule - solve the problems when the position vectors are given
8.3	Product of vectors (2 Hrs.)	Know to find out products of vectors - define scalar product - determine the angle between two vectors - state the condition of perpendicularity - compute the scalar product - define vector product - state modulus of cross product - compute the angle between two vectors - state the condition of parallelism - compute the vector product - etc.

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PROGRAMME: DIPLOMA IN PRODUCTION ENGG.
SCHEME: REVISED, IMPLEMENTED FROM 1995-96
SEMESTER: SECOND
COURSE: Basic Engineering Drawing (PC. 2053)

RATIONALE

Engineering drawing, being the universal language of engineers for effective communication, has a vital role in the professional practices of technicians. Development of basic skills related to drawing are needed in all the disciplines of engineering. It is one of the important aims of any technician education. This course of Basic Engineering Drawing for diploma programmes is aimed at developing a a foundation of such basic knowledge and skill. The aim of incorporating the I.S.696-latest revision is to train the students in standardising the pictorial language.

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BASIC ENGINEERING DRAWING

Scheme of Studies

Sl.No.	Topic	Contact Hours Theory	Pract.	Tot.	Plates
1.	Introduction	2	-	02	-
2.	Engineering lines and letters	3	9	12	1
3.	Layout and Dimensioning	3	-	03	1
4.	Conventions & Symbols	4	6	10	-
5.	Scales	4	9	13	2
6.	Geometrical constructions	4	12	16	2
7.	Engineering curves	6	12	18	2
8.	Theory of Projections	3	-	03	-
9.	Projection of points, Lines and planes	6	15	21	2
10.	Projection of geometrical solids	6	15	21	3
11.	Section of solids	6	15	21	3
12.	Isometric views	6	15	21	3
13.	Free hand drawing	3	4	07	1
		56	112	163	20

BASIC ENGINEERING DRAWING

Course Contents

Topic	Contents
Introduction	Introduction to engineering drawing, drawing materials, equipments, instruments and their usey.
Engineering Lines and Letters	Different types of engineering lines, practice problems for representation of each type of line, standard practice for writing single stroke vertical and inclined capital and lower case gothic letters and numerals.
Layout and Dimensioning	Planning of drawing sheet as per IS 696, boundary lines and title block. Types of dimensions, system and arrangement of dimensioning, correct dimensioning practices.
Conventions and Symbols	Identification and representation of various conventions and symbols used in engineering drawings.
Scales	Importance of scales in engineering drawing, types of scales - plane, diagonal and vernier scales, practical problems for constructing various types of scale.
Geometrical Construction	Bisect a line and arc, divide a line in-to number of equal parts, circle through 3 points, circle touching two

	Engineering Curves	Type of engineering curves, method of construction of engineering curves, practice problems of drawing various curves.
	Theory of Projections	Orthographic projection - first and third angle methods, pictorial projections - classification - Axonometric, oblique & perspective (orthographic projection in detail and pictorial in brief).
9.	Projection of Point, Lines and Planes	Projection of points situated in different quadrants, Projection of lines in different positions w.r.t. H.P., V.P. and lines inclined to both HP & VP, their true length. Planes in different position with respect to HP & VP. Practice problems on point, lines and planes.
10.	Projection of Geometrical Solids	Types of solids, terminology, position of solid with fespect to HP & VP. Projections of solids in different position with respect to HP & VP. Practice problems to draw projections of solids.
11.	Section of Solids	Concept of sectioning planes, auxilary planes and true shape of the section. Practice problems for drawing orthographic sectional projections of solids.
12.	Isometric Projections	Isometric scale, isometric axes, isometric views of polygons, circle, geometrical solids like prism, pyramid, cylinder and cones.

13.	Free hand Drawing	Free hand drawing material, free hand drawing practice for straight lines, arcs, circle, angle, geometrical figures, solids by proposition, free hand orthographic projections of simple objects.

List of Reference Books

1. I.S. 696 - Latest revision
2. Engineering Drawing - N.D. Bhatt
3. Engineering Drawing - R.B. Gupta
4. Engineering Drawing - P.S. Gill
5. Engineering Drawing - O.N. Ghose
6. Engineering Graphics - K.L. Narayan & P Kannaiah
7. Geometrical Drawing - R.K. Dhawan
8. Technical Drawing - Giesecke, Mitchell, Spencer, Hill.

PROGRAMME: DIPLOMA IN PRODUCTION ENGG.
SCHEME: REVISED, IMPLEMENTED FROM 1995-96
SEMESTER: SECOND
COURSE: Mechanical Engineering Science-I (P.C. 2054)

RATIONALE

Mechanical Engg.Science I includes the course of Applied Mechanics and strength of Material. It is intended to expose the students to the principles of mechanics with the help illustrations selected from the field of engineering.

A basic knowledge of this subject is considered a necessity for a technician who is engaged in production, operation or maintenance. Technicians have to deal with different types of forces acting on components, by them. Accordingly they should possess the knowledge of laws of forces, motion and their applications in different practical situations.

Only those topics which form common requirement are included in the subject of Mechanical Engg.Science I.

SCHEME OF STUDIES
MECHANICAL ENGINEERING SCIENCE - I
(App.mechanics and strength of material)

No.	Contents	Theory Hours	Lab Hours
1.	Statics (Force,Moment,couple	10	12
2.	Centre of Gravity	5	4
3.	Moment of Inertia	10	-
4.	Friction	15	6
5.	Simple lifting machines	10	14
6.	Work,power and energy	10	04
7.	Direct stress and strains,	15	16
8.	Shear force and Bending moment	10	-
9.	Bending stresses in Beams	10	-
10.	Deffection of Beam	7	-
11.	Torsion	10	-
		112	56

The experiments mentioned in 'Remark' ..... are required fulfilment of curriculum needs. These shall be required to be performed ever during practical examination.

S.No.	Topic/sub-topic	ILO's	Remark
1)	STATICS	The student will be able to	
1.1	- Scalar and vector quantities	Understand the concept of scalar and vector quantities. - Define the scalar and vector quantities - Differentiate the scalar and vector quantity by illustrating examples.	
1.2	Force - Definition unit, magnitude - Type: compression, tension and shears force Internal and external forces, parallel force-like and unlike - Effect of force - Characteristics of force	Comprehend the meaning of the force and its effects. - Define force - State the unit of force - etc. - List the types of forces - Explain the effect and characteristics of force	Teacher will explain diffrent type of force by going suitable example.
	- Principle of transmissibility of forces - Free body diagram	Understand the principle of transmissibility of force - Explain the term 'free body diagram' - Define the principle of transmissibility of force - Construct free body diagram for a given force system acting on a body	Emphasis should be the numerical proble
	- Resultant of a system of forces Triangle law of force polygon law of force and (1.1,1.2 - 6 hrs.)	Compute resultant of a system of forces. - Define the term 'resultant' - Find out the resultant of force for a given system - Resolve forces by applying law of - Resolve the forces usint the law of polygon of forces triangle of forces - Resolve forces using vector method	Verify the law of polygon lab
1.3	Moment : Turning effect - Resultant moments - Equilibrium of forces	Understand the principle of moment - State the meaning of moment and its effect in turning - Illustrate the practical situation of equilibrium of forces	

1.4	Couples Definition, classification - couple and force combination - characteristics of a couple (1 Hr.)	Understand the phenomena of couples and its effects. - Explain the meaning of the term couple - Show the effect of couple and force combination - Give characteristics of couple - etc.	An experiment to demonstrate the effect of couple is desirable
1.5	Equilibrium of forces - system of force - principle of equilibrium Analytical method: (2 Hrs.)	Understand the principle of equilibrium of forces - Explain the system of forces - State the principle of equilibrium of forces - Use and apply different analytical methods for study of equilibrium of forces.	Verify the law of equilibrium in lab
2)	CENTRE OF GRAVITY		
2.1	- Definition of centre of gravity and centroid	Locate centre of gravity of simple geometrical lamina. - Define centre of gravity and centroid - Differentiate centre of gravity and centroid	Experiment/Lab. exercise for determination of C.G. of simple regular lamina
	Methods of finding out centre of gravity of simple geometrical lamina (2 Hrs)	- Find out centre of gravity of simple geometrical lamina from given data - State the use of finding C.G. in practical applications - etc.	Problems related to lamina such as - Rectangle, triangle, semi-circle, Trapezoid, T-section, I-section, Z-section
2.2	Method of finding centre gravity of solid bodies	Find out centre of gravity of solid bodies from the given data .	Such as cylinder, cone, hemisphere etc. (3 Hrs)

3)	MOMENT OF INERTIA		
3.1	Inertia force, Definition of moment of inertia based on mass & area. (1 H.)	understand the concept of Inertia force.	
3.2	- Moment of Inertia of a plane area (2 Hrs)	- Define moment of inertia on the basis of mass and area.	
3.3	- Methods of finding out the moment of inertia of regular section, hollow section and composite sections (6 Hrs)	- Find out moment of inertion of regular section, hollow section and composite section - State the need to calculate moment of inertia for machine components and mechanisms	
3.4	- Theorem of perpendicular axis - Theorem of parallel axis. (1 hr.)	State the theorem of perpendicular axis and theorem of parallel axis	
4)	FRICTION		
4.1	- Concept of friction	understand the concept of friction	
4.2	- Types of friction-static and Dynamic-sliding and Rolling and pivot friction	- List the different types of friction	
4.3	- Limiting friction force	- Define limiting friction force	
4.4	- Laws of friction	- State laws of friction	
4.5	- Angle of friction - Angle of friction and total reaction - Coefficient of friction (5 Hrs.)	- Define angle of friction, total reaction and coefficient of friction - Describe the need of friction in practical applications - Describe engineering situations where friction is desired to be reduced (As it can not be eliminated) - etc. - Compute the loss of energy and/or force under some given engineering & day-to-day situations - etc.	Data related to co-eff. of friction for common pairs like steel to steel, cast iron to cast iron etc. under lubricated & non-lubricated conditions should be given.

4.6	Friction on inclined plane - Motion up the plane: pull 'P' parallel to and acting up the plane. - Motion down the plane, pull 'P' parallel to the plane - Motion up the plane: horizontal pull P assisting the motion - Motion down the plane, horizontal pull P (8 Hrs)	Understand the change in frictional force with variation in the direction of pull as applied to a body moving up/down on an inclined plane. - Analyse effects of friction on inclined plane with varying pull conditions and direction of motion up and down the plane. - etc.
4.7	- Application of friction-examples such as Belt drives, clutches and Bearings. (2 Hrs)	Describe application of above laws of friction and state with examples its importance in engineering applications.

5) SIMPLE LIFTING MACHINES

5.1 - Basic concept of machine

5.2 - Types of machine

simple & compound machine

(5.1,5.2 - 1 Hrs)

Understand the basic concept of machine

- List different types of machines
- Classify machines into simple and compound machines
- List at least five examples of each type of machines
- State their uses

5.3 - Mechanical advantage

- Velocity ratio and

efficiency of simple lifting machines such as levers pulleys, the differential wheel and axle screw jack. (7 Hrs)

Know about the parameters related to lifting machines.

- Define effort, load, mechanical advantage, velocity ratio, efficiency of machine
- Explain the terms mechanical advantage, velociry ratio and efficiency of machine in relation to different machines.

5.4 - Ideal machine

5.5 - Reversible machine

5.6 - Law of machine.
(5.5 to 5.7 - 2 Hrs)

- Evaluate/compute mechanical advantages, velocity ratio & efficiency for simple problems related to machines
- etc.
- Explain ideal machine, reversible machine and law of machine
- List two examples of each of the above

6.1	- Concept of work	Know how to find out amount of work, power and energy - Define the terms work, power & energy	
6.2	- work done by torque (6.1,6.2 - 2 Hrs)	- calculate work done by torque	
6.3	- power - BHP, IHP mechanical efficiency - mechanical energy (7 Hrs)	- Define BHP and IHP and mechanical efficiency - Given relevant data compute work, BHP,IHP and mechanical efficiency	
6.4	- dynamometers, their use and types Measurement of BHP (1 Hr)	Understand the process of measurement of BHP by Rope brake dynamometers. - explain working of dynamometers and their uses.	- A demonstration on use of dynalnometers is recommended
7.	DIRECT STRESS AND STRAIN	Know the different types of stresses and strains, their importance and relationship & modules of elasticity	
7.1	- Types of load	- list different types of loads and deformation.	
7.2	- Stress and strain - Types of stresses and strain - Hook's law - Modulus of elasticity (7.1,7.2 - 2 Hrs)	- Define stress and strain - Differentiate between stress and strain - compute stress and strain on being given relevant data - Define modulus of elasticity	
7.3	- Tensile test	Know the method of performing tensile test and its importance. - Perform tensile test	- An experiment using universal testing or tensile testing machine and plotting of data
7.4	- stress strain diagram	- analyse the results	
7.5	- Factor of safety (7.3 to 7.5 - 1 Hr)	- compare the results of test of different material	

7.6	- Stress in bars of varying sections	Understand the effect of changes in cross-sectional area as regards to stresses and strains.
	- Principle of superimposition of stresses	- calculate stresses and strain in bars of varying section Understand the principle of superimposition.
		- State and apply principle of superimposition
	- Stresses in composite bars (3 Hrs)	Understand the stress behavious of composite bars
7.7	(Thermal) stresses in simple bars of uniform cross section (2 Hrs)	- define composit bar - list three situation where composite bars are used
	- Thermal stresses in composite bars.	- Calculate the stresses in composite bars.
7.8	- Shear stress on shear strain	Understand the effect of temperature on simple/composite bars (a) free to expand and (b) constrained
	- Modulus of Rigidity	- Define and calculate thermal stresses in bars of uniform cross sections.
	- Elastic constants	Know about stresses and strains due to shear and related elastic constraints
	- Linear strain - lateral strain - Poisson's ratio - volumetric strain - Bulk modulus	- Define shear stress and shear strain - Define modulus of rigidity - Define various elastic constants and calculate poisson's ratio, Bulk modulus and volumetric strain
	- Relation between bulk modulus & young's modulus - Relation between modulus of elasticity and modulus of rigidity (4 Hrs.)	Establish relationship between various elastic constant - Write the relation between bulk modulus and young's modulus - Write the relation between modulus of elasticity and modulus of rigidity - etc.
7.9	- Strain energy and impact loading - Definition of strain energy	Understand the concept of strain energy
	- Resilience	- Define strain energy and modulus of resilience
	- Proof resilience - Modulus of resilience - Strain energy stored in a body when the load is applied (a) gradullaly (b) suddenly (c) with impect. (3 Hrs.)	- calculation of the strain energy under different load condition - etc.

8)	SHEAR FORCE AND BENDING MOMENT	The student will be able	
		- to know beams and the affect of load on beams.	
8.1	- Definition of beam	- define beam	
	- Type of beams	- list types of beam	- Cantilever - Simply supported beam - Overhanging beam - Built-in-beam
8.2	- Types of loading	Know the different types of loading	
	- Concentenated	- list types of loading - explain the meaning of concentrated & distributed - uniform & variable	
	- Distributed (8.1,8.2 - 2 Hrs.)		
8.3	- Bending moment	Know about bending moment and shear force in different types of beams	
	- Definition shear force	- define bending moment and shear force	
	- Shear force and bending moment sign conventions	- state the sign convertions of of shear force and B.M.	
	- Shear force and Bending moment diagram	Understand the method of constructing bending moment and shear force diagrams under varying load conditions.	For cantilever beam with various kinds and combination of loading and for simply supported beams with various types of loading and combination loading
	(8 Hrs.)	- Construct shear force and B.M. diagras under different load c conditions for different types of beam.	- A demonstration in laboratory for different types of beams & their practical applications
		- calculate BM & SF for lever and simply supported beac on being given relevant data	

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9	BENDING STRESSES IN BEAMS	Understand the principle of distribution of stresses due to applied bending load.	
9.1	- Theory of simple bending	- explain the theory of bending and position of internal axis.	Consider examples of square, circular and I-Section beams
	- Assumptions (3 Hrs.)	- enumerate assumptions.	
9.2	- Bending stresses in beams	- define bending stress	
	- Equation of bending, section modulus	- state equation of bending apply equations of bending to calculate	
	- Bending stresses in symmetrical sections. (5 Hrs.)	bending stresses in symmetrical sections	
9.3	- Beam of uniform strength (2 Hrs.)	Understand concept of beam of uniform strength. - Describe the meaning of the term beam of uniform strength - Sketch a cantilever & simply supported beam which may have uniform strength - Explain the need of having a beam of uniform strength	
10)	DEFLECTION OF BEAM	Understand the method of calculating strength and stiffness of a beam	
10.1	- Strength and stiffness of the beam	- Define and calculate the strength and stiffness of beam	
10.2	- Curvature of the bending beam	- Describe the curvature of beam - State some examples of curvature of beam	
10.3	- Importance of deflection & practical application.	Understand the importance of deflection - Appreciate the importance of deflection - Enumerate the practical application	
10.4	- Relation between slope of deflection and radius of curvature. (10.1 to 10.4 - 3 Hrs.)	- Compute relation between slope of deflection & radius of curvature using proper formula & given relevant data	
10.5	- Deflection in simply supported beam with central point load	Know the method for computing deflection in simply supported beams and cantilevers.	
10.6	- Deflection in cantilever with a point load at the free end	- State the relation between slope, deflection and radius of curvature - Find out the deflection in simply	

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List of Practical

1. To verify law of triangle of forces.
2. To verify parallelogram of forces.
3. To verify polygon law of forces.
4. To verify Lami's theorem
5. To verify law of moment
6. To find out C.G.of various regular lamination like triangle,rectangle circle etc.
7. Study the forces in members of jib crane
8. To findout M.A., V.R.and efficiency of
   a. simple wheel and axle
   b. differential wheel and axle
   c. single purchase crab
   d. double purchase crab
   e. simple screw jack
   f. differential pulley block
   g. system of pullys
9. Measurement of B.H.P of an engine by rope brake dynamometer.
10. Tensile test of M.S.specimens on universal testing machine
11. Compression test of aluminium specimens
12. Shear test
13. Bending test (cross braking strength)
14. Izod impact test
15. Charpy test
16. Verification of law of moment by Bell crank lever
17. Coefficient of friction between
    a. different surfaces
    b. glass and other surface
    c. roller, slide & surface

List of Reference Books

(A) Applied Mechanics — (1) I.B.Prasad
-- do -- — (2) R.S.Khurmi

(B) Strength of Materials — (1) K.D.Saxena
-- do -- — (2) R.S.Khurmi
Strength of Materials & Mechanics of Structure — (3) Dr.B.C.Punmia

PROGRAMME: DIPLOMA IN PRODUCTION ENGG.
SCHEME: REVISED, IMPLEMENTED FROM 1995-96
SEMESTER: SECOND
COURSE: Mechanical Engineering Science-II **(P.C. 2055)**

Rationale

The subject of Mechanical Engineering Science - II has been designed to cater to the needs of industries for various mechanical implements which are not directly connected with the narrow concept of Production Engg., but, however, as a part of broad-based Mechanical Engg., one comes across in various spheres of the industrial arena. This subject encompasses the overview of energy, prime movers, internal combustion engines automobiles, compressors, pumps, refrigertion, air-conditioning, environment and pollution control. The emphasis should be on the basic principles and general awareness. In-depth study of the diffferent topics is out of scope. Numerical treatment is avoided. However, the practical aspects are expected to be covered.

Diploma course in Mechanical Engineering
(Production)

Mechanical Engineering Science-II

S.no.	Topic	Theory hrs.	Practical hrs.
1.	Energy	10	14
2.	Prime movers and power plants	20	6
3.	Internal combustion engines	10	4
4.	Automobile	10	18
5.	Compressors	5	-
6.	Blowers and fans	2	-
7.	Pumps	5	4
8.	Refrigeration	8	8
9.	Air conditioning	8	2
10.	Environment and pollution control	6	-
	Total Hours :	84	56

MESCE

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S.no.	Topic/sub topic	Intended learning outcomes (Students will be able to)
1.	ENERGY	Student will be able to
1.1	Definition of energy	Know the basic concept of energy
1.2	Forms of energy - potential - kinetic - internal - Heat energy - chemical energy - electrical energy	and their forms - distinguish between various forms of energy - list the practical application of each form of energy
1.3	Sources of energy - fuels - water - solar - bio-mass - wind - nuclear - tides and waves - geothermal (1.1 to 1.3 : 2 Hrs)	Know the various sources of energy - state the various sources of energy - explain the concept of solar, wind, bio-mass, geothermal, tidal, waves and ocean energy - describe potential of each form of energy for future use. - list the devices which converts solar, wind, biomass, geothermal, tidal, wave, and ocean energy into useful forms of energy - give brief explanation of working of these devices with a simple sketch.
1.4	Types of energy sources	Understand the implications of different sources of energy
1.5	- Energy conversion (law of conservation of energy) - Conversion of heat into work - Direct Energy conversion - Devices, their working concept and use - limitation and potential of energy (1.1,1.5 : 2 Hrs)	- Classify the energy sources - differentiate between conventional/ non-renewable and non-conventional/ renewable energy sources - categorise different types of energy resources in non-renewable and state the renewable ones
1.6	Commercial viability of transformation of energy (1 Hrs)	Understand the law of conservation of energy explain law of conservation of energy with examples. - define mechanical equivalent of heat - explain the concept of direct energy conversion - list the devices used - explain the working principle - give practical applications Understand the terms of commercial viability of transformation of the - explain the term commercially

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1.7	Fluid flow Types of flow - laminar - turbulent - steady - unsteady - uniform - non uniform (2 Hrs)	Know different types of flow - state different types of fluid flow - distinguish between various forms of flow - give examples of various type offlow
1.8	Continuity equation forms of energies related to in fluid flow - potential & kinetic energ - pressure energy - total energy of fluid flow (1 Hr.)	Understand the continuity equation - explain the continuity equation explain the concept of total energy of fluid flow and correlalte it with the the concept of total head
1.9	Concept of - datum prassure (head) - velocity head - pressured head - total head of a fluid particle in motion	- experimentally confirm the concept of total head in fluid flow - state the practical situations where this concept is applied /found
1.10	Bernoulli's theorem - statement - experimental verification - illustrations based on applications (2 Hrs)	Understand the concept of bernoulli's theorem - state the Bernoulli's theorem - identify the various heads considered in Bernoulli's theorem - give some situations where the Bernoulli's theorm can be applied.

2.	PRIME MOVERS	Understand the function of prime movers
2.1	Definition of prime mover	The student will be able to
2.2	Classification of prime mover Based on - - steam - hydro - gas - I.C.engine (2 Hrs)	- state the purpose of prime mover - classify the prime movers - distingwish between various types of prime movers
2.3	Working principle and application of following prime movers - steam engine - steam turbine - water turbine - gas turbine (3 Hrs)	- Explain the working of different prime movers - State application prime movers in various fields of engineering
2.4	Over view of modern power plant - definition of power plant - classification of power plant - hydro plant - steam (thermal) plant - nuclear power plant (3 Hrs)	Understand the working of different types of power plants - state power plant - enumerate two types of modern power plant - give examples of present status of various types of power plants, their future potential.
2.5	Elements of steam power plant Function of each element - generating unit - price mover - Impulse and reaction turbine - auxilliary equipment - turbo generator (5 Hrs)	Draw schematic diagram of steam power plant and identify the essential components and state the function of each components - explain the working of steam power plant with the following circuits - coal and ash circuit,air and gas circuit water and steam circuit,cooling water circuit
2.6	Gas turbine plant open and close components of gas turbine power plant i) compresser ii) combustion chamber iii) turbine	Draw schematic diagram of gas turbine power plant identify the component and - give the function of each component - explain the working of Gas turbine plant - give specific areas of application of gas turbine plant

- Working of Gas Turbine Power Plant
(2 Hrs)

2.7 Elements of hydro power plants, working of hydro power plants

2.8 Nuclear power plant

- Nuclear Fusion and Fission
- Energy from Nuclear Fission
- Nuclear Fission reaction
- Reactor control

(4 Hrs)

3. I.C.ENGINES

(1 Hr.)

3.1 Definition of I.C.Engine

3.2 Classification of I.C.Engine on the basis of

- fuel used
- ignition system
- number of strokes per cycle
- arrangement of cylinders
- application

3.3 Construction of I.C.Engine

Function of essential parts of I.C. Engine & their materials

- engine cylinder block, cyclinder head
- piston & piston rings
- gudgeon pin
- connecting rod bearing
- crankshaft
- camshaft

(2 Hrs)

- explain the working of hydro powr. plant
- draw the schematic diagram
- identity the components of Nuclear Power Plant
- explain the working of nuclear power plant

Know the function of I.C.Engines

- give definition of Heat engine and I.C. engine.
  know the basis on which I.C.Engines can be classified
- classify the I.C.Engines
- disting with between various types of I.C engines
- give extaples of use of particular type of I.C.Engine

Understand the constructional details of I.C.Engines

- explain the construction of I.C.Engine
- enumerate the essential parts
- give functions of each part
- state the materials used for different components.

MESCC

3.4	Working of I.C.Engine (petrol & diesel) - Two stroke - Four storke (1 hr.)	Understand the working of two/four stroke petrol/diesel engines - explain the working of I.C.Engine - explain the working of Two stroke, Four stroke petrol/diesel engines - compare the effeciency of two/four petrol/diesel engines (only theoretical comparison, no numerical analysis to be done)
3.5.1	Systems used in I.C.Engine (basic knowledge) - Fuel supply system and their component - carburettor - fuel pump - fuel ingection pump - injector and nozzle	Understand the working of different systems of I.C.Engines - list various systems I.C.Engine - explain working of fuel system
3.5.2	- Ignition system and their components - coil ignition system a. Battery b. H.T.coil (ignition coil) c. distributor d. spark plug - magneto ignition system	- sketch the Battery Ignition system and lable the various components - explain the function of each components of coil ignition system and magneto ignition system
3.5.3	- Cooling system of I.C.Engine - Need of cooling - Type of cooling	- justify the need of cooling of I.C.Engine - list the types of cooling system - explain the air cooling method - enumerate the components of water cooling system, give the function of each of the component and explain working.
3.5.4	- Lubricating in I.C.Engines - Need of lubriction - Types of lubrication system - Working of the splash and pressure feed lubrication	- justify the need of lubrication of the system - list the types of lubrication - explain the working of splash lubrication - explain the need of pressure feed lubrication - explain the working of pressure feed lubrication - explain the working of gear type oil pump

(3.5.1 to 3.5.4 :- 6 Hrs)

4 AUTOMOBILE

4.1 Introduction of automobile

- Classification of automobile vechiles
  - scooter,motor,cycle
  - light motor vechile (car,jeep)
  - medium motor vechile (minibus,tetador, pickup vans, station wagon
  - heavy motor vechile (buses,trucks)

(2 Hrs)

Know the purpose of automobiles
- define an automobile
- classify the automobile vechiles
- destinguish between various types of automobiles
- give example of practical use of each type of vechile.

4.2 Major components of automobiles

- chassis and body
- engine (power unit)
- transcission system
  a. clutch - function and type
     i) single plate
     ii) multi plate
     iii) centrifugal
     iv) fluid flywheel

(6 Hrs)

Understand the working of diferent components of automobiles
- list the essential components of automobiles
- give the function of each components
- explain the working of different type of clutches..
- state the use of fluid flywheel in automatic transmission system.

4.3 Gear box
- function
- type of gear boxes
  a. sliding mesh
  b. constant mesh
  c. synchro mesh
  d. torque convertor (automatic gear box)

(2 Hrs)

- describe the function of gear box
- list the type of gear boxes
- distinguish between different types from their utility point of view
- identify the components of final drive system and give their function (universal joint, propeller shaft differential and axle.)

5.	COMPRESSOR	
5.1	Industrial uses of compressed air	Understand the use of compressed air in industry - give the application of compressed air in industry
5.2	Classification of compressors and their field of application A. reciprocating and B. open and hermetically sealed unit working of reciprocating and hermetically sealed compressors (5.1,5.2 :- 5 Hrs)	Understand the working of compressor - identify the type of compressor commonly used. - explain the working of reciprocating compressor with a sketch - state the term hermetically sealed compressor give the application of hermetically sealed compressor - explain the working of hermetically sealed compressor unit
6.	BLOWER AND FAN - purpose - classification - constructional details - applications (2 Hrs)	Understand the use of fan and blower - justify the need of blower and fan - give the names of commonly used blower and fans - give exaeples of specific situation in a Production Engg. industry where compressor, blower and fans are used, also mention their purpose.
7	PUMPS	Justify the need of pumps in (i) industries (ii) agriculture, (iii) mining
7.1	Function of pumps	
7.2	Classification of pumps - reciprocating - centrifugal (7.1 & 7.2 :- 1 Hr.)	- list the types of pumps - differentiate between reciprocating and centrifuguel pumps
7.3	Components and working of reciprocating pump Suction and delivery head (1 Hr.)	Understand the working of reciprocating pump - identify the different components of reciprocating pump - explain the working of reciprocating pump

7.4	Principle of centrifugal pump, its components and working (1 Hr.)	Understand the working of centrifugal pump - explain the principle of working of centrifugal pump - list the parts of centrifugal pump
7.5	Comparision of centrifugal and reciprocating pumps (1 Hr.)	- compare the reciprocating and centrifugal pump
7.6	Industrial application of pumps (1 Hr.)	- give the names and specific use of other type of pumps used in industry such as gear pump
8	REFRIGERATION AND AIR-CONDITIONING	Understand the term refrigeration & its unit.
8.1	Definition refrigeration	- define refrigeration
8.2	Unit of refrigeration	- State the unit of refrigeration
8.3	Methods of production of refrigeration such as - cooling by ice - evaporation of a volatile liquid - expansion of compressed gas (1 Hr.)	Know the different ways of producing cold - explain the methods of producing cooling effect
8.4	Classification of refrigeration system on the basis of its use - domestic - commercial -industrial	- list the refrigeration system on the basis of its use.
8.5	Common application of refrigeration - food preservation - cold storage - comfort air conditioning - transportation - chemical industries - medical application - manufacturing and treatment of metal - oil refineries - water cooling and ice making (2 Hrs)	Know the applications of refrigeration - list the application of refrigeration system

8.6	Vapour compression refrigeration system - Essential components of vapour compression refrigeration system i) compressor ii) condenser iii) expansion device iv) evaporator Working of vapour compression refrigeration system with schematic diagram (3 Hrs)	- Understand the working of vapour compression system of refrigeration - list the essential components of vapour compression refrigeration system and give their functions - draw the schematic diagram of vapour compression refrigeration system - explain the working of vapour compression refrigeration system
8.7	Refrigerants - definition of a refrigerant - classification of refrigerant - primary and secondary refrigerant - important properties - common refrigerants in use	Understand the importance of selection of a proper refrigerant - classify the refrigerant - list the important properties of refrigerant - given a situation suggest the refrigerant - enumerate the commonly used regrigerant and give their use
9.	AIR-CONDITIONING	Understand the term air-conditioning and its area of application
9.1	- Definition of air-conditioning	- enumerate the application of air-conditioning in various fields
9.2	- Application of air-conditioning such as:- - Theater - Community halls - Industry - Restaurants - Hospitals - Residence etc. (1 Hr)	

9.3	Psychrometry - Definition - Psychrometric properties a. dry air b. saturated air & degree of saturation c. partial pressure d. dry bulb temp e. wet bulb temp f. dew point temp g. humidity ratio h. absolute humidity i. relative humidity - Psychrometric chart and its use (2 Hrs)	Understand the term Psychrometry and psychrometric properties - define psychrometry - enumerate the different psychrometric properties - explain the different psychrometric properties - show the different psychrometric properties on psychrometric chart
9.4	Psychrometric processes a. heating b. cooling c. humidifying d. dehumidifying e. heating and humidification f. heating and dehumidification g. cooling and humidification h. cooling and dehumidification i. adiabatic saturation - Psychrometric processes on psychrometric chart - Importance of psychrometric processes (2 Hrs)	Understand the different psychrometric processes and their importance - list various psychrometric process and give their definition - show the different psychrometric processes on psychrometric chart - correlate the different psychrometric processes with the term airconditioning

9.5	Air conditioning system - Working of central air-conditioning system - window air conditioner - application and operation	Understand the working of central airconditions system - draw the schematic diagram of central air-conditioning system - list the essential components Understand the working of window air-conditioner - state the use of window air conditioner - give the various sizes of commercially available window air-conditioner - identify the components airconditioner and - explain its working
9.6	Rough estimation of the capacity of air conditioner required for a given size of room	Suggest the capacity of air conditioner on the basis of size of room
9.7	Air cooler application and working (9.5-9.7 : 3 Hrs)	Understand the working of an air-cooler - identify the components of an air-cooler - explain the working of an air-cooler
10	ENVIRONMENT AND POLLUTION CONTROL	Understand the importance of controlling the environmental pollution
10.1	- Definition of environment	- define the term environment
10.2	- Impact of human beings upon environment	- list the constituents of atmosphere
10.3	- Environmental pollution, Green house effect - types of pollution a. air pollution b. water pollution c. noise pollution (10.1 to 10.3 : 2 Hrs)	- define the term environmental pollution - explain Green house effect - state the types of environmental pollution - state the factors contributing to various types of pollution
10.4	Air pollution-control Control particulate contaminants using the devices such as - gravitational settling chambers - centrifugal collectors - wet collectors - fabric filters (Bag house filters) - electrostatic precipitators (2 hrs)	Explain the importance of environment pollution control. - list different devices used for air pollution control.

10.5	Noise pollution and control - Sources of noise pollution - Control of noise pollution - Noise control devices (1 Hr.)	- Enumerate the sources of noise pollution - Enumerate the different noise control devices
10.6	Global warming - Definition and its effects (1 Hr.)	Understand the global warming and its effects - Define the term global warming and state its effects.

Mechanical Engineering Science II

List of Experiments

1. To measure the pressure of water in pipe by a. piezometer b. different types of manometer
2. To verify Bernoullie's theorem
3. Study of solar cooker
4. Study of solar water heater
5. Study of solar water stell
6. Study of solar photovoltaic cells
7. Study of steam turbine models
8. Study of reciprocating pump
9. Study of centrifugal pump
10. Study of petrol engine/diesal engine
11. Study of automobile chassis with respect to layout
12. Location and function of various components
13. Study of the following assemblies used in auto vehicles (a) Engine (b) Transmission system (c) Final drive (d) Braking system (e) Electrical system (f) Steering mechanism
14. Study of various elements of scooter
15. Battery servicing and charging
16. Use of refrigeration tools such as
17. Tube cutter, spring bender, flaring tool, swaging tool, pinch-off tool, different types of wrenches pliers service valve, service gauges, electrical meters, leak detectors.
18. Study of water cooler
19. Study of ice plant
20. Study of air conditioner (window)
21. Study of air-cooler

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List of Reference Book

(A) Heat Engines	Patel & Karam Chandani
Thermodynamics	P.L.Balancy
-- do --	Dom Kundwar
Thermal Engg.Vol.I & Vol.II	Kapoor
(B) Automobile Engg. Vol.I & Vol.II	Dr.Kripal Singh
Automotive Mechanics Principle & Practics	Heitner.J
(C) Refrigeration & Air-Conditioning	C.P.Arora Dom Kundwar Prasad Manohar
(D) Power Plant Engg.	Dom Kundwar
-- dO --	Nagpal
Power Plant Technology	El.Wakil
(E) Conventional & Non-Conventional Sources of Energy	G.D.Rai
(F) Environmental Pollution Control Engineering	Rao C.S

Curriculum

for

Third Semester

Diploma in Production Engg.

(Under Indo-German Project)

Implemented from 1995-96
(Based on Semester System)

M.P. Board of Technical Education,
Office Complex, Block A/IV, Gautam Nagar, Bhopal - 462-023

M. P. BOARD OF TECHNICAL EDUCATION, BHOPAL

THIRD SEMESTER DIPLOMA IN PRODUCTION ENGG. **(REVISED, IMPLEMENTED FROM 1995-96 AT BHOPAL & INDORE)**

S. No.	Name of Subjects	Scheme of study			Scheme of Examination										
		THEORY	LAB	TOTAL	SESSIONALS		PROGRESSIVE ASSESSMENT		BOARD EXAMINATION						REMARK
					TERM WORK	Lab. WORK	I	II	THEORY PAPER	DUR-ATION	MARKS	PRACT.	DUR-ATION	MARKS	
1.	Materials Technology (P.C. 2056)	4(64)	4(64)	8(128)	20	25	10	10	1	3HRS	100	1	3HRS	50	
2.	Manufacturing Tech.-I (P.C. 2057)	4(64)	4(64)	8(128)	20	25	10	10	1	3HRS	100	1	3HRS	50	
3.	Mechanics of Machines & Machine Design (P.C. 2058)	4(64)	-	4(64)	20	-	10	10	1	3HRS	100	-	-	-	
4.	Electronics (P.C. 2059)	4(64)	4(64)	8(128)	20	25	10	10	1	3HRS,	100	1	3HRS	50	
5.	Introduction to Computer and Programming (P.C. 2060)	2(32)	6(96)	8(128)	20	25	10	10	1	3HRS	100	1	3HRS	50	
6.	TCPC Training marks of four weeks after second semester.	-	-	-	-	-	-	-	-	-	-	1	3HRS	100	
	TOTAL	18 (288)	18 (288)	36 (576)	100	100	50	50	5	-	500	4	-	200	

NOTE:

1. No. of theory paper: 05
7. Total theory marks: 500
8. No. of Practical: 04
9. Total Practical Marks: 200
10. In-plant Training Marks: 100
11. Total marks of Sessionals, Prog. Assessment, Pract. & Inplant training: (100+100+50+50+200+100=600)

7. Ratio of theory marks and total of: 500:600 sessional, Prog. Assess., Pract. and i.e.1:1.2 In-plant training
8. Total marks: 1100

9. Passing marks for
a. Theory: 33%
b. Practical : 40%
c. Sessional: 60%
d. Inplant training: 50%

NOTE: All students have to undergo TCPC training of FOUR weeks immediately after THIRD semester examination.

Amendment for Phase-II training as approved in the Board of Studies meeting held on 6/6/2000:

All students have to undergo **TCPC training of TWO weeks** immediately **after THIRD semester examination.**

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APPROVED BY BOARD OF STUDIES ON 27/06/95

Preface

Production Engineering relates to actual Shop-floor working which needs knowledge and skills in several areas with wide divergence such as human and material management, monitoring the operation of process equipment alongwith their maintenance, enhancement of productivity, etc. With growing industrialization and competition, this offers a real challenge to production engineerfor his survival and success in the environment.

Interaction with industry, has repealedly established that practical know-how and skills play a major role in the career of a production engineer. As such, emphasis has been laid more on practical and shop-floor practices. The theory content is included as a support to understand or analyse the phenomenon help in selection ofeconomic and justified alternatives

The optional subjects have been classified in two major groups.

a) Higher Mathematics is meant for those students who are determined to go for higher studies on completion of Diploma. It shall be a binding for these students to opt. for Higher Mathematics infinal year also.

b) Plastics technology and steel fabrication technology;

All those students who intend to go for entrepreneurship or seek employment on completion of Diploma shall opt either for plastics technology or steel fabrication technology. These students will not be allowed to opt for Higher Mathematics in final years.

To develop a visualization regarding working of industry and to provide an exposure to the techniques and equipment not available in industry and the industrial environment it is emphasised to arrange for visit to local industry. This approach shall not only provide a closer liaison with industry but also a possibility for adequate employment.

The marks for 8 weeks practical training shall be included in the mark sheet for the second year production engineering specially to highlight the industrial orientation achieved by the students.

The working group (list enclosed) for developing this curricula anticipates that if properly implementation of this curricula with adequate support of industry, will provide proper background to the students to undertake studies of final year and be more useful to industry or prepared for higher education.

S.K. Verma
Indian Team Leader
PDU Bhopal.

D.J. Hahn
German Team Leader
PDU Bhopal.

III

CURRICULA FOR SECOND YEAR DIPLOMA IN PRODUCTION ENGINEERING

WORKING GROUP

Chairman : Mr. S.K. Verma,
Indian Team Leader
PDU, Bhopal

Advisor : Mr. D.J. Hahn
German Team Leader
PDU, Bhopal

Members - Industry

1. Mr. S.N. Daga
Sr. Dy. Gen. Mgr.
BHEL, Bhopal

2. Mr. S. Koshal
M/s Pratibha Enterprises
Govindpura Industrial
Estate, Bhopal

3. Mr. H.S. Virdi
M/s Virdi Engg. Works
Govindpura Industrial
Estate, Bhopal

4. Mr. N.R. Edkie
Sr. Manager
BHEL, Bhopal

5. Mr. Rajeev Koshal
M/s Vimal Industries
Govindpura Industrial
Estate, Bhopal

6. Mr. M.K. Sachdeva
M/s Sachdeva Engg. Works
Govindpura Industrial
Estate, Bhopal

Members - Higher Institutions

1. Dr. Narendra Nagar
Prof. & Head of the
Deptt. SGSITS, Indore

2. Dr. R.L. Gupta
Prof. & Head of the Deptt.
MACT, Bhopal

3. Dr. S.C. Jain
Prof. Mech.
MACT, Bhopal

4. Dr. V.K. Khare
Asstt. Prof. Mech.
MACT, Bhopal

5. Dr. O.P. Rai
Prof. Maths.
MACT, Bhopal

6. Dr. A.D. Telang
Prof. Mech.
MACT, Bhopal

Members - PDU

1. Mr. B.K. Saxena
   Expert Teacher
   P.D.U., Bhopal

2. Mr. R.L. Shrimali
   Expert Teacher
   P.D.U., Bhopal

3. Mr. K.C. Mahajan
   Expert Teacher
   P.D.U., Bhopal

4. Mr. P.K. Shrivastava
   Expert Teacher
   P.D.U., Bhopal

Member - Polytechnics

1. Mr. U.K. Jain
   I/C Principal
   S.V.G. Poly., Bhopal

2. Mr. Rajmohan
   Head of the Deptt.
   S.V.G. Poly., Bhopal

3. Mr. Shamim Uddin
   Head of the Deptt.
   S.V.G. Poly., Bhopal

4. Mr. V.K. Jain
   W/S Supdt.
   S.V.G. Poly., Bhopal

5. Mr. N.H. Kela
   Lect. Mech.
   Govt. Poly. Durg

6. Mr. I.K. Shrivastava
   Lect. Mech.
   S.V.G. Poly., Bhopal

7. Mr. K.S. Tiwari
   Asstt. W/S Supdt.
   S.V.G. Poly., Bhopal

8. Mr. A.K. Nagrani
   Asstt. W/S Supdt.
   S.V. Poly., Indore

9. Mr. M.K. Jain
   Jr. Inst.
   S.V. Poly., Indore

10. R.S. Godbole
    Lect. Mech.
    SATI, Poly, Vidisha

11. Mr. G.C. Joshi
    Lect. Mech.
    S.V. Poly. Indore

12. Mr. N.P. Khandelwal
    Lect. Mech.
    Govt. Poly., Harda

13. Mr. V.M. Saxena
    W/S Supdt.
    SATI, Poly, Vidisha

14. Mr. P.D. Dale
    Asstt. W/S Supdt.
    Govt. Poly Harda

15. Mr. R.C. Dubey
    Lect. Mech.
    S.V. Poly. Indore

16. Mr. A.K. Gupta
    Head of Deptt.
    Govt. Women Poly.,
    Bhopal

17. Mr. H.K. Pareek
    Lect. Mech.
    S.V.G. Poly., Bhopal

18. Mr. A.K. Gupta
    Lect. Electronics
    Govt. Poly., Durg

18. Mr. Manoj Singh
    Lect.
    S.V.G. Poly., Bhopal

19. Mr. Anil Bakhru
    Lect.
    S.V.G. Poly., Bhopal

20. S.K. Gandhi
    Lect.
    S.V.G. Poly., Bhopal

DIPLOMA COURSE IN MECHANICAL ENGINEERING (PRODUCTION)

SECOND YEAR

S.NO.	Subject	Scheme of studies: Theory lect	Lab. Lect	Term Work	Lab Work	Shop Work	Prog Test I&II	Scheme of examination: Paper	Theory Duration	# Marks	Lab/ Shop Duration	Marks
1.	Materials Technology	3 (84)	2(56)	20	20		20	I	3hrs	100	2hrs	50
2.	Metrology & Quality Control	3 (84)	2(56)	20	20		20	I	3hrs	100	2hrs	50
3.	Manufacturing Technology — I —	3 (84)	2(56)	20		40	20	I	3hrs	100	3hrs	50
4.	Manufacturing Technology — II —	3 (84)	3(84)	20	-		20	I	3hrs	100		
5.	Mechanics of machines & machine design	3 (84)	-	20	-		20	I	3hrs	100	-	-
6.	Production Drawing	1 (28)	6(168)	30	-		20	I	4hrs	100	-	50
7.	Electronics	2 (56)	2(56)	20	20		20	I	3hrs	100	2hrs	50
8.	Introduction to computer & programming	1 (28)	2(56)	20	20		20	I	3hrs	100	2hrs	50
9. ++	Elective (a) ~~Higher~~ Maths — I — (a) ~~Higher~~ Maths — II — (b) Steel fabrication technology (c) Plastics technology	2 (56) 2 (56) 2 (56) 2 (56)	- - 2(56) 2(56)	10 10 20 20		20 20	10 10 20 20	I II I I	3hrs 3hrs 3hrs 3hrs	75 75 100 100		50 50 150 +
10.	TCPC Training (8 - weeks) (after First Year examination)					100						450
	Total	23 21	19 21	180 180	80	160	180			950 - 900		500

* Industrial visits to be arranged to take care for practicals. ++ Any one Elective to be chosen.
+ The external examiner must be from the industry.
# 20% Marks to be reserved for viva for all practicals.
@ Each period will be of 50 minutes duration i.e. 42 X 50 minutes = 35 hours per week, one hour per week is reserved for library reference.

Remarks : 1) TCPC Training - shop work assessment
Assessment through student diary, training report & viva. The external examiner should be from industry

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(Ft/R1s/R12dc265)

DIPLOMA COURSE IN PRODUCTION ENGG.
REVISED CURRICULUM FOR SECOND YEAR, JUNE '95

CONTENT

PROGRAMME: DIPLOMA IN PRODUCTION ENGG.
SCHEME: REVISED, IMPLEMENTED FROM 1995-96
SEMESTER: THIRD
COURSE: Materials Technology (P.C. 2056)

MATERIALS TECHNOLOGY

RATIONALE

The knowledge of materials their properties and behaviour is essential for any one associated with engineering activities. It is because the materials dictate the nature of technology used in design and production of a product along with a performance of any engineering product.

The curriculum of the subject emphasizes upon understanding the properties and behaviour of materials and external influences like pressure, heat and environment. As the range of materials available for engineering use is vast. The basis groups of materials such as ferrous, non-ferrous, non-metallic materials along with their general characteristics and applications have been stressed upon. The curriculum is designed to provide back ground knowledge required for the second year subjects like processes planning, tool design, maintenance project etc. and also to assume shop floor responsibility without much difficulty.

Topic on processing of plastics and powder-metallurgy have been included keeping in view of their close relationship to metallurgical processes.

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MATERIALS TECHNOLOGY

Scheme of Studies

Topic No.	Contents	Hours Distribution Theory	Lab Work
1.	Introduction	02	-
2.	Technical Properties and Testing of Materials	12	36
3.	Structure of Metals and metallography	08	08
4.	Equilibrium Diagrams	03	-
5.	Ferrous Metals and Alloys	12	02*
6.	Heat Treatment of Steel	16	06*
7.	Non Ferrous Metals and Alloys	06	01*
8.	Non-metallic materials	06	-
9.	Plastics	4	03*
10.	Powder Metallurgy	04	-
11.	Selection of Material	04	-
		84	56

Note:- For topic No. 5,6,7 and 9 the practicals house to be utilized for study during industrial visit/demonstration in laboratory class.

SUBJECT:- MATERIALS TECHNOLOGY

S.No	Topics	Intended learning out cones (ILOs)	Remarks
1.	Introduction	* Know the common materials used in industry * List the common materials used in industry * State the uses of the common materials	
1.1	Classification of Materials	* Know the classification of engineering materials. * Classify the engineering materials as (ferrous, non-ferrous and non-metallic materials)	
1.2	Engineering requirement of Materials	* Understand the various requirements of engineering materials. * Explain various requirements of the engineering field which affect the selection of materials.	
2.	Technical Properties and testing of Material	* Know about various properties of engineering materials.	
2.1	Technical properties	* Classify the properties as Mechanical, elect thermal prop. etc. * Define the various Mech. properties * Illustrate with examples.	
2.2	Testing of material Necessity of testing Classification of testing	* Understand the necessity of testing of material. * Explain the importance of testing of materials . * Classify the methods of testing of materials as destructive and non-destructive types.	

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2.2.1	Destructive Test	• Enumerate the varous types of destructive tests.
	i) Teusile test	• Recall the methods of performance of teusile test
	ii) Hardness testing methods rockwell, Brineil and vickers hardness testing methods	• Understand the various hardness testing methods. • Explain the Rockwel, Brinell, Vickers, hardness testing and methods.
	iii) Impact test	• Understand the various impact testing methods. • List the impact testing methods as:- i) Izod impact test ii) Charpy impact test • Explain the procedure of Izod and Charpy impact test.
2.2.2	Non-destructive test (N.D.T)	• Understand the various non-destructive tests • List the various N.D.T such as ultrasonic test, magnetic text and dye penetration test. • Explain the procedure of carrying out N.D.T • State the applications and limitation of the different N.D.Is.
3.	Structure of metal and metallography	
3.1	Crystal structure of methods	• Understand different types of crystal structures of metals

	Types of space lattice	* Define the terms space lattice * State F.C.C, B.C.C & H.C.P lattice structure of metal with examples. * Explain the correlation of different type of space lattices and the properties of the materials. * Draw the various crystal structure of metal
3.2	Solidification of metals	* Understand the process of solidification of metals
3.2.1	Dendrites formation	* Define the term dendrites. * Explain formation of dendrites
3.2.2	Advantages and dis-advantage of dendrites	* State the adventage and dis-advertage of dendrites
3.2.3	Columnar, equiaxed and chile crystals	* Explain the formation of columnar and equiaxed and chile grains in an ingot structure
3.2.4	Effect of impurities.	* State the effect of grain boundaries, segregation of impurities an grain size
3.3	Elementary metallography	* Understand the difference between macro and micro-scope examination.
3.3.1	Macro and Micrography	* State the difference between macro & micro-scope examination. * Scopic examination.
3.3.2	Metallurgical microscope	* Know the construction and use of metallurgical microscope * Identify the various parts of metallurgical microscope. * Operate the metallurgical microscope

3.3.3	Preparation of specimen for microscopic testings	* Understand the procedure of preparation of specimen for microscopic examination
3.3.4	Steps for preparation of specimen	* Explain the various steps of preparation of specimen * Prepare specimen for microscopic testing
3.3.5	Interpretation & analysis of micro structure	* Interpret the result of microscopic testing * Analysis the structural constituents of micro structure.
4.	Equilibrium diagrams	* Understand the equilibrium diagrams
4.1	Terms related to equilibrium diagram	* Define the related terms of equilibrium diagram
	Cooling curves	* Explain the cooling curves of pure metal and alloys
	Solid solutions	* State the types of solid solution * Explain the cooling curve of pure iron * Interpret the cooling curve of pure iron
4.2	Iron-carbon equilibrium Diagram	* Interpret iron carbon equilibrium diagram * Explain the structural changes during cooling of eutectiod, hypoeutectiod and hyper eutectiod steels.
	Level Rule Principle	* Know lever rule principles
5.	Ferrous metals and allays	* Understand difference between ferrous and no-ferrous metals
5.1	Difference between cast iron and steel	* State the difference between cast iron and steel.

	Effect of carbon content on properties	* Explain the effect of carbon content on Mech. properties of ferrous metal.
5.2	Properties and uses of steel	* Understand the difference between carbon steels and alloys steels.
5.2.1	Plain carbon steels	* State the difference between plain carbon and alloy steel
	Classification of carbon steel	* Classify carbon steels * State the applications of carbon steels * Select the carbon steel for the given application
5.2.2	Alloying elements and their effect	* State composition and uses of alloy steel. * State composition and uses of free cutting steel. * Tool steel die steel and stainless steel. * Select alloy steel for the given application.
5.2.3	Cast Iron	* Know properties and uses of cast iron
	Types of cast iron	* State different types of cast irons.
	Effect of impurities	* Describe properties associated with cast iron * State effect of impurities on properties of cast iron. * Select cast iron for given application
5.2.4	Standardization of steel	* Understand the need of standardization of steel.
	Define the term standardization of steel	* Explain the importance of the need of standardization of steel. * Know designation of steel as per I.S. Code. * Illustrate with examples the designation of steel.

6.	Heat treatment of steel	• Understand the need for "Heat treatment" of steel
	Purpose of Heat treatment	• State the purpose of heat treatment • List for various heat treatment processes for steel such as annealing and normalizing etc.
6.1	Annealing & Normalising	• Understand the need for annealing and normalizing process of heat treatment.
	Purpose of Annealing and Normalising.	• State the purpose of annealing. • State the purpose of normalising • Describe the process of annealing & normalising.
	Comparison of Annealing and Normalising.	• Compare annealing with normalising
6.2	Hardening process	• Understand the process of hardening
	Purpose of hardening	• Explain the purpose of hardening
	Cooling medias	• List the factors affecting the hardness produced. • List different cooling media
	Factors affecting hardness	• State factors affecting the rate of cooling.
6.3	Tempering	• Understand the process of tempering
	Purpose	• Explain the purpose of tempering • Describe the process of tempering

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	T.T.T Diagram	• Explain T.T.T (Time termperature transformation) diagram. • Interpret T.T.T. Diagram
	Hardenability	• Define hardenability • State procedure for determining hardenability.
	Defects caused in heat	• Identify the defect caused in heat treatment • Suggest suitable remedy for removing defects of heat treatment
5.4	Surface hardening	• Understand surface hardening
	Purpose	• Explain th purpose of surface hardening
	Classification	• Classify the surface hardening • Describe the process of flame hardening and induction hardening
6.5	Case Hardening	• Understand the principle of case hardening
	Types, Procedure	• State types of case hardening processes • Describe the procedure of (i) Car bruising (ii) Cyaniding (iii) Nitriding
	Applications	• State application of each process
	Advantages & limitation	• State advantages and limitation of each process • Select heat treatrant process for a given job

7.	Non-ferrous metals and Alloys	• Know different types of non-ferrous metals • State different types of non-ferrous metals and alloys.
7.1	Copper and its alloys.	• State properties and uses of copper.
	Properties and uses of copper	
	Composition, properties and uses of Brasses	• State composition and properties of brasses and their application.
	Composition, properties and uses of Bronzes	• State composition and properties of and uses of bronzes and their application. • State composition, properties and application of gunmetal and bearing materials. • Select suitable copper alloy for given application.
7.2	Aluminum and its alloys	• State properties and uses of aluminum
	Properties and uses of aluminum	• State composition properties and uses of different aluminum.
	Properties and uses of different aluminum alloys	• Select suitable aluminum alloy for given application.
7.3	Zn and Zn based alloys	• Know zinc and zinc based alloys
	Properties and uses of Zinc Die casting alloys	• State composition, properties and uses of common zinc alloys. • State composition, properties and die casting alloys

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7.4	Nickle & Nickle based alloys	• Know nickle and nickle based alloys
	Properties and uses Nickle and its alloys	• State composition, properties and uses of common nickle alloys
7.5	Lead and lead based alloys	• Know lead and lead based alloys
	Properties, uses and composition of lead and its alloys.	• State compositin, properties and uses of lead alloys • Select suitable zinc, nickle, lead alloy for a given application.
8.	Non-metallic materials	• Know commonly used important non-metallic materials.
8.1	Ceramic materials	• State properties and uses of ceramic materials
	Classification of refractory material	• Classify the refactory materials as acid, basic and neutral refactory materials
	Properties and use requirements of good refractory	• State propeties and uses of refractory materials • State requirements of good refactory • Apply concept to suggest a proper refractory material. • Given a situation select the proper refractory
8.2	Abrasive materials	• Know commonly used abrisive materials
	Classification of abrasive materials	• Classify abrasive materials • List natural and synthetic abrasives

	Composition properties and uses of abrasive	• State composition properties and use of abrasive materials • Select suitable abrasive material for given application.
8.3	Rubber	• Know different types of rubber.
	Classification, types properties and uses	• Classify rubber as natural and synthetic • State properties and uses of rubber. • Select suitable type of rubber for given application
8.4	Insulating material	• Know the various thermal and electrical insulating materials.
8.4.1	Properties and uses of thermal insulating materials	• State properties and uses of various thermal insulators.
8.4.2	Properties and uses of electrical insulating materials	• State properties and uses of various electrical insulators.
9.	Plastics	• Know the various plastic materials used in engineering field.
9.1	Advantages of plastics	• State advantages of using plastics as compared to other materials.
9.2	Properties of Plastics	• State common properties and uses of plastics
9.3	Classification of Plastic	• Classify plastics as thermosetting and thermo plastic materials.

9.4	Processing methods Application of plastics Application of fiber glass and reinforced plastics	* State various plastic processing methods * Describe extrusion, blow moulding, transfer moulding, injection moulding processes. * Describe reshaping and joining the components with acrasives. * List the various application of fiver glass and reinforced plastics.
10.	Powder metallurgy	* Understand powder metallurgy
10.1	Manufacturing process	* Describe the process of manufacturing metallurgy. * Explain the blending of powder. * Explain compacting, presintering sintering.
10.2	Secondary operations	* List secondary operations
10.3	Advantages and limitations	* State advantages and limitations.
11.	Selection of material	* Select the proper materials for a given application.
11.1	Factors affecting selection of materials	* Understand the factors affecting the selection of material for engineering use.
11.2	Justification for selection	* Justify the selection of material for a given application

LIST OF EXPERIMENTS

S.No.	Name of Practicals	Total Practical Hours 56
1.	Study of Universal Testing Machine	3
2.	Tensile testing of	
	i) Mild Steel test piece	3
	ii) Cast iron test piece	3
	iii) Aluminium test piece	3
3.	Hardness Testing :-	
	i) Rockwell Hardness testing	3
	ii) Brinell hardness testing	3
4.	Impact testing:-	
	i) Charpy impact test	3
	ii) Izod impact test	3
5.	Study the metallurgical microscope available in the laboratory	2
6.	Preparation of specimen for microstructure testing	3
7.	Study the structure of different material (Ferrous and Non-ferrous materials)	3
8.	Study of Ultrasonic flaw detector	2
9.	Detect the surface cracks using ultrasonic Flaw detector	3
10.	Study of the magnetic partical testing equipment	2
11.	Detect the surface cracks by magnetic partical testing equipment	2
12.	Conduct the Jominy hardenability test using Jominy endquench apparatus	3
13.	Visit to plastic industry for demonstration of plastic processing methods	3
14.	Visit to industry for study of different ferrous and non-ferrous metals	3
15.	Visit to industry for the study of heat treatment processes	6

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2. Engineering Physical metallurgy by Akhtin Mir Pub Moscous
3. Heat Treatment of Metals by Zakharov Mir Pub. Moscous
4. Material science and metallurgy by O.P. Khanna Dhanpat Rai and Sons
5. Material Science by Narang Khannel Pub.
6. Engineering materials by Agrawal T.M.M
7. Engineering metallurgy by D Sawroop
8. Experiments in materials technology edited by Higgerson Affiliated E.W.P
9. Material Science by Hari Joshi M.P Hindi Granth Academy
10. Materials science by I.P. Singh
11. Material scinece by Hajara Chaudhary.

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PROGRAMME: DIPLOMA IN PRODUCTION ENGG.
SCHEME: REVISED, IMPLEMENTED FROM 1995-96
SEMESTER: THIRD
COURSE: Manufacturing Tech.-I (P.C. 2057)

MANUFACTURING TECHNOLOGY-I

Manufacturing Tech-I

Sl.No.	Topic	Intended Leavening Out - Come	Remark
1.	JOINING PROCESSES		
1.1	Fastening	Knows about the Fastening devices	Demonstrate various Fastening devices
1.1.1	Need of Fastening devices	- States the need of Fastening devices	
1.1.2	Definitions of Fastening devices	- Defines Fastening devices - etc.	
1.1.3	Classification of Fastening devices on the basis of :- (a) Production Process (b) Detachability (Temp. & Permol) (c) Nature of locking (d) Frictional connection (e) Positive looking .. (f) Material joint	Understands the classification of Fastening devices - Classify the different type of Fastening devices - Explain principle of different types of Fastening devices - Identify the different Fastening devices with the suitable examples of their use - etc.	
1.1.4	Application of following detachable Fastening devices (a) Screw (b) Nut & Bolt (c) Stud & Nut (d) Threaded Pin (e) Locking Gand (f) Lock with bonding agent (g) Pin Connection (h) Keys & cotters (i) Insertion of hadyes (j) Press Fitting	Knows applications of the different types of detachable Fastening devices - State function of different type of Fastening devices - Sketch various Fastening devices - Suggest proper Fastening devices for a given situation - etc	

.2	RIVETING		
1.2.1	Need of Riveting functions	Knows why is the Riveting process required	Demonstrate different types of Riveted joints
1.2.2	Definition of Riveting	- States the Need of Riveting etc.	
1.2.3	Types of riveting (a) Hollow Riveting (b) Mushroom Riveting (c) Thermal Riveting (d) Blind Riveting (e) Expanded Riveting	- Defines the term Riveting - Lists the type of Riveting - Outlines the details of various types of riveting	
1.2.4	Procedure of Riveting	- Describe the procedure of making Riveted joints etc. - etc	
1.2.5	Application of Riveting (a) Containers (b) Pressure vessels (c) Rails (d) Machine Structures (e) Fluid shells	Knows various application of Riveting - Enumerates with suitable examples the applicsation of Riveting - etc	
1.2.6	Faults in Riveting (a) Displacing hole (b) Too large hole or Small hole	Knows about faults of Riveting - Lists various faults of Riveting - Methods to prevent these faults	
1.3	SOLDERING & BRAZING	Understands the phenomena of Soldering & Brazing etc.	Demonstrate the Soldering & Brazing Processes in the workshop

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1.3.1	Definition	- Define the term Soldering & Brazing - Differentiate between the two processes on the basis of application, area - etc
1.3.2	Soldering process	- Explains the phenomena of the Soldering & Brazing process - States the ways in which Soldering is done, i.e, Hand & dip Soldering - States the Sequence of operations of Soldering - etc
1.3.3	Brazing, Types, Advantages & Limitations	Understand the brazing process - State the steps of the brazing process - Name the different Brazing processes such as Forge Brazing, Gas Burner Brazing, Furnace Brazing, Salt Bath Brazing, Dip Brazing, Electric Resistance Brazing, Induction Brazing etc. - Outline the different type of Brazing Processes etc.
1.3.4	Braze Welding	- Give the advantages and limitations of the Brazing process - Understand the Braze Welding process - Explain the Braze Welding process - State its application & limitations - etc

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1.3.5	Soldering Materials Fluxing agents, Soft Solder, Hard Solders (Brazing)	Knows about the Fluxing agents - State the Purpose of Fluxing agents - State the Criteria of selection of Fluxing agents - State the composition and areas of application of some commonly used soft and Hard Solders (Brazing) - List the forms in which Solders are available - etc	
1.4	ADHESIVE BONDS	Knows the meaning of Adhesive Bonding - Enumerate a few applications of Adhesive joints	Demonstrate various Adhesive available in market consider Metal to Metal, Metal to Non-metal, Non-Metal to Non-metal etc
1.4.1	Need of Adhesive Bonds	- State the need of Adhesive Bonds	
1.4.2	Definition of Adhesive Bonds	- Define the Adhesive Bonds etc.	
1.4.3	Types of Bonding (a) Adhesive (b) Pastes (c) Cement	Know the types of Bindings - Describe the various types of Bindings - etc	
1.4.4	Principle of Adhesive Bonding (Point line & Surface contact in rivety welding & adhesive bonding respectively)	Understand the Principle of Adhesive Bonds - Explains the Principle of Adhesive Bonds - Procedure of making Adhesive joints need for curring - etc	

1.4.5	Types of Adhesive joints (a) Single overlap (b) Shouldered overlap (c) Double overlap (d) Splice (e) Splice with Single strip (f) Double strip splice	Know types of Adhesive joints - List various types of Adhesive joints - Represant the different Adhesive joints according to convention - etc	Demonstrate Adhesive joints take support of O.H.P.
1.4.6	Surface preparation of Adhesive	Know the surface preparation for Adhesive joints - State the procedure surface preparation - etc	
1.4.7	Classification of Adhesives on the basis of :- (a) Setting (i) Hot & (ii) Cold (b) Composition (i) Single component (ii) Double component	Know the Classification of Adhesives - Describe the Classification of Adhesives etc.	
1.4.8	Testing of Adhesive joints (1) Peeling Strength (2) Tensile Strength	Knows the test procedure - State the test procedure - Significance of each test - etc	
1.4.9	Limitation of Adhesive joint	Knows the limitation of adhesive joint - State the limitation of adhesive joint etc.	
1.5	Welding	Understands the concepts of welding etc.	Demonstrate Welded parts
1.5.1	Need of Welding	- State the need of Welding etc.	

1.5.2	Definition of Welding	- Define Welding etc.	
1.5.3	According to:- (1) Pressure (2) Fusion	Knows Classifying Welding - Outlines Welding Process etc.	
1.5.3.1	Classification of welding process fusion welding Electric Resistance, Solid face	- State the basis of classification of Welding processes - Classify the Welding Processes etc.	
1.5.4	Weldabilit,	Understands the concepts of Weldability - Define the term Weldability - Explain factors on which Weldability depends etc.	
1.5.5	Resistance Welding (1) Principle (2) Equipment (3) Different Resistance Welding processes such as:- Spot, Screen, Butt, Flush, Projection, Percussion, High Frequency	Understands the concepts of Resistance Welding - Explains the phenomena of Resistance welding etc.	
1.5.6	Application of Resistance Welding such as :-	Knows various Engg. applications Illustrate the applications of Resistance Welding in the Engg. field etc.	Sketches the lab[illegible] diagram to the show general layout of the Resistance Equipment Explains the importance of controlling the related parameters Explain the different Resistance Welding Processes

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1.5.7	Gas fusion Welding (1) Principle (2) Equipment (3) Operating Technique right ward, left ward (4) Working Sequence (5) Application	Understands the Gas Welding Process - Explains the Principle of Gas Welding - Describes the tools and Equipments used in Gas Welding - Sketch the Welding torch - Explains the characteristics of the Oxy-acetylene flame - Explains the temperature characteristics curve with respect to flame cone - States the field of application of Gas Welding with illustrations etc.
1.5.8	Consumables (i) Filler wire (ii) Fluxes (iii) Gas Oxygen & Acetylene	knows about Consumables used - Lists the Consumables used - States the functions of flux - States the important characteristics of fiiler wire and gases - States the precaution in handling and storing of Gas Cylinders etc.
1.5.9	Gas Cutting (1) Method (2) Limitations (3) Torches (4) Applications	Understands the concepts of Gas Cutting - States the field of application in Engg. - Explains the principle of Gas Cutting - Draws & labels sketches - Explains the procedure of Gas Cutting - States the limitations of Gas Cutting Process - Describes the Gas Cutting Torch

ARC WELDING: Principle	Understands the Arc Welding Processes - Explains the phenomena of Arc Welding Process - Explains the phenomena of Polarity and characteristics of straight and reversed polarity - Explains the various are Welding Processes - Lists the advantages, disadvantages and limitation of various are welding processes - Compares the A.C. and D.C. Power - Sources function of various - Explains the Tools, Equipments and accessories as used in manual metal Arc welding, TIG and (MIG/MAG) Welding Processes with the help of Sketches - Defines used the terms open Circuit Voltage and duty cycle - Illustrate with examples the applications of various Arc Welding Processes in the engg. field - Draws labeled Sketches of the various types of joints etc.
Arc Welding Processes such as Carbon Arc, manual Metal Arc, Tungston Inert Gas (TIG) Metal Inert Gas and Metal active Gas (MIG/MAG), Submerged Arc, Atomic Hydrogen, Electro-Slag stand Electro Gas, Flux Cored Plasma Arc etc. - Tools and Equipments - Welding Parameters - Applications - I.S. Codes for Welded joints	
WELDING ELECTRODES - Classification - Function of Flux - Coating ingredients - Coating of Electrodes as per I.S. - Flux Cored Electrodes	Understands the concepts about electrodes - Gives the classification - states the Function of Flux - States the coating ingredients - Explains the Coating procedure of electrodes as per I.S. - Given a situation selects the electrode for a specific application etc.

1.6.13	Pre-Weld and Post-Weld treatment	Understands the necessity and procedure of Pre-weld and Post-Weld treatment - Explains the procedures of these treatment
1.6.14	Testing and Inspection - Destructive tests - Non-destructive tests	Understands the testing procedures of Weldments - Names the destructive tests such as chemical, corrosion, metallographic, impact, Tensile tests etc. and non-destructive tests such as visual inspection, magnetic particle, dye penetration, Ultrasonic, radiographic test etc. - Describes the procedures of performing tests - Interprets the results of these tests
	Special Welding Processes - Thermit Welding - Ultrasonic Welding - Electron Beam Welding - Explosive and friction Welding etc.	Understands the concepts of Special Welding Processes - Lists Special Welding Processes - Gives reason for walking them as Special welding Processes Explains the procedure of these Welding Processes - Illustrates with examples the application of these processes etc.
1.6.15	Arc Welding Defects their causes and prevention	Understands about the Arc Welding defects - Explains the various Arc Welding defects such as incorplete penetration, lack of fusion, under cut, [illegible], slag inclusion, porosity, cracks (hot & cold) Faulty fled size and proficle, Tungsten

		inclusion, lamellar bearings, Arc blow, Distortion etc. - Explains the causes of defects and the methods to be adopted for their prevention
1.6.16	Safety in Welding (a) Personal Safety (b) Equipment Safety	Understand about the safety precaution in Welding States Safety precaution to be observed in Welding from the personal and equipment point of views
	Metals Cutting - Principles - Classification Thermal Cutting Oxygen and Oxygen Arc, Spark evoslan Electro beam and Laser	Understands the Metal cutting Processes - States the Principle Metal Cutting Processes - Describe various Metal Cutting Process - Gives the limitations of process also with utterance to metal composition & thickness & size length
	Arc Metal Cutting Processes - Principle - Classification - Carbon Arc - Metal Arc - Air Arc - Plasma	States Principles of Arc Metal Cutting - Lists the various Arc Metal Cutting Process - Describe the various Arc Metal Cutting Processes. - Compare the process
	Applications in Engineering field	Illustrates the field of applications of Arc Metal Cutting in Engineering
2.	FOUNDRY	
2.1.1	Introduction (1 Hrs.)	Knows about the Foundry - Define Foundry - Give Some examples of certain products produced in a Foundry

		- Trace the development of foundry to its present state	
2.1.2	Stages of product manufacturing in the foundry (1 Hrs.)	Knows about the different stages of producing a product in foundry - List the steps such as:- i) Pattern making ii) Moulding iii) Melting iv) Casting v) Fittling, Cleaning vi) Inspection, Testing and remedial actions for defects removal of casting	
2.1.3	Pattern & Patternmaking:- - Introduction	Understands the concepts about pattern & Pattern making - Define the terms pattern - State the role of pattern in relation to foundry - Establish the difference between carpantary work and wood pattern making	
	- Pattern making material selection of pattern material (2 Hrs.)	Understands common materials used in pattern Making - List the common materials used in pattern making - State the factors to be considered in selection of proper material for pattern making - Evaluate the suitability of the wood, Cost iron, Brass, Aluminum and Steel as pattern making material	
2.1.4	Types of pattern (2 Hrs.)	Knows the different types of the pattern & their uses. - List the types of patterns	Study of different types of pattern

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		- Describe each type of pattern - Select pattern for a given casting - State use of master pattern	
2.1.5	Pattern making allowances (1 Hr)	Understands the concepts of allowances provided on a pattern - List common allowances provided on pattern - Describe each type of allowance using suitable sketch - State the need for each type of allowance	
2.1.6	Pattern making Tools (1 Hr) Tools & their use Designing of Pattern tools & their use	Knows classification of tools - List pattern making tools - Describe a contraction scale - State specific use of contraction scale in pattern making	Demonstration of tools & their use in workshop Study of contraction scale and its use in producing a pattern
		Understands the designing of pattern - Explain the factor to be considered in designing of a pattern such as product shape, location of riser, runner etc	
2.1.7	Construction of pattern (1 Hr)	Knows about the layout of making pattern - Explain the procedure for pattern construction and developing a layout	Study of simple pattern
2.1.8	Cores & Core Prints (1 Hr)	Understands the function of Cores & Core Prints - Define the term Core Print - Describe different types of Cores & Core Prints	Demostrate the different type of Core Prints

2.1.9	Core Boxes (1 Hr)	Knows about the Core Boxes - States the different type of Core Boxes	Demonstration of different types of Core Boxes
2.1.10	Colour Coding for patterns & Core Prints (1 Hr)	Knows about the Colour Coding used for patterns & Core Prints - State the standard colour codes	Study in lab
2.1.11	Preservation of pattern (1 Hr)	Knows about the Preservation of patterns - State the purpose for application of preservatives of pattern - Name the preservatives used - Explain the method of storing patterns and factors to be considered	Demonstration of different wooden pattern
2.2	Moulding	Knows about the Moulding - Define the term Moulding - Describe the factors to be considered for Mould making	
2.2.1	Introduction (1 Hr)	Knows about the materials used in Moulding	
2.2.2	Moulding Materials (a) Sand (b) Sand Binders and Sand (c) Sand Additives etc.	Lists the materials used in Moulding such as :- - Sand - Sand Binders - Sand Additives - Classify the Sand as :- - Natural Sand and Synthetic Sand - Give the functions of Sand - Sand Binder and Sand Additives - Define the following terms related to types of moulding Sand i) Green Sand ii) Dry Sand	

iii) Loam Sand
iv) parting Sand
v) Facing Sand
vi) Baking Sand
vii) Oil Sand and
viii) Core Sand

2.2.3 Properties of Moulding Sand

- Refractoriness
- Permeability
- Flowability
- Achesiveness
- Cohesiveness
- Collapsibility etc.

Understand the properties of Moulding Sand
- Explain the important properties of Moulding Sand
- State the effect of these properties on the quality of casting produced

Sand Testing (3 Hrs.)

- List the various tests performed on Moulding Sand
  (a) Grain fineness
  (b) Permeability
  (c) Strength
  (d) Clay content
  (e) Hardness
- Describe the procedure of performing these tests

Demonstration to be made in the workshop

Sand Binders

i) Organic Binders
- Dextrin
- Molasses
- Linseed Oil
- Mineral Oil

- List different types of Sand Binders and additives
- Outline the details about the different types of Sands, and Binders and Sand Additives

ii) Inorganic Binders
- Fire Clay
- Ball Clay
- Fullers Earth
- Bentonite
- Limonite
- Kaolonite

iii) Additives
- Coal Dust
- Wood Dust/Saw Dust
- Fuel Oil
- Pitch
- Resins
- Sea Coal
- Corn Flour
- Silca Flour
(4 Hrs.)

2.2.4	Moulding Tools and Equipments	Knows the tools Machines & Equipments as used for Sand Moulding * Describe various Moulding Tools and Equipments such as:- - Hand Tools - Flasks * Draw labelled sketches of the various Moulding Tools, containers * State the purpose of the Machines used in Moulding	Use of various Tools to be demonstrated in workshops
	b) Moulding Containers		
	c) Moulding Sand Preparation Machines (2 Hrs.)	Knows about the Moulding Sand Preparation Machines - List the Machines used for preparing Moulding Sand	

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ii) Inorganic Binders
- Fire Clay
- Ball Clay
- Fullers Earth
- Bentonite
- Limonite
- Koolonite

iii) Additives
- Coal Dust
- Wood Dust/Saw Dust
- Fuel Oil
- Piteh
- Resins
- Sea Coal
- Corn Flour
- Silca Flour
(4 Hrs.)

2.2.4 Moulding Tools and Equipments

Knows the tools Machines & Equipments as used for Sand Moulding
* Describe various Moulding Tools and Equipments such as:-
- Hand Tools
- Flasks
* Draw labelled sketches of the various Moulding Tools, containers
* State the purpose of the Machines used in Moulding

Use of various Tools to be demonstrated in workshop

b) Moulding Containers

c) Moulding Sand Preparation Machines (2 Hrs.)

Knows about the Moulding Sand Preparation Machines
- List the Machines used for preparing Moulding Sand

	d) Moulding Machines 1) Plain Squeezing Moulding Machines 2) Jolt role over pattern draw Moulding Machines 3) Automatic Flaskless Moulding Machines 4) Pin lift of push-off type Machines (1 Hr)	- Sand Mixture - Laboratory Balance - Sand Rammer Jolt squeeze machine etc - Describe the function of these Machines
2.2.5	Types of Mould and Moulding Methods (2 Hrs.)	Knows the different types of Mould and Moulding Methods - State the type of Mould used for metal casting, as a) Permanent Mould/Dies b) Temporary Mould - State the types of Mould such as:- a) Green Sand Moulds b) Skin dry Moulds c) Dry Sand Moulds d) Cemented Bonded Moulds e) Carbon Di-oxide (Co2) Moulds - Describe the different methods for Mould making, such as:- a) Bench Moulding b) Floor Moulding c) Pit Moulding d) Machine Moulding
2.2.6	a) Runner, Riser and Gating (1 Hr)	Understands the importance of Runner, Riser and Gating in Sand Moulding - State the function of Runner and Riser - Explain the importance of using a Riser and its size is Mould making

Demonstration to be made in the shop for use of Runner, Riser and cutting of gates

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	b) Preparation of Green Sand (1 Hr)	- Explain the term gating - Explain the importance of size, snape and number of runners & gates Understands the procedure of preparation of Green Sand - State the constitutuents of Green Sand - Gives the procedure of preparation of Green Sand	
	c) Mould making by Green Sand (2 Hrs.)	Knows the Mould making procedure - Describe the procedure of making the green Sand Mould - List the precautions used in Green Sand Moulding	Green Sand moulding to be demonstrated in the workshop
2.2.7	Core and Core making (2 Hrs.)	Understands the Core making - Define the Core and Core making - List the types of Cores as:- a) Horizontal b) Vertical c) Balance d) Hanging and e) Wire Core etc. - Describe the procedure of preparation of Core Sand, Core making material - Core making - Core baking and - Core finishing - List the Core supports (reinforcement) as:- a) Core Dryers b) Rods & Wire c) Arbors d) Lifting Rings d) Chaplets	
2.2.8	Metal Melting a) Cupola and Oil fired furnaces (3 Hrs.)	Knows about the Metal Melting furnaces - List the Metal melting furnaces as : i) Cupola Furnace	

		iii) Open Hearth Furnace iv) Convertors v) Electric Furnace - Describe constructional details and working of the Cupola furnace, Oil-fired furnaces.
	b) Flux & refectories (1 Hr)	Knows about the Flux used in Metal Melting - State the function of Flux is Metal Melting - List the Fluxes used as Lice Stone and dolomite - State the function of Refractories - List the different types of Refractories as:- i) Acid Refractories ii) Basic Refractories iii) Natural Refractories - State the application of these refractories
	c) Metal Melting in Cupola and casting process (2 Hrs.)	Understands the process of metal melting in Cupola and casting process - Explain the Metal Melting process in the Cupola - Explain the Metal Melting procedure - List the precautions to be observed in Metal pouring
2.2.9	Special Casting Processes Special Casting a) Permanent Mould Casting b) Slush Casting	Understands the different Special Casitng Processes - Explain each of the Special Casting Processes - Given the situation select a proper

	c) Pressed Casting d) Die Casting - Hot Chamber - Cold Chamber - Airbelowing/Gross Type - Vacuum Casting e) Centrifugal Casting f) Investment Casting g) Continuous Casting (6 Hrs.)	Casting Process - Illustrate with examples the types of products manufactured by these Special Processes.	
2.2.10	Casting Defects:- a) Blow holes, Swell, Shrinkage, Hot tears, Cold Shuts, colderacks, Lifts & Shifts, Sponginess (Honi Combing), Pour short, Runout & Bustout, Metal Penetration, Fins, Internalair pockets, Misrons, Warpage, Brushes, Hardspot. (2 Hrs.)	Understands the Casting defects and and their remedial actions - Explain the different types of defects	Deconstrate some defective casting to spot out the defect
	b) Reasons for Casting defects (1 Hr)	- Give the reasons of these Casting defects due to faults pertaining to:- a) Design of Casting b) Design of Pattern Equipment c) Moulding & Core making Equipment d) Mould & core Materials e) Gating and Riser Placing f) Moulding & Core making Technique g) System of Metal Melting Pouring f) Metal Composition etc.	
	c) Remedies for defects (1 Hr)	- Give the remedial actions for the different defects in Casting	
	Revision	- Revise the topics studied	

List of Practicals

a) Foundry
b) Joining Process

Sl.No.	Name of Practical	Time Allotted
A)	Foundry - Pattern making	
1.	Study of layout of pattern making shop	1
2.	Study the tools and equipments used in pattern making	2
3.	Study different type of patterns	2
4.	Construct the layout for preparing a pattern incorporating various allowances	1
5.	Prepare the following jobs a) Single piece solid pattern b) Two piece split pattern c) Core box	6
6.	Study of the layout of the foundry shop	1
7.	Study of the Moulding tools and equipment	
8.	Prepare Green moulding sand for moulding making	2
9.	Prepare the mould using a single piece solid pattern to include Runner, Riser	2
10.	Study the equipment used and procedure of testing of the green moulding sand to find out a) Grain fineness b) Permeability c) Strength d) Clay contact e) Hardness etc.	4
11.	Prepare a green sand mould for two pieces/three pieces pattern using three flasks	2
12	Study of bench 'pit' and floor moulding	2
13	prepare the core sand for making the different types of cores	2
14	Study of the metal melting furnaces a) Cupola furnace b) Pit furnace c) Tilling (oil or gas fired) furnace d) Open hearth type furnace	2
15)	Prepare an ahhesive joints, using a) Similar metals b) Dissimilar metals c) Metal and non-metal d) Non-metals	2

	Joining processes	
16.	Prepare a soldered/Brazed joint	1
17.	Study of the layout of a welding shop	1
18.	Study the constructional and operational details of A.C. and D.C. power sources	2
19.	Study of tools and accessories used in manual metal arc welding, TIG and MIG/MAG welding processes	2
20.	Prepare welded joints employing manual metal Arc welding process	4
21.	Prepare welded joints employing TIG and MIG/MAG welding process	4
22.	Study of the constructional and operational details of the Resistance welding machines	2
23.	Study of the constructional and operational details of the gas welding and gas cutting equipment	4
24.	Prepare welded joints employing Oxy-acetylene gas welding process	2
25.	Perform gas cutting operation employing gas cutting equipment	2
26.	Study of various welding defects	2

	Reference Books	Written	Publication
1.	Technology of the metal trade	GTZ Publication	
2.	Modern Arc welding Technology	S.V.Nadkarni (Advani - Oerlikon Ltd.)	Oxford & IBH publishing Co.
3.	Basic welding Principles	Emanuele Stieri	Prentice hall publication
4.	Workshop Technology	Gupta & Kanshik	
5.	Elements of workshop Technology	Hajra & choudhary	
6.	Material & processes in manufacturing	E.paul degarma	
7.	Manufacturing science and technology	suresh dalela	
8.	Introduction to manufacturing process	John a.schey	Mcgraw hill kogakusha Ltd.,

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PROGRAMME: DIPLOMA IN PRODUCTION ENGG.
SCHEME: REVISED, IMPLEMENTED FROM 1995-96
SEMESTER: THIRD
COURSE: Mechanics of Machines & Machine Design (P.C. 2058)

MECHANICS OF MACHINES & MACHINE DESIGN

RATIONALE

The course of Diploma in mechanical engineering (production is aimed at producing middle level technical personnel their job requirement is to be more practical oriented thee present course curriculum has been framed keeping precisely this in view.

While handling different machines in shop floor or related shops he has to use them, guide others and also tackle related problems while interacting with subordinates semiskilled, skilled worker and make suggestions at times to superior technical personnels.

Keeping this in view the fooling topics are included example chapter of cams & follower has been includeding view of modern and CNC machines using them more frequently similarly clutches, universal joint, balancing and vibration have been included on the other hand some topic of less importance are deleted to make curriculum more balanced and relevant. Along with knowledge of mechanics of machines, elementary knowledge of design of machine element has been included using of I.S code has been also included change will makes the subject more interesting, more knowledgeable and practical oriented for middle level technician.

Paper satter is requested to go through the contents of detail syllabus carefully before setting paper.

CONTENTS

S.NO	TOPIC	ITEMS
1.	Introduction of machines of	6
2.	Types of power transmission	4
3.	Belt, rope and chain drive	12
4.	Gears and gear trains	6
5.	Bearing, gender and detalies	8
6.	Cansand Cam followers	6
7.	Balancing and Vibrator	6
8.	Introducter in Machine Design	9
9.	Design of simple machine elements such as Bolts, Nuts Welded joints, shaft, Key, Coupling, Springs	27
	Total	84

Sl.No.	Topic	Learning Outcome	Remark
1.	Introduction to Mechanics of Machines (6 hrs.)	Knows about Mechanics of Machines and its sub-divisions	
1.1	Mechanics of machines and its sub-divisions	- States the purpose of the course 'Mechanics of Machines' - Lists the sub-divisions as Kinematics Dynamics kinetics and statics - Outlines each or the above sub-divisions	
1.2	Machine and structure	Knows about machine & structure the - Defines the terms machine and structure - Give suitable examples for each etc.	
1.3	Link, Kinematic pair, Kinematic Chain, Mechanism and Inversion	Understands Link, Kinematic pair, Kinematic chain, Mechanism and Inversion - Defines each of the above terms - Explains each of the above terms with the help of neat sketch and suitable examples - States the types of Kinematic pair with examples for each type and practical applications	Demonstrate suitable models to the students
1.4	Kinematic chain i) Four bar or Quardic cycle chain ii) Single slider crank chain iii) Double slider chain	- Gives the types of kinematic chain and illustrate with suitable examples - Explain principle of worky & construction of crank and slotted lever quick return motion mechanism with neat sketch - Explains the principle of works and construction of unit worth's quick return motion mechanism with the help of sketch	Demonstrate suitable models

		- States at least two applications of the above mechanisms
2.	Methods of power transmission 1) Coupling 2) Belts, Ropes and Chains 3) Bears (4 Hrs.)	Understands the power transmission system - Classifies the power transmission systems - Describes each with suitable examples and their practical applications - Compares the above three system in respect of their efficiency power transmitted, Distance, Shock absorption etc. Knows the types belts used in power transmission - Lists the type of belts - Describe shapes, uses, materials,
3.	Belt, rope and chain drive (12 Hrs.)	
3.1	Type of belt 1) Flat belt	power transmission capacity etc.flat belt and 'V'belt
	2) 'V' belt 3) Ribbed	
4)	Tootred or tuning belt	
3.2	Types of flat belt drive 1) Open belt 2) Cross belt 3) Compound belt 4) Loose and fast belt drive	Understands the type of flat belt drive - Lists the types of belt drive - Explains each of the above drive with neat sketch - Give application of each type of belt drive - Lists the losses in belt drive - States the belt speed for maximum power and economy and for efficiency and longer life
3.2.1	Looses in belt drive belt speed	
3.2	'V'belt drive - Working - Cross - Section - Application - Limitation	Understands the 'V' belt drive - Explain 'V' belt drive with neat sketch - Gives the cross - section of v - belt - Gives application with suitable example of this drive - Gives limitation of v - belt drive

3.3	Velocity ratio, belt slip and creep	Understand the velocity ratio slip and creep - Defines the velocity ratio - Explain the term slip and creep - Compute the velocity ratio for open belt drive, compound belt drive without slip and with slip	Solve few suitable numerical examples example
3.4	Ratio of driving tension for flat belt and angle of contact	Understands the principle of finding ratio of tensions in the flat belt - Explain the tight side tension (T1) and slack side tension (T2) with neat sketch - Explain the term angle of contact of belt by neat sketch - Determination of angle of contact - Derive the method of comp of by a flat belt - Explain how B the power transmitted by a belt using neat sketch - Establish formula of power transmission $\text{Power Transmission} = \frac{(T1 - T2)U}{75}$ - Compute Power Transmitted by flat belt	Solve simple Numerical problems
3.6	Ratio of Driving Tensions for V belt	Understands the derivation of relation between driving tensions in V belt drive - Describe angle of groove of pulley (2r) - Establish relation $\frac{T1}{T2} = e$	

3.7	Power Transmitted by 'V' belt	Understands the power transmitted by by 'V' belt - Explains power transmitted by 'V' belt - Establish formula for power transmission i.e. $\frac{(T1 - T2)U}{75}$ - Compute power transmitted by 'V' belt	Solve Numerical problem
3.8	Centrifugal tension	Understands the centrifugal tension - Explain centrifugal tension in the belt by sketch - Explains the effect of centrifugal tension - Compute tension - Solve problems on power transmitted by belt considering centrifugal tension	
3.9	Designation of belt and belt selection	Understand the method of specifying flat & belt - Explains the terms used in specifying the belt as per I.S. code - Illustrate with suitable example - Lists factors considered for selection - of belt - Interpret data provided by manufactures for selection of belt under given conditions	
3.9.1	Belt joints & fastences	Knows about belt joints and factors - States the propose - Describe the method of joining belts and factors	

3.10	Rope drive - Rope materials - Classification of rope - Wire rope construction - Advantages of rope drive - System of rope drive - Application - Rope fasteners	Understands the use of rope drive - Explains the construction of wire rope - Illustrate allocation with suitable - Gives the reasons for using wire ropes	
3.11	Chain drives - Types of chain drive - Advantages -Applications - Construction of roller chain - Selection of chain	Understands the use of chain drive - Lists the forms of chains with sketch - Illustrate the applications with suitable examples - Gives the advantages of using chain drivesover other drives	
4.	Gears and Gear trains		
4.1	Advantages of gear drive (6 Hrs.) Classification of gears based on the mutual position of the shaft - Gear materials - Types of gear failure.	Understands the classification of gears - Classify the gears based on the mutual position of the shaft i.e. 1) Parallel axis 2) Intersecting shaft 3) Non parallel non intersecting axis	
4.2	Types of gear trains	Knows the types of gear trains - Describe the ear train or train or wheels - Describe different types of gear trains with line sketches 1) Simple gear train 2) Compound gear train 3) Reversed gear train 4) Epicyclic gear train	Demonstrate models
4.3	Calculation of velocity ratio for 1) Simple gear train 2) Compound gear train	Computation of velocity ratio and speed of particular gear in the train - Defines velocity ratio	Solve numerical problems

		- Establish relation between speed, bitch circle diameter and number of teeth of gears used in train - Compute velocity ratio and speed and number of teeth of particular gear in gear train
5.	Bearing Guides and clothes (8 Hrs.)	
5.1	Propose classification of bearing such as 1) Sliding bearing 2) Rolling bearing 3) Thrust bearing - Types of sliding bearing , Rolling bearing Bearing material	Understands the main division of bearing i.e. sliding contact and - States the purpose of the bearing - Gives types or sliding contact bearing with neat sketches - Classify the bearings - Explain the meaning of sliding contact bearing and rolling contact bearing - Gives types of rolling contact bearing and line diagrams - States the applications of different types or bearing with example
.2	Designation of bearings	Understands the method of spefifying different type of bearings - Explains the terms used in specifying the different types of bearings as per I.S. code - Illustrate with suitable example - Interpret manufacturer's table for selection of bearing under given conditions

5.3	Selection of bearings based on Mechanical, Environmental and Economic considerations selection	Understand the selection criteria of bearing - Explains the criteria used for selection - Given a situation, select the bearing	
5.4	Clutch Type, function, Application	Understands the function type and application of Clutch - Explains functions of Clutch with neat sketch - Lists the type of Clutch such as 1) Disc or plate clutch 2) Cone clutch 3) Centrifugal clutch - Describes each of the above clutch with neat sketch - Illustrates application of each type clutch	
6.	Cams and Cam Followers (6 Hrs.)		
6.1	Function, Classification, Application of Cams & followers	Understands the function, application and Classification of Cam & follower - Defines Cam & follower - Explains the function of cam and follower with neat sketch - Illustrates the application of cam and follower - Gives Classification of follower with sketch according to i) Surface of contact ii) Motion of follower iii) Path of motion - Gives classification of cam as i) Radial or Disc cams ii) Cyclinderical cams	Demonstrate models

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6.2	Base circle trace point, Pressure angle, Pitch point, Pitch circle, Prime circle outstroke, Return stroke, Dwell, angle of cam rotation	Understands the terms used in construction of cam profile - Lists the terms used in designating cam profile - Explains each term with neat sketch	
6.3	Motion of followers 1) Uniform velocity 2) Simple harmonic motion 3) Uniform acceleration	Understands different motions imparted to the followers - Explains each type of motions imparted to the follower with neat sketch - Draws the displacement diagram on the basis of given data for each type of motion of follower	
6.4	Construction of cam profile when follower follow radial path of motion	Understands the construction of cam profile when path of motion of follower is radial - Explains the cam profile with sketch - Construct displacement diagram and cam profile on the basis of given data	Draws few cam profiles for knife edged and roller follower
7.	Balancing and Vibration (6 Hrs.)		
7.1	Need of balancing rotating masses	Understands the need of balancing of rotating masses - Explains the effects of unbalance or rotating masses or high sheed machine - Gives importance of balancing	
7.2	Balancing of a single rotating mass by a single mass rotating in the same plane	Understands balancing of a single rotating mass - Computes unbalanced contrifugal force on the basis of given data - Finds the balance mass or radius at which balance mass us to be attached	

7.3	Balancing of several masses rotating in the same plane	Understands balancing of several masses rotating in the same plane - Computes unbalanced centrifugal force due to each unbalanced rotating mass - Finds the resultant unbalanced force due to all unbalanced rotating masses - Calculates weight of balance mass or radius of rotation at which balance mass is to be attached
7.4	Introduction to the Vibration	Understands the vibratory motion - Defines Vibration - Explains vibratory motion with examples and sketches - Lists the type of vibrations
7.5	Period of vibration, cycle, amplitude of vibration, frequency free or natural vibration, force vibration, Damped vibration	Understands the terms used in the vibration - Explains each of the terms used in the with the help of sketches
8.	Introduction to Machine Design (9 Hrs.)	
8.1	Machine and Machine element purpose Bolt nut, axle, shaft, key bearing coupling, clutch belt, rope, chain gear, spring etc.	Understands the concepts about design and its procedure - Explains the term engineering design - Outline the design procedure
8.2	Factors influencing design of machine elements strength, stiffness, light weight wear resistance,	Understands the terms 'machine' and 'Machine elements' - Defines the term 'machine' and

	minimum size, availability processibility, safety and factor and compliance with standard	'Machine element' - States the purpose of machine elements - States the uses of machines and machine elements - Gives examples of machines and machine elements Understands the factors influencing the design or machine elements - Lists the factor to be considered in designing a machine element - Discusses the importance of each factor on design of a machine element - Explains the influence of each of the factors on final design and production of machine elements
8.3	Basic steps in designing a machine elements	Understands the proceedure or designing a a machine element - Lists the steps in designing a machine element - Describe the importance of each of the step
8.4	Engineering materials	Understands the factors influencing the Engg. materials - Lists factors to be considered while selecting the materials such as strength, rigidity, machineability surface finish, and cost special factors - corrosion resistance electrical, thermal etc. - Describes each of the factor listed above

8.4 .	Types of Forces and their effects (Tensile, compressive, shear, bending and twisting	Understands various types of loading and their effects - Names the types of forces due to loading - Describes the effect of each type of force on machine elements - Explains the term safe design stress, factor of safety, ultimate stress, Elastic limit and endurance limit	
8.5	Interchangability and Standardisation	Understands Interchangability and Standardisation - Defines standardisation and Interchangability - Explains each of the term with suitable examples	
9.	Design of simple Machine elements (27 Hrs.)		
9.1	Types of Fastners 1) Temporary 2) Permanent	Knows the types of fastners - Lists the types of fastners - Describes each type of fastner with neat sketch and example	
9.2	Design of threaded joint Bolt and Nut	Understands the procedure and method of designing Bolt and Nuts - Recalls the knowledge of different type of threads, Nut & Bolts - Lists the advantages of bolted joints - Names the types of forces which the bolts are subjected to under the given situation	Solve simple problems Solve simple numerical problems

		- Computes size of bolt & nut considering materials of bolt & nut and allowable stress for the given material - Computes allowable stress in bolt & nut on the given cores section of bolt	
9.3	Welded joints, Symbol used for welded joint, Design of fillet and butt weld	Understands the procedure of Designing Welded joint - Recalls the knowledge of different type of Welding processes - Explains the different types of Welded joint with sketches 1) Butt Welds 2) Fillet Welds 3) Edge Welds 4) Corner Welds - Sketches the symbols used for different types of welds - Sketches the following types of welded joint i) Transverse fillet weld ii) Longitudinal fillet weld iii) But weld - Establishes the relation between the acting load, allowable shear stress, allowable tensile stress, length of weld and effective thickness of weld for the above three type of welds - Designs simple welded joints subjected to tensile load	Demonstrate Models Solve simple problems
.4	Design of shart - Types material	Understands the procedure of designing shaft	Solve few simple problems

- Application
- Causes of failine
- Manufacture of shaft
- Criteria design of shaft
- Design of shaft
- Standard available
- Sizes shaft spinded shaft
- Fexible shafts

- Lists the different types of shaft such as 1) Spindle 2) axle 3) Shaft-solid & hollow
- Differentiates between an axle and a shaft
- States the materials used for shaft
- and axle
- States the function of spined and flexible shaft
- Gives the uses of each type of shaft
- Lists the causes of failure of a shaft
- States the methods employed for the manufacture of shaft
- List the Criteria for the design of shaft
- Design the simple shaft on the basis strength subjected to torsional loading only
- Selects the appropriate shaft from the available standard sizes
- Explains the function and area of application of flexible shafts

9.5 Design of Key
- Function, Type, Advantages & Disadvantages,
- Design of key

Understands the procedure of designing Key — Solve few problems
- Explains the function of Keys
- List the types of keys
- Lists the advantages and disadvantages of keys 1) Rectangular or square key (sunk key) 2) Gib head key 3) feather key 4) woodruff key
- Effect of key ways in sunk keys
- Design the sunk keys

9.6	Coupling 1) Muff Coupling 2) Flange Coupling 3) Universal coupling	Understands the functions, type and constructional details of coupling - Explains the functions of coupling - Classify the couplings 1) Rigid coupling 2) Flexible coupling - Describes constructional details of following coupling with neat sketches 1) Muff Coupling 2) Flange Coupling 3) Universal Coupling	Demonstrate models Demonstrate models
9.7	Springs - Classification - Cylindrical helical spring with axial loading - Spring Scale - Resilience - Free length - Solid length - Materials of Coiled springs - Types of compression springs and its buckling - Tension spring and ends of tension - Concentric spring - Conical spring - Torsion spring, Spiral spring, Leaf spring and its materials, Disc springs	Applies the knowledge about springs - Classifies the different types of springs - Defines the terms spring scale, resilience, free length and solid length of a spring - Describe the types of tension spring ends - States the materials used for Coiled spring - Describe the construction of different types of springs - Gives the application of different types of spring	

IInd Year Diploma in Production
Subject/Course - Electronics

Rational

Faced with the need of competentent technician in the area of production engineering, a student technician requires an integrated approach with electronics discipline which will help him in dealing with various process involved in production technology such as process control, maintenance, handling of various apparatus.

Theimportant job functions in the area of production technology particularly in the contact of electronic discipline are operation, measurement and handling of various equipment.

The content of the course electronic deals with the basic electronics, digital electronics instrumentation, power supply and micro processor. It is expected that a student technician of production engineering after gone through the various concepts and principle dealt with the content, will be able to perform his job functions competently and confidently. The preknowledge imparted to the student kept in to consideration and the approach of presentation tries to satisy the need of second year diploma production engg. student.

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PROGRAMME: DIPLOMA IN PRODUCTION ENGG.
SCHEME: REVISED, IMPLEMENTED FROM 1995-96
SEMESTER: THIRD
COURSE: Electronics (P.C. 2059)

Subject/course : Electronics

SCHEME OF STUDENTS
(Distribution of Hours)

S.No.	Topic	Hour's Distribution	
		Theory	Practical
1.	Semiconductor devices	12	6
2.	Digital electronics	12	
3.	Power supplier	06	8
4.	Micro Computer	08	10
5.	Electronic Measurement	09	16
6.	Transducers/Sensers	09	06
As per Scheme	Total	56	56

Name of subject : Electronic

Sl. No.	Topic Sub Topic	Intended learning Outcome (ILO) (Objective)	Remark
1.	Semiconductor devices		
1.1	Electronic symbols, identification of different Semiconductor devices	Understands the facts about Semi- - Identifies electronic symbols of various components	Various Electronics components & devices may be shown to the student in electronics lab
1.2	P type and N type Semiconductor	- Describes the construction of N type and P type Semiconductor	
1.3	Junction diode its characteristics	- Explains the working of Junction diode - Explains the characteristics of Junction diode on V-L scale	
1.4	Zener diode • Constructional difference of Junction diode and Zener diode • Characteristics of Zener diode • Zener regulator	- Outline the constructional detail of Zener diode - Compares the characteristics of - junction diode with Zener diode Understands the working principle of Zener Regulator - Explains the working of Zener regulator - Justifies the necessity of regulator circuit in D.C. power supplies	Circuit may be demostration on electronics experiemanter

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1.5	Transistor Types of Transistor field effect UJT SCR	Understands the facts about transistor - Gives this type of transistor - Describes the constructional details of NPN and PNP transistors - Explains the use of transistor as an amplifier - Outline the constructional detail of FET, UJT and SCR - Explains the working of FET, UJT and SCR
1.6	Indicating devices Light emiting photo diode opto coupler	Understands the concepts about indicating devices - Describes the construction details of LED - States the use s of LED and photo diode - Explains the working principle of opto coupler
1.7	Amplifier fundementals CB, CC, CE amplifier applications	Understands the concepts about amplifier - Defines amplifier - Analyses the characteristics of CB, CC and CE amplifier - Justifies the use of Ce circuit in amplifier
1.8	Oscillar circuit RC oscillator Wein Bridge oscillator phase shift oscillator LC oscillator Hartley oscillator colpit oscillator	Understands the working of oscillation circuit - Explains the working of oscillator - States the applications of oscillators in the area of production technology
2	Digital electronics	
2.1	Number System - Number system	Understands the about number system - Explains different number systems

	- Binary system, Decimal system - Octal/Hexa decimal system - Conversion of numbers - Boolean Postulates - Demargan's theorem	- Converts number between different systems - Writes Boolean postulates - States De'margan's theorems	
1.2	Basic Logic gates - Concepts of logic function - Truth table, symbol and Boolean equation of OR, AND, NOT, NOR, NAND, EX OR and X-NOR gates	Understands logical functions - Draws the symbols of various gates - Writes the boolean equation of logic gates - Writes truth tables of gates - Defines univeersal gates	
1.3	Flip flops - flip flop as memory element - Types of flip flop operation of R-S flip flop and J-K flip flops	Understands the concepts related to flip flops - States the meaning of flip flop - States the types of F/Fs - Explains the logic diagram of R-S F/F and its working - Explains the logic diagram of JK, F/F and its working	Application of such circuit in the protection engg. may be given to the student
3. 3.1	Power supplied - Need of power supplies -Concept of stabilize voltage and current	- Recogrise the need of power supplies in eletronics -Explains the concept of current stabilization and voltage stabilization	Teacher will give various power supplies and demonstrate how P.S is used for various ASI ratings
3.2	Types of ppower supplies - Linear (Unregulated & regulated) - Switched mode	States the types of Power supplies - Explains the circuit of series - States the limitation of linearly regulated P.S	
3.3	Introduction to SMPS - Block diagram - Comparision of SMPS with linear	Knows about switched mode power supply (SMPS) - Defines the term SMPS - Explain the working principal SMPS with the help of a block diagrae - States the function of each block	

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3.4	Safety precaution in handling power supplies	- States the safety precaution to be taken while using power supplies	
4.	Electronic measurements		
4.1	Basic eletronics measuring equipment - Multimeter : Function types, voltage and current measurement, cantinuity testing resistance measurement	Understands the principle of operation or multimeter - States the functions of multimeter - Gives the types of multimeter - Explains the working principle of analog and digital multimeter - Canpares anolog and digital multi- - Selects proper mode and measures the voltage and current (AC/DC) - Use the multimeter for centinuty testing - Tests component with the help of multimeter - States safely precaution to be observed while a multimeter - States that are hazarctous to the proper working of equipment	Analog and digital multimeter may be shown Importance of current probe/errors in action should be given to student during practice etc. should be given in using a multimeter Demostration may be given
4.2	Cathode ray osulloscope - Introduction - Working principle - Application - Special purpose CRO - Safety and precaution	Understands tthe workingof CRO - States the function of CRO - Draws the block diagram of a general purpose CRO - Explains the working principle of CRO - Names the trant panel control of CRO - States the functions of front panel controls of CRO - Uses CRO to display electrial signal - Uses CRO to measure a) Voltage b) current c) Frequency d) Phase difference	Demostrate the use of CRO for various measurement purposes

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		- Explains the functions of the following in connection of CRO a) Multiple beam b) Multiple trace c) Storage - States the safety precautions to be observed while using CRO	Demonstration on safety precaution may be given
5.0	Microprocessor	Understands the facts and principle related with microprocessor	Microprocessor kit may be given, and after demonstration student may be asked to load and execute step a programme on it
5.1	Introduction to micro computer and microprocessor	- Defines microprocessor and micro computer	
5.2	Microprocessor chip 8085 and its block diagram	- Explains the organisation of microcomputer	
5.3	Semiconductor memories	- Describe the block diagram of 8085 based microcomputer	
5.4	Microprocessor programming	- Explains the need of semiconductor memories in microcomputer	
5.5	Microprocessor in process control	- Defines program - Describes the use of PP in process control	
5.6	Microprocessor and microcontroller Applications of microcomputer and microcontroller	Understands the limitations of microprocessor - States the limitations - Defends the use of microcomputer over microprocessor for industrial application - Lists the uses of microcontroller in production technology	
6.	Transducers & sensors	Understands the working principle and applications oftransducers	Different types of transducers may be shown demonstrated to the student Aplication of transducers s
6.1	Introduction	- Defines transducers - Classifies transducesrs as active and passive	
6.2	Selection of transducers	- States factors responsible for selecting transducer	

6.3	Displacement measurement	- Explains the principle of transduction - Describes variable resistance device - Describes LVDT. (Linear variable different transducer) - Describes digital encoder for linear and angular displacement measurement - Describes a) Capacitance sensor b) Ultrasonic transducer - States the factor affecting the strain measurement - Gives the type of strain gauges - Describe semiconductor stain gauge	sensor may be given to the special, re atec with product or engg.
6.4	Level measurement		
6.5	Strain measurement		
6.6	Pressure measurement	Understands the applications of of transducers for pressure measurement - Lists the various elastic elements for pressure measurement - Describes LVDT type pressure sensor - Describes variable capacitance type pressure senspor - Explains working of pressures transducer	
6.7	Temprature measurement	Understands the application of transducer for temp. measurement - Explains the working principle in the folling temp. measurement devices in the context or application transducers a) Resestance thermometer b) Thermo couples c) Thermistor d) Photo conductive cell e) Photo voltaic cell f) Optical	

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st of Practicals

	(Time alloted Hrs.)
Plot V - I characterstics of for ward biased and recersed biased semiconductor diode	2
Assemble common emitter amplifere circuit using NPN transister and draw the characterstic	2
Identification of various electronics devices using test and measuring equipment	2
Study simple board micro processer (8085) and its various components	2
Load and execute ready simple programmes	8
Study various logic gates and verify their truth table	4
Assemble OR & NOT gates on digital experimenter using NAND gate	2
Make R - S flip flop and J - K flip flop on digital experimenter and verify its truth table	2
Study IC - 555 and its pin configuration	2
Study series regulators	2
Determine the load regulation characterstics of series regulator	2
Study ICS used in power supplies such as 7805,7810 /7905,7910,723 etc.	4
Study of analog multimeter	2
Study of digital multimiter	2
Measure voltage and current (AC&DC) with the help of analog multimeter	2
Measure voltage and current (AC&DC) with the help of digital multimeter	2
Measure the resistance and test the continuty with the help of analog and digal multimeters	2
Study of CRO	2
Measure voltage and current on CRO	2
Determine frequency of AC singal on CRO	2
Study if various transducers available in the job	6

Reference Book

Basic electronics and linear ciruits By :- Bhargava & kulshreshtha Publisher :- Tata McGraw Hill, India
Microprocesor and microcomputer By :- B.Ram
Pub :- Dhampat Rai & Sons
Digital Principles and application By :- Malvina and Leech
Pub :- McGraw hills
Modern electronic equipment By :- Khandpur
Pub :- TMH
Instrumentation devices and systems
By :- C.S.Rangan
Pub :- TMH
Electronic instrumentation and measurement techniques
By :- W.D.Cooper
Pub :- PHI

7/197 **PROGRAMME: DIPLOMA IN PRODUCTION ENGG.**
SCHEME: REVISED, IMPLEMENTED FROM 1995-96
SEMESTER: THIRD
COURSE: Introduction to Computer and Programming (P.C. 2060)

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4 .NTRODUCTION TO COMPUTER AND PROGAMMING

Rationale

The students of Diploma in production Engineering are to study computer aided manufacturing (AM) in their final year, therefore to prepare a foundation for this course, a course in computer and its application has been introduced at second year level. This course encompasses An over view of computer, Components of a computer, various input/output devices,internal and external memories, operating system, details about Dos operating system, programming steps, Programming in FORTRAN, an introduction of Database,DBMS,RDBMS, Application packages such as wordstar, FOXBASE/FOXPRO,Lotus 1-2-3 and Harvard Graphics,Virus and Vaccines etc.
It is intended that the students will appreciate the application of computer in the field of production engineering and be able to develop the elementary programmes only.

Introduction To Computer And Programming
List Of Theory Periods Allotted

	Topics	No.of Hours	
		Theory	Practicals
1.	Introduction to computers	2	
2.	Input.Output and memory	4	3
3.	Operating system	4	6
4.	Introduction to programming	10	10
5.	Database and application packages	8	27
	Total	28 Hrs.	56 Hrs.

Introduction To Computer And Programming

	Topic/Subtopic	Objective/I.L.O	Remark
1.	Introduction to computers (2 Hrs.)	Understands the principles of computer - Explains the functions of a computer - Lists difference between a computer and - Describes generation and classification of computer - Lists the area of application of computer in general and production engineering in particular such as - CAM, CIM, CAPP, FMS, CADD, CAE, CAI, CAQC etc. - Explains the micro computer architecture with the help of labelled back diagram - Defines data VS information - Defines software and hardware - Lists language hierarchy - Defines Bit, Nibble, Byte, KB, MB - States ASCII and EBCDIC codes - Explains the concept of various and vaccines with explains	
2.	Input, Output and Memory (4 Hrs.)	Understands input - output Devices - Defines the term common units - Explains the functions and use of input, output devices ie. Mouse, Digitizer, joystick, light pen, moderns, printer, plotter etc. - differentiate between impact and non-impact type of printers	

3. Operating system
(4 Hrs.)

Understands the memory devices
- Defines primary and auxiliary memory
- Defines internal memory ie, RAM, ROM, PROM, EPROM, EEPROM
- Describes the functioning of Floppy disk, Hard Disk , Magnetic Tape and magnetic Drums
- Lists the advantages and disadvantages of various external memory devices
- Explains the concepts of direct and serial accessing

Understands the operating system
- Explains operating system
- Explains the necessity of operating system in a computer
- Describes the different types of operating system such as on line, real time, time sharing and batch
- Explains single user and multiuser operating systems with suitable example
- Explain the concept of file and directory
- Defines internal , External , Internal commands of dos
- Explains internal commands such as MD, RENAME, COPY, DEL, COPY, CON, TYPE, DATE, TIME, CLS etc.
- Explains internal commands such as FORMAT, DISK COPY, CHK DSK, TREE, ATTRIB, CD, MD, RD etc.
- Explains intrupt commands such as ^p, ^c etc

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4.	Introduction to programming (10 Hrs.)	- Explains the concept of local area net work (LAN) wide area net work (WAN) metropolitan area net work (MAN) Understands programming concepts - List different steps of program development - Defines the term algorithm - Explains the steps for writing algorithum with suitable examples - Defines the term flow chart - Sketches symbols used to make a flow chart - Sketches the flow chart for the given example - Defines debugging and different types of error - Explains variable and constants used in FORTAN - Explains arithmetic expression and logical expression - Explains procedure to be adopted to convert mathematical expression into FORTRAN equivalent - Explains program structure of FORTRAN - Explains various commands of FORTRAN such as READ, WRITE, FORMAT, IF(IF-ELSE, DO, CONTINUE, END, STOP, PAUSE DIMENSION, various formats of Goto etc. with suitable examples - Defines sub routine - Develop simple and elementary programmes	The same event may be used for algorithm, creating of flow chart and developing program

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9.	Data base and application packages (8Hrs.)	Understands Database concept - Defines database DBMS, RDBMS - Explains various types of database such as relational, Net work and Hierarchical - States all the softwares involved in database management and their field of application Understands application packages - Explains the functions of application packages - Explains basic commands of WORD STAR (Opening menu, Edit menu, Block and save menu various Dot commands) - Explains basic commands of FOXBASE /FOXPRO (Creating database ,manipulating database, various Dot commands relates to manipulating - Explains different types of Graphs menus bar chart, Pi - chart etc. - Explains graphics representation through Lotus 1-2-3 and Harvard Graphics	Demonstration to be done in practice s - do - - do - - do -

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Introduction To Computer And Programming
List Of Practicals

	Practicals	No. of Hours
1.	Study various input,output memory units	3
2.	Practice various internal external,internal command of Dos	6
3.	Develop and run a few simple FORTAN programs.	10
4.	Practice WORDSTAR	8
5.	Practice various commants including file management commants in FOXBASE/FOXPRO	11
6.	Prepare different types of graph with the help of Lotus 1-2-3	9
7.	Prepare different types of graph with the help of Harvard Graphics	9
	Total	56 Hours

List of reference books

1. Fundamentals of computer by V.Rajaraman
2. Introduction to computer and MSDOS
3. Programming in fortran by Scheme Series
4. Computer programming in FORTRAN by V.Rajaraman
5. Word star professional by R.K.Taxali
6. Illustrated FOXPRO by BPB Publication
7. Illustrated Lotus 1-2-3 by Hyeller
8. Learn Harvard Graphic by Columbus, L in a day
9. Introduction to word star by Arthue Naiman
10. The MSDOS Hand book by Richard Allenking
11. Presentation with Harvard Graphic by Hoath.M