M.P. BOARD OF TECHNICAL EDUCATION, BHOPAL.

ADVANCED DIPLOMA

IN

MANUFACTURING ENGINEERING

(PRODUCTION ENGINEERING)

32/2

M.P. BOARD OF TECHNICAL EDUCATION, BHOPAL.

ADVANCED DIPLOMA

IN

MANUFACTURING ENGINEERING

(FIRST TO EIGHTH SEMESTER)

32/3

ADVANCED DIPLOMA PROGRAMME

IN

MANUFACTURING ENGINEERING

Identifying technicl skills in

Manufacturing Engineering Technicians

ADVANCED DIPLOMA PROGRAMME IN MANUFACTURING ENGINEERING

TECHNICAL SKILLS FOR TECHNICIAN

(Based on the views of industry Experts)

Area	Broad Roles	Technical skills
DESIGN & DRAFTING	(a) Drafting of working drawing (Mechanical)	- Reading of working drawing. - Drawing with drafting standard - Use of computer for mechanical drawing.
	(b) Interpreting production drawing and design	- Reading of production drawing or blue print. - Making correct graphical representation of engineering structures, machine designs and data relationships. - To supplement calculations with drawings or sketches. Modify the drawings as per the requirements.
MANUFACTURING PROCESSES	(a) Process Planning	- Making process plans. - Correcting process plans. - Interpreting & communicating process plans.
	(b) Selecting tools	- Selection of machine tools, cutting tools, forming tools, inspecting tools, holding tools and cutting parameters. - Setting and operating machine tools. Identifying critical Areas of machining based on tolerances and surface finishings.

Area	Broad Roles	Technical skills
		- Interpreting categories for capacity & capability.
	(c) Presetting operations	- Presetting of tools and jobs.
	(d) Developing program for computer control machines.	- Interpreting part program. - Developing/modifying part program.
	(e) Monitoring operations and problem solving.	- Interpreting trend data. - Interpreting alarms. - Interpreting quality checks. Making on line changes in process parameters to maintain quality.
	(f) Expediting	- Planning for multiple operations in single set up. Performing multiple operations in single set up. - Following up implementation & operations. Ensuring timely completion of operation.
MATERIALS MANAGEMENT	(a) Selection of materials	- Identify metals and alloys by their application. - Identify and analyse various metal alloys and materials by their characteristics.
	(b) Procurement of materials	- Making/Listing proper specifications. Determining what and how much to buy. Identification with standard specification known to the trade.

Area	Broad Roles	Technical skills
		- Scrutinizing of material bought against specitifications.
		- Use of simple techniques for procurement of materials like value analysis and standardisation in procurement.
	(c) Material handling	- Selection of material handling equipment.
		- Replacement of material handling equipments.
		- Tackling and Analysis of material handing problem
		- Transporting, elevating conveying self loading and bulk handling equipments.
		- Ensuring safety in operation.
	(d) Inventory Management	- Keeping procurmental policies of Inventories.
		- Forecasting various techniques to assess the demand.
		- Applying a general problem solving model to Inventory problem situation.
		- Applying general decision criteria for Inventory problems.
	(e) Purchasing materials	- Procurement of the right quality materials in the right quantity and at the right time
		- Buying from the right supplier.
		- Interpreting previous records.
		- Co-ordinating with production personnel.

Area	Broad Roles	Technical skills
		- Co-ordinating with maintenance personnel.
		- Use of some techniques like computer techniques, critical path techniques, import and export purchasing techniques etc.
		- Ensuring standard of quality & performance
QUALITY CONTROL AND INSPECTION		
	(a) Inspection of Boughtout spares	Check spare parts against design specifications.
		- Using of quality control charts and instruments.
	(b) Stage Inspection	- Inspection of operation/ process/product in different stages.
	(c) Non destructive testing	Awareness of non-destructive testing.
	(d) Inspection of process operation.	Inspection of casting product/ process operation in different stages.
		- Interpretation of S.Q.C. norms and control charts.
		- Reading and interpretation of test result.
INSTRUMENTATION AND CONTROL		
	(a) Handling of automatical process instruments (Electrical, Mechanical Hydraulic and Pneumatic)	- Use of latest process automatic instruments.
		- Setting and operation of instruments such as thermo-couple, Pyrometers, resistance, thermometers, monometers etc.

Area	Broad Roles	Technical skills
		- Calibrating instruments with reference to standard instruments.
		- Preventive measures for upkeep the instruments.
		- Awareness of Hydraulic and pneumatic control circuits.
ENVIRONMENTAL CONTROL		
	(a) Ensuring safeguards against environmental pollution	- Identifying sources of pollution in an industry.
		- Using remedial measures to minimise the pollution
		- Using proper environmental protecting equipment.
		- Continuous monitoring of pollution level.
MAINTENANCE		
	(a) Diagonising faults	
	(i) Operating Machines (Pumps, Compressors, conveyers & crane etc.)	- Testing of geometric alignment
		- Using of tools like spanners, bearings extractors, Allen keys, etc.
		- Interpreting abnormal vibrations, undue heating, irregular motions.
		- Identifying defective components/parts like Gears, slides, cluches, brakes.
		- Repairing and replacing defective parts using standard procedures.
		- Identification of proper errors.

Area	Broad Roles	Technical skills
		- Checking tensions in Belt drives.
		- Handling and cleaning of machine parts.
		- Assessment of lubricant condition.
		- Ensuring flow of lubricants.
		- Selection of proper speed feed rate, depth of cut, heating and flow of material
	(ii) Handling Instrumentation devices	- Setting of Instruments.
		- Calibrating Instruments with reference to standard instruments.
		- Testing of measuring devices.
	(b) Taking corrective meanures for the fault	- Maintenance of record of faults and undertaken corrective measures.
		- Preparation of proper History sheets.
	(c) Ensuring preventive maintenance for :	- Making schedule for preventive maintenance.
	(i) Machines	- Checking Machines performance periodically.
		- Carrying out adjustments.
		- Assessment of noise.
		- Assessment of vibrations.

Area	Broad Roles	Technical skills
	(ii) Cutting tools forming tools sliding parts valves, bearings.	- Checking and carrying out adjustments.
	(iii) Flow pipes	- Carrying out anti corrosive treatment on water line.
		- Checking and stopping of leakage.
	(iv) Cooling system and Pumps	- Carrying out treatment on coolants.
		- Cleaning of filters in pneumatic & hydraulic lines.
		- Draining water traps in pneumatic lines.
		- Carrying out adjustment of pumps.
		- cleaning of valves.
	(d) Erection and commissioning	- Transporting and handling equipment at site.
		- Placement of equipment at site
		- Assembly of different components.
		- Levelling and alignment of components and assemblies.
		- Pre-testing on no load.
		- Performing trial run.
SAFETY	(a) Following safety procedures and norms	- Observing safe practices while working.
		- Recognizing common hazards in use of hand tools and power tools.
		- Identifying the hazards due to improper use of pneumatic and hydraulic equipment.

Area	Broad Roles	Technical skills
		- Following standard procedures for handling and storing fuels, solvents and refrigerants.
		- Using proper personal protective equipment for safety.
		- Explaining how fires are prevented, contained and extinguished.
		- Following safety norms for carrying out the task.
	(b) Investigating Reasons for accidents	- Reporting of accident to the concerned persons or departments.
		- Ability to use accident report and investigating forms.
		- Find out probable reason(s) for an accident
		Providing appropriate safeguards for the safety of other workers working in that area.
MANAGEMENT		
	(a) Leadership	- Applying situational leadership.
		- Diagnosing own and other's leadership behaviour.
	(b) Communication	- Communicating with clarity both verbally and writing.
		Interpreting orders, memos, letters, design details to workman.

32/12

Area	Broad Roles	Technical skills
		Collecting opinion of workman and reporting briefly on incident.
		- Explaining technical complexity to customers and suppliers.
	(c) Encouraging team work	- Building participating groups on the shop floor.
		- Working in groups.
	(d) Problem solving	- Applying a general problem solving model to technical problem situations.
	(e) Decision making	- Applying general model of decision making to shop floor situation.
	(f) Project management	- Interpreting and modifying project plans.
		Interpreting and drawing of simple project networks.
		- Crashing a project network.
		- Implementing and monitoring a project.
		- Use of simple techniques.
	(g) Managing people	- Motivating subordinate.
		- Obtaining commitment of shop floor workers for jobs and tasks
		- Dealing with shop floor conflicts.
		- Tackling problem-workers.
		- Encouraging shy and new workers.

Area	Broad Roles	Technical skills
	(h) Cost Control	- Preparing and interpreting cost, time and effort estimates. - Identifying approximate man power and other resource needs. - Generating cost production ideas. - Generating waste production ideas.
	(i) Becoming more responsive	- Identifying situational needs. - Devicing steps to fulfil the reasonable situational needs. - Keeping tracks and fulfilling the targets and due dates. - Allocating work among indiludals in shop floor. - Co-ordinating between shop floor workers. - Ensuring safety in shop floor. - Ensuring high standard of quality and performance.

Iv. Semester

S.No.	Course Title	Theory	Practical	Total
1.	Computer Applications	3	4	7
2.	Metal cutting & Machine Tool Engineering	4	2	6
3.	Mechanics of Machines	4	2	6
4.	Fluid Mechanics and Hydraulic Machines	4	2	6
5.	Process Planning and control	4	–	4
6.	Machine design	1	6	7
V.	Semester	20	16	36

Inplant Training (Duration 16 weeks)

VI. Semester

S.No.	Course Title	Theory	Practical	Total
1.	Instrumentation and control	4	4	8
2.	CNC Technology	4	4	8
3.	Tool Engineering	4	4	8
4.	Quality Control (ISO - 9000)	4	–	4
5.	Business communication	4	–	4
6.	× Elective			
	✗ A. Production Management			
	✓ B. Enterpreneurship)	4	–	4
		24	12	36

VII. Semester

S.No.	Course Title	Theory	Practical	Total
1.	Managing people at work	3	0	3
2.	Industrial Management	5	0	5
3.	CAD,	3	6	9
4.	PMS,CIM & Robotics	4	2	6
5.	Maintenance Engg.	4	3	7
6.	Project	–	6	6
		19	17	36

VIII Semester

Industrial Training and Practical (Duration 20 weeks)

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

1. Semester

S.NO.	Course Title	Theory	Practical	Total
1.	Maths -I	5	-	5
2.	Engg. Physics	5	2	7
3.	Engg. Chemistry	3	2	5
4.	Workshop practice - I	-	6	6
5.	Engineering Drawing	-	8	8
6.	Communication Skills	5	-	5
		18	18	36

II Semester

S.No.	Course Title	Theory	Practical	Total
1.	Maths - II	5	-	5
2.	Applied Mechanics	3	2	5
3.	Electrical Engg.	4	2	6
4.	Elements of Thermal engg.	4	2	6
5.	Machine drawing	1	6	7
6.	Workshop Practice - II	1	6	7
		18	18	36

III Semester

S.No.	Course Title	Theory	Practical	Total
1.	Basic of computers	4	2	6
2.	Material Science	4	-	4
3.	Manufacturing Processes	5	2	7
4.	Workshop Practice - III	1	6	7
5.	Electronics	4	2	6
6.	Engineering Metrology	4	2	6
		22	14	36

MADHYA PRADESH

BOARD OF TECHNICAL EDUCATION

DIPLOMA
IN
ENGINEERING
(FOUNDATION COURSE)

CURRICULUM
IN
COMMUNICATION SKILLS

DEVELOPED AT

TECHNICAL TEACHERS' TRAINING INSTITUTE
BHOPAL

1989

SUBJECT: COMMUNICATION SKILL

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Rationale

32/18

Place of English in our curriculum and its value is seldom called into question. However, teaching of Inglish 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 syntan and levies form the most vital components. Due care has to be taken in their selection to achieve aims of the course.

32

32/19

-17-

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 physical 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, Bombay)

2- Living English Structures, by W.Stannard Allen

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

32/20

SUMMARY OF CONTENTS

Sl.No.	TOPIC	NAME OF THE BOOKS	LECTURE HOURS
1.	Passages 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)	
4.	Unseen passages for comprehension	-	
5.	Paragraph writing on topics of general interest.		

1/8/1

1. Passages for comprehension (A course in Technical English, Book-1) 32/21

Sl.No.	Topics	Content details	Scope	Lecture hours
1.	(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: put 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.	

1	2	3	4
2.	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.

32/33

2	3	4
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.	

1	2	3	4	5
4.	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 1. Concept words Cavity wall, setting out, lay cut, pointing, plate level. II. Compound words Load bearing walls, metal ties etc.		2 hours

32/24

32/25

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 hours

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	2	3	4	5
6.	Unit 8 Road making. 32/26	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 decided 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 scund is not the same; it has to be explained.	2 hours

-24-

2	3	4	5
Unit No.9 Solar energy 32/27.	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) Prepositional 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.		2 hours

Distinction between prepositional phrases and phrasal verbs needs to be emphasized by giving suitable examples.

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

32/28

-26-

32/28

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 cell affect-effect. c) Compound words Production failure machine components, material structure production process.	Grammar unit on Modifiers with special reference to 'Nouns' as modifers.	3 hours.

22/29

32/30

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.

32/30

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 a/an/the' with countable Words used as comtable or uncountable according 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	
7.	'Shall-will' and 'going to'	Ex:115,116	Expression of three important ideas with'if'
8.	.Conditions & unreal past.	Ex: 145	1. Main clause-future;"f".....present 2. Main clause- conditioned; 'if'....past 3. Main clause-conditional perfect."if"... .....past perfect.
9.	Reported speech.	Ex:229,230,232	When the reporting verb is in the present present perfect or future tense. When the reporting verb is in the past, past perfect or conditional tense. Reported speech(Questions).

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

1301

Topic	Content	Scope
	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 innumerable 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.	

32/33

Sl.No.	Topics	Content	Scope	Lecture hours.
1.	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

32/34

32/34
1-32-

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

32/35

1	2	3	4	5
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

3 2/36

32/36

1	2	3	4	5
4.	The refugee	A story about the extremely pitible condition of flood hit refugees wandering 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

32/37

32/38

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

- 36 - 32/38 -

The luncheon

The story deals with a humorous situation resulting from actual actions of an imposing lady which were incongruous with her words.

32/39

While reading the study, the following salient features must be carefully booked into:

a. Character-sketch of the lady.

b. mental condition of the host.

c. the most amusing part of the story.

32/39

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

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 fxxx the purpose of testing students comprehension.	32/40	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 ~~xxxxxxx~~ 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

32/40
38

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

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION : BHOPAL

Scheme of Examination for first year diploma course (10+3) year.

S.No.	Subjects	Term work	Lab work	Progressive Assessment I	Progressive Assessment T	Board paper.	Exams duration	Theory marks	Board practical Exams.	Duration	Marks	Remarks
1.	Communication Skill	30	-	10	10	1	3 Hr.	100	-	-	-	
2.	Applied Physics-I	25	25	10	10	1	3 Hr.	100	1	3 Hr.	50	
3.	Applied Physics-II	25		10	10	1	3 Hr.	100				
4.	Applied Chemistry-I	25	25	10	10	1	3 Hr.	100	1	3 Hr.	50	
5.	Applied Chemistry II	25		10	10	1	3 Hr.	100				
6.	Applied Mathematics-I	30	-	10	10	1	3 Hr.	100	-	-	-	
7.	Applied Mathematics-II	30	-	10	10	1	3 Hr.	100	-	-	-	
8.	Applied Mechanics	25	25	10	10	1	3 Hr.	100	1	3 Hr.	50	
	Total	215	75	80	80			800			150	

32/42

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

FIRST SEMESTER

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

Courses for I Semester

Sr.No.	Course Title	Theory	Practical	To
1.	Maths - I	5	-	
2.	Engg. Physics	5	2	
3.	Engg. Chemistry	3	2	
4.	Workshop Practice-I	-	6	
5.	Engg. Drawing	-	8	
6.	Communication Skills	5	-	

DETAILED SCHEME OF STUDY AND EXAMINATION OF ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING
FIRST SEMESTER

	Course Title	Hours/ Week (C1) Th.	Prac.	Sessional Marks Term work (D1)	Labwork (D2)	Progressive Assessment I (E1)	II (E2)	Board Exams paper (F1)	Duration Hrs (F2)	Theory marks	Practical Viva (H1)	Duration (H2)	Practical marks
1.	Math. I	5	-	15	-	10	10	1	3	100	-	-	-
2.	Engg. physics	5	2	15	25	10	10	1	3	100	1	3	50
3.	Engg. Chemistry	3	2	15	25	10	10	1	3	100	1	3	50
4.	Engg. Drawing	0	8	40	-	10	10	1	4	100	1	3	50
5.	W/s Practice 1	0	6	-	50	-	-	-	-	-	1	4	50
6.	Comm. skill	5	-	15	-	10	10	1	3	100	-	-	-
		18	18	100	100	50	50			500			200

(a) Total theory marks = 500
(b) Total (Term work, Lab. work, Progressive assessment & Practical) = 500

Advanced Diploma in Manufacturing Engineering

First Semester

MATHEMATICS – I

Theory per week: 5 Hrs. Practical per week: Nil

COURSE CONTENT

1. Algebra

Quadratic Equation General solution, nature of roots, relation between the roots & coefficients of the equation, formation of an equation from given roots.

Indices

Logarithms

Sequences & series – Arithmetic and Geometric progressions.

Permutations & Combinations – Factorial notation, symbols nPr, nCr, Simple problems.

Binomial theorems – Statement of theorem to any index, General term middle term/terms, greatest term.

Determinants
Partial Fractions

Trigonometry

System of measurement of angles, trigonometric ratios & identities, T.R. of standard angles & angle of any magnitude, use of T.tables, graphs of T.functions, inverse T.functions, solution of T.equations, T. ratios of compound angles, multiple & submultiple angle, C-D formula, A-B formula, properties of triangle & solution of triangle, height and distance.

Vector Algebra

Vectors & scalors, i, j, k. vectors.
Addition of vectors, multiplication by a scalor, dot product, cross product with geometrical and physical applications.

Statistics

Definition of Descriptive statistics, scales, frequency distribution, scales, frequency distribution, measures of central tendency, mean, mode, measures of dispersion, variance, standard deviation, concept of normal distribution.

REFERENCES

Mathematics for polytechnics - Vol I & II: T.T.T.I.,Bhopal.

Plane trigonometry - part I & II by S.L.Loney.

Algebra by K.P.Basu

Mathematical Statistics by M.Ray & Sharma

Mathematics for polytechnics by S.P.Deshpande.

Vector Algebra by Shanti Narain.

Higher Engineering Mathematics by G.S.Grewal.

(B)

Advanced Diploma in Manufacturing Engineering

First Semester

ENGINEERING PHYSICS

Theory per week : 5 Hrs. Practical per week : 2 Hrs.

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	S.I. Units.	4	4
2.	General properties of matter	10	6
3.	Heat Transfer	10	3
4.	Thermodynamics	8	0
5.	Electricity	8	4
6.	Cells, batteries and their maintenance.	6	3
7.	Electromagnetism	8	6
8.	Basic Electronics	10	2
9.	Optics	3	–
10.	Ultrasonics	3	–
		70	28

Adva[illegible]ploma in Manufacturing Engineering

First Semester

ENGINEERING PHYSICS 32/50

Theory per week : 5 Hrs. Practical per we[illegible] : 2 Hrs.

COURSE CONTENTS

1. S.I.Unit

Significance of S.I. Units, Fundamental Units, Base Units, Deriv[illegible] Units in terms of base units and notations.

2. General Properties of Matter

* Molecular Kinetic theory of matter, Kinetic and potential energy of molecules, concept of internal energy and heat energy, gas laws and their derivations by kinetic theory.

* Cohesive and adhesive [illegible]s, surface tension, surface energy, Rise in capillary tube.

* Fluid viscosity, streamline and turbulent flows, Stoke's law, Kinematic viscosity, Coefficient of viscosity by poiseuille's method.

* Elasticity, Hook's law, elastic limit, Young's Modulus, Bulk modulus.

3. Heat Transfer

Distinction between heat and temperature, mode[illegible] of heat transfer, variable and steady state coefficient of thermal conductivity for good and bad conductors, [illegible]vection, natural and forced heat transfer, during heat convection, radiation, emissive and absorptive power, black body radiation, Stefan,- Boltzmann law, Newton's law of cooling.

4. Thermodynamic[illegible]

First law of thermodynamics, second law of thermodynamics, thermodynamic proc[illegible]s reversible and irreversible process, carnot cycle.

5. Electricity

Electric current, free electron, theory of metallic conduction, current voltage relation, work and power in electrical circuits.

6. **Cells, Batteries and their Maintenance**

Comparative study of the chart specifying the primary and secondary cells electrodes, electrolyte, depolariser, principle of potentiometer, EMF, internal resistance of different types of cells. Maintenance of primary and secondary cells, when in use or when they are stored.

7. Electromagnetism

* Magnetic induction, magnetic induction of a current element, straight conductor, circular coil, magnetic flux.

* Motion of a charged particle in a magnetic field, current carrying conductor in a magnetic field, moving coil galvanometer, conversion of galvanometer into ammeter and voltmeter.

* Magnetic properties of materials, permeability, susceptibility.,

* Elementary idea of transformer.

8. Basic Electronics

* Thermionic emission, photoelectric emission, photocell, photovoltaic cells.

* Semiconductors, intrinsic and extrinsic semiconductor, P-type, N-type, P-N junction as a rectifier.

9. Optics

Dual nature of light, wave theory, huygen's principle, concept of wave front, wave as rap, principle of suprim position, interference of light, conditions of interference, speed of light in different media, optical density, refractive index, diffraction of light.

10. Ultrasonics

Audible frequencies, infrasonics ultrasonics production of ultrasonic waves. Uses of ultrasonics in industry i.e. in cold welding, drilling etc. piezo electric generators.

LIST OF EXPERIMENTS

1. Precise measurement of length by
   (a) vernier calliper
   (b) Micrometer Screw
   (c) Screw gauge

2. To determine surface tension of liquid by capillary rise method.

3. To determine coefficient of viscosity of liquid by poisenlle's method.

4. To determine coefficient of thermal conductivity of a good conductor (searle's Method)

5. To determine Young's modulus.

6. To study V-9 characteristics by Ohm's law.

7. To measure resistance by ammeter and voltmeter and verification of series and parallel combination.

8. To convert a galvanometer into a voltmeter of a given range.

9. To convert a galvanometer into an ammeter of a given range.

10. To investigate the relation between current flowing through the resistance and heat generated.

11. To study the variation of magnetic field by varying the current in coil.

12. To determine the internal resistance of cell by potentiometer.

13. To study the unidirectional property of P-N junctions.

REFERENCES :

1. Principles of Physics - TTTI, Bhopal.
2. Principles of Physics - Brijlal and Subramanian
3. Modern college Physics - H.E.White
4. College Physics - Sears and zee manskey
5. A level physics - Roger mumcaster.

Advance Diploma in Manufacturing Engineering

First Semester

32/54

ENGINEERING CHEMISTRY

Theory per week : 3 Hrs. Practical per week : 2 Hrs.

Sr. No.	Title	Theory Hrs.	Practical Hrs.
1.	Metals and Alloy .	5	12
2.	Fuels and C ustion	5	5
3.	Lubrication and Lubricants	5	6
4.	Bonding	4	–
5.	Catalysis	2	–
6.	Co on and protection	6	–
7.	Protective coating	3	1
8.	Dielectrics	4	–
9.	Pollution – Water, Air and Indu l.	4	4
10.	Oxidation and Reduction	3	–
11.	Indust detergents	1	–
		42	28

Advance D[illegible]a in Manufacturing Engineering

First Semester 32/55

ENGINEERING CHEMISTRY

Theory per week: 3 Hrs. Practical per week: 2 Hrs.

COURSE CONTENT

1. Metals and Alloys

General properties of metals, some important Ferrous & non ferrous alloys and their properties, Chemical analysis of [illegible] and alloys.

2. Fuels & Combustion

Classification of fuels, Calorific value, properties and specifications of different fuels, Handeling & storage of Fuel, Fire - protection.

3. Lubrication & Lubricants

Friction and [illegible] Lubrication, Mechanism, Classification and properties of Lubricants, Selection of Lubricants. Systems of lubrication, gravity forced, static and hydrodynamic, addition of agents for motor oil.

4. Bonding

Nature of Chemical Bond, Ionic and Covalent bonding, Physical bonding.

5. Catalysis

Types, characteristics of catalytic reactions, Autocatalysis.

6. Corrosion & Protection

Corrosion, Types of corrosion, factors affecting corrosion, Protection against corrosion.

7. Protective Coatings

Introduction, cleaning and preparation of metal surfaces, galvanising, types of coatings - chemical conversion coatings, paints, varnishes, enamels, Laquers, Ceramic

8. **Dielectrics**

Introduction, Dielectric properties, classification of Dielectrics, Gaseous Insulators, Liquid insulating materials, Solid insulating materials.

9. **Pollution**

Water Pollution - BOD, MPN, Purification of Water.

Air pollution - Major air pollutants, Air pollution and measures for its control.

Industrial pollution - Industrial wastes (effluents, garbage fumes etc.), measures for its control.

10. **Oxidation & Reduction**

Oxidation and Reduction, Electronic concept of oxidation and reduction, Oxidation number and Valency, Acid, Base, pH, Colorimeter.

11. **Industrial Detergents**

(brief idea)

32/57

LIST OF EXPERIMENTS

1. To measure the pH of different solutions by –

   (a) pH meter
   (b) colorimetric method

2. To determine the percent[illegible] copper in a sample of Brass by volumetric method.

3. To determine the p[illegible]centage [illegible]on in Ferrous Salt.

4. Quantitative estimation of two metals in an alloy (Solder/Bra[illegible]

5. To find out the flash point, fire point of dry/non-drying oils.

6. To determine the viscosity of lubricants by viscometer.

7. To determine the moisture content of a given sample of coal.

8. To determine the rate of corrosion on simple and galvani[illegible] nail by nail and acid method.

9. Analyse the Cations and Anions in a giv[illegible] salt by macro analysis.

10. Determination of total dissolved soli[illegible] (TDS)

11. Determination dissolved oxygen (DO)

12. Determination of most p[illegible]le number (MPN)

13. Identify the concentration of NH_3, CO_2, and SO_2.

14. Measurement of conductivity of given sample.

32/58

REFERENCES

Advance Inorganic Chemistry by Behl & Tuli.

Advance Inorganic Chemistry by Mitra

Applied Chemi : , by Shrivastava & Singhal; PBS Publication, Bhopal.

Objective Ch · y by Shrivastava & Shrivastava; Chandra Publication, Bhopal.

Engineering Chem : , by P.C.Jain & Monica Jain; Dhanpat Rai & Son's Publication.

E p iments in Applied Chemistry by M.Prasad; Chandra Publication, Bhopal.

A text book of Engineering Chemistry by P.C.Jain.

Advanced Diploma in Manufacturing Engineering

First Semester

ENGINEERING DRAWING

Theory per week - NIL Hrs. Practical per week - 8 Hrs.

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Introduction to drawing equipments	-	2
2.	Engineering Scale , Lines and curves	-	12
3.	Lettering and Dimensions	-	10
4.	Projections of points, lines and planes	-	15
5.	Orthographic projections	-	15
6.	Projection of solids and section of solids.	-	15
7.	Projection of machine components by free hand sketching	-	15
8.	Development of surfaces	-	12
9.	Isometric Projections	-	12
10.	Standard conversions & symbols	-	4
		-	112

NOTE :- Theoretical inputs will be provided during the Practical sessions.

Advanced Diploma in Manufacturing Engineering

32/60

First Semester

ENGINEERING DRAWING

Theory per week - NIL Practical per week - 8 Hrs.

COURSE CONTENT

1. **Introduction to Drawing and Drawing Instruments**

Define engineering drawing. Display and explain the use of various Drawing instruments and Drawing layouts.

2. **Engineering Scales, Lines and Curves**

Calculation of representations fraction and length of scale, construction of plain scale, diagonal and vernier scale, alphabets of lines - thick, medium, and thin lines. Conventional representation of centre line, full line, hidden line, cutting line, section line, dimension line, extension line etc. practice on sketch book. Engineering curves method of construction of curves like ellipse, parabola, hyperbola, cycloid, involute, helix, and spiral of archemedise. Uses of these curves.

3. **Lettering and Dimensioning**

Single stroke letters, gothicletters. Principles of dimensioning systems - Aligned and unidirectional. Arrangement of dimensions - chain, parallel and combined. Size and location dimensioning - superfluous dimensions. (IS 696 - 1972). Arrow heads & Extension lines. Practice problems on dimensioning techniques. Rules for dimensioning the isometric drawings.

4. **Projection of Points lines and Planes**

Introducion, elements of projections. Projection of points in different planes. Projection of line - True length. Projection of Planes practice problems.

5. **Orthographic Projections**

Meaning of orthographic projection. Planes of projections. Terms associated with orthographic projections front, side and top view. Differentiate between first angle and third angle projections on the basis of -

(a) Position of the object corresponding to the reference plane.
(b) Position of projection plane in relation to that of observer's eye and that of object.
(c) Relative position of front view and top view.
(d) Relative position of side view.

6. **Projection of solids and section of solids**

Types of solids-terminology; position of solids with respect to reference planes. Practice problem to Draw the projection of slids placed in various position with respect to the reference planes. (Cone, Cylinder, Cube, Prism & Pyramid) Define sectioning, need of sectioning, differentiate between full section, half section and Partial section. Simple problems.

7. **Projection of simple machine components by free hand sketching**

Techniques of free hand sketching, free hand sketching of simple machine components such as bearing cap, simple journal bearing, simple brackels, orthographic views of Hexagonal and square nut and bots, simple practice problems.

8. Development of surface

Concept and importance of development in engineering applications. Development of cube, prism, pyramid, cylinder and cone. Practical problems of development of chimney, Ducts and Hoppers etc.

9. Isometric Projections

Need and use of isometric scale. Procedure for preparing sometric drawing of rectangular Pentagonal and Hexagonal blocks and sphere.

10. Standard Conventions and Symbols

Sign conventions and symbols used in CME engineering as per IS code 696-1972. Symbols of building material Brickhas, Brick work, stores, concrete, wood, glass and foundation Bolts. Conventional representation of features like, external and internal threads; compression, tension and leaf springs, knurling, bearings and gears.
Elementary electrical symbols like DC, AC, Bulb fuse; earthing, plug, Resistance, capacitance, inductance, Bell, Buzzer, louuspeaker, Fan, Fan regulator, Exhaust Fan.

REFERENCES

1. IS Code 696-1972
2. Elementary engineering drawing by N.D.Bhatt; Charotar Book Stall, Anand.
3. Engineering Drawing by Gujaral and Shende; Khanna Publishers.
4. Machine Drawing by N.D.Bhatt; Charotar Book Stall, Anand.
5. Engineering Drawing by R.B.Gupta; Satya Prakashan, New Delhi.
6. Graphics for engineers by W.J.Luzzadar; Prentice Hall India Ltd., New Delhi.
7. Fundamentals of engineering drawing by W.J.Luzzadar; Prentice Hall India Ltd., New Delhi.

Advanced Diploma in Manufacturing Engineering

First Semester

WORKSHOP PRACTICE - I

Theory per we : Nil Practical per week - 6 Hrs.

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Introduction to Workshop	-	2
2.	Carpentry shop	-	18
3.	Fitting Shop	-	24
4.	Sheet metal shop	-	20
5.	Smithy Shop and forging	-	20
		-	84

NOTE: Theoretical inputs will be provided on shop floor during workshop practice.

Advanced Diploma in Manufacturing Engineering

First Semester

WORKSHOP PRACTICE - I

Theory per week - Nil Practical per week - 6

COURSE CONTENT

1. Introduction to Workshop

Familiarisation of different sections of a general engineering workshop. Safety precautions and good housekeeping in the workshop. Layout of different sections of workshop, general safety rules of workshop.

2. Carpentry shop

General layout of carpentry shop, Types of job produced in carpentry, Basic information required by carpenter. Raw materials, carpentry hand tools like saws, planner, chisels, hammer, mallet, marking gauge vice, try square, engineering rule etc., use of carpentry tools for making simple joint.

3. Fitting shop

Introduction of tools and equipments used in fitting shop - Files, vices, chisels, punch, scriber, hammers, try square, callipers, surface plate etc.
Fitting processes - Filing, chipping, scraping, sawing etc. Preparation of Male-Female joints.

4. Sheet-Metal shop

Metals used in sheet metal work - Black Iron, Galvanised Iron, Stainless sheet, Copper, Aluminium, Tinned plate.
Tools - Stakes, Hammers, scissors etc. sheet metal processes - Folding, Hemming,

5. Black Smithy and forging

Layout of shop, types of jobs produced in black smithy and forging shop. Basic information required for jobs to be made in these shops. Forging operations, furnance operations and type of heating systems used in forging shop.

LIST OF EXPERIMENTS

1. Study and sketch of various tools used in different sh such as - carpentry, fitting, sheet metal and smithy sho

2. One job in carpentry shop with the use of differ carpentry tools.

3. One job on differ ypes of carpentry joints.

4. One job on fitting joints containing different operat such as hacksaw cutting, filling, slotting, fitt drilling etc.

5. Filing and fitting of mating parts, checking gap gauge.

6. One job on forging operations such as bending, upsett drawing down, and setting d etc.

7. One job on sheet metal work containing surface develop of jobs and marking, joints and soldering.

REFERENCES

1. Workshop tech. Vol. I & II by Hazra Choudhary.
2. Workshop Technology Vol. I & II by Chapman.
3. Workshop Technology Vol. I & II by Gupta and Kaushik.
4. Manufacturing Processes by Young.
5. ~~Welding Technology Vol. I by Asian Publication.~~
6. ~~Video Films on welding technology by T.T.T.I., Bhopal.~~

Advanced Diploma in Manufacturing Engineering

First Semester

COMMUNICATION SKILLS

Theory per week: 5 Hrs. Practical per week: Nil

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Passages for comprehension	20	–
2.	Applied grammar	20	–
3.	Rapid Reading (short stories)	10	–
4.	Unseen passages for comprehension	06	–
5.	Precis writing	07	–
6.	Paragraph writing	07	–
		70	–

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

SECOND SEMESTER

32/69

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

Courses for II Semester

Sr.No.	Course Title	Theory	Practical	Total
1.	Maths - II	5	-	5
2.	Applied Mechanics	3	2	5
3.	Electrical Engg.	4	2	6
4.	Elements of Thermal Engineering.	4	2	6
5.	Machine Drawing	1	6	7
6.	Workshop Practice-II.	1	6	7

DETAILED SCHEME OF STUDY AND EXAMINATION OF ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING
SECOND SEMESTER

32/70

Course Title	Hours/week Th. (C1)	Prac. (C2)	Sessional Marks Term work (D1)	Lab work (D2)	Progressive Assessment I (E1)	II (E2)	Board paper (F1)	Exams Theory Durat hrs. (F2)	marks	Practical Viva (H1)	Duration hrs. (H2)	Practic marks
1. Maths II	5	-	15	-	10	10	1	3	100	-	-	-
2. Applied Mechanics	3	2	15	25	10	10	1	3	100	1	3	50
3. Electrical Engg.	4	2	15	25	10	10	1	3	100	1	3	50
4. Elements of ~~Heat~~ Thermal ~~Engine~~ Engg.	4	2	15	25	10	10	1	3	100	1	3	50
5. Machine drawing	1	6	40	-	10	10	1	4	100	1	3	50
6. Workshop practice II	1	6	-	75	-	-	-	-	-	1	4	50
	18	18	100	150	50	50			500			250

(a) Total theory marks = 500
(b) Total (Term work, lab work, progressive assessment & Practical) = 600

Advanced Diploma in Manufacturing Engineering

Second Semester

MATHEMATICS - II

Theory per week: [illegible] Hrs. Practical per week: Nil

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Coordinate Geometry	20	
2.	[illegible]	10	
3.	Differential [illegible]	20	
4.	Integral Calculus	20	
		70	

Advanced Diploma in Manufacturing Engineering

econd Semester

32/72

MATHEMATICS – II

Theory per week: 5 Hrs. Pr..tical per week: N

COURSE CONTENT

1. Coordinate Geometry

Cartesion & polar coordinates, point, locus.

Straight line – F ion of a straight line, angle betw
t aight lines, conditions for perpendicular & paral
lines, lengt' of perpendicular, Bisector of an angle betw
two straight lines.

Circle – Equation of a circle, equations of tangent
normal & chord

Parabola – Equation of a parabola, its tangent and normal

Ellipse – Equation of an ellipse, its tangent & normal.

2. Complex Variables

Complex Numbers : Basic defintion, operation and geome
representation of complex number, complex number as vect
complex conjugates, absolute values, polar forms, prob
powers and

Defintion of Function of Complex Variable : Definition,
Quotients.

3. Differential Calculus

Functions and limits, di erentiation of all types
functions, partial differentiation, higher derivatives
second order).

4. Integral Calculus

Integration as reverse proc s of differentiation, sta
formula, Integration by substitution, integration by p
integration by partial fractions, definite integral.

REFERENCES

1. Mathematics for polytechnics - Vol. 1 & Vol.II; TTTI,Bhopal.

2. Coordinate Geometry by S.L.Loney.

3. Text book on Differential Calculus by Gorakh Prasad.

4. Text book on Integral Calculus by Gorakh Prasad.

5. Higher Engineering Mathematics by G.S.Grewal.

6. Complex Variables and applications by Churchill Ago.

38

Advanced Diploma in Manufacturing Engineering

Second Semester

APPLIED MECHANICS

Theory per week : 3 Hrs. Practical per week : 2 Hrs.

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Introduction	2	-
2.	Forces	6	5
3.	Moment and couple	4	2
4.	Motion	3	3
5.	Friction	6	3
6.	Simple machines	6	3
7.	Centre of Gravity and moment of inertia	4	3
8.	Work, Power and Energy	5	3
9.	Stresses in frames	6	6
		42	28

Advanced Diploma in Manufacturing Engineering

Second Semester

APPLIED MECHANICS

Theory per week : 3 Hrs. Practical per week : 2 Hrs.

COURSE CONTENT

1. Introduction

Definition of statics, Dynamics, mechanics, kinematics, scolar and vector quantities, units of measurement.

2. Forces

Definition, measurement of force, Effect of a force, representation of force by vector , resultant force, composition of forces, Bow's notation, methods of finding resultant of coplanar force by analytical and graphical method simple laws of triangular and polygon forces, Lami's theorem.

3. Moment and couple

Definition, types, laws, effects, principle of moments and its application, levers and their types, reaction and fulcrum, couple and torque and their application.

4. Motion

Definition of speed, velocity, acceleration, angular velocity angular acceleration and relative velocity, Newton's laws of motion, simple harmonic motion periodic motion, phase and phased differenc, relation between SHM & cirrular motion, and application.

5. Simple Machines

Definition of mechanical advantage, velocity ratio, efficiency of machine, law of machine, simple screw jack, wheel and axle, rope and pulley, Different types of lifting devices, simple numerical problems.

6. Friction

Definition, types of friction, laws of friction, angle of friction, angle of repose, inclined plane, body sliding down a plane, Method of reducing friction, application of friction, simple numerical problem.

7. Centre of Gravity and Moment of Inertia

Definition, difference between centre of gravity & centroid, method of finding out centre of gravity of simple geomatrical plane figures such as I T & L sections, Definition of moment of inertia, method of finding out M.I. of various geometrical shapes, M.I. of Disc and rod etc.

8. Work Power and Energy

Definition of work, unit graphical representation of work, calculate work done pulling bodies on rough inclined plane. Definition of Power, type of engine power, mean effective pressure, mechanical efficiency, cylinder volume & power, measurement of BHP and types of dynamometer.
Definition of energy, types of mechanical energy, law of conservation of energy.

9. Stresses in frames

Definition of frame, perfect, deficient and redundant frame, assumptions made in finding stresses, method of joint, method of section and graphical method.

+35 ✓

8. Work Power and Energy

Definition of work, unit graphical representation of work calculate work done pulling bodies on rough inclined plan Definition of Power, type of engine power, mean effecti pressure, mechanical efficiency, cylinder volume & powe measurement of BHP and types of dynamometer.
Definition of energy, types of mechanical energy, law conservation of energy.

9. Stresses in frames

Definition of frame, perfect, defi...t and redundant fra assumptions made in finding stresses, method of join method of section and graphical method.

32/78

LIST OF EXPERIMENT

Verification of law of triangle of forces.

Verification of law of parallelogram of forces.

Verification of law of Polygone of forces.

Verification of the Principle of moments.

Determination of coefficient of friction for surfaces of different materials on
(i) Horizontal plane
(ii) Inclined plane

Verification of Lami's Theorem by Jib-crane method.

To find the V.R., M.A. and efficiency of the following:-
(i) Simple screw Jack
(ii) Differential pulley block
(iii) Differential wheel and axle
(iv) Simple and Double purchase creb.

Determination of law of machine for a given device.

To study SHM with the help of a simple pendulum and investigate the effect of length, mass of bob and amplitude on time period.

REFERENCES

1. A text book of applied mechanics by R.S.Khurmi; S.Chand & Co., New Delhi.
2. A text book of applied mechanics by I.B.Prasad; Khanna Publishers, Delhi.
3. Engineering mechanics by Timoshenko & Young; McGraw Hills Book Co.
4. Applied mechanics by Ramamurtham; Dhanpat Rai & Sons, Delhi.
5. Applied mechanics by D.A.low.
6. Engineering mechanics by Irving H. Shames; Publication Prentice Hall of India.
7. Applied Mechanics by Sadhy Singh.
8. Applied Mechanics by J.B.Gupta.

Advanced Diploma in Manufacturing Engineering

Second Semester

ELECTRICAL ENGINEERING

Theory per week : 4 Hrs. Practical per week : 2 Hrs.

Topic No	Title	Theory Hrs.	Practical Hrs.
1.	Fundamental of Electrical Engineering	8	-
2.	Electrical Circuits	6	4
3.	Electromagnetism	6	-
4.	A.C. Fundamentals	8	-
5.	D.C. Machines	8	6
6.	A.C. Machines	10	8
7.	Electrical Measuring Instruments	4	6
8.	Electrical Wiring and Safety	6	4
	TOTAL :	56	28

Advanced Diploma in Manufacturing Engineering

Second Semester

32/81

ELECTRICAL ENGINEERING

Theory per week : 4 Hrs. Practical per week : 2 Hrs

COURSE CONTENT

1. Fundamentals of Electrical Engineering

Introduction, electrical phenomena and their cause, electric current, potential and voltage. Voltage generation and its principle, methods of voltage generation. type of voltage and voltage measurement. Electric current, current strength, types of current effect of electric current measurement.

2. Electrical circuits

Ohm's law, resistance of conductors, specific resistance types of resistors, series connection and parallel connection of resistances, Kirchoff's voltage law, Kirchoff's current law, electrical power, electrical energy and their measurement.

3. Electromagnetism

Electromagnetism, its phenomena and units, magnetic field of a coil, straight conductor, right hand screw rule, magnetic flux, flux density, field strength, magnatomotive force (mmf), Faraday's law of electromagnetic induction.

4. A.C. Fundamentals

Generation of sive wave, terms related to A.C. tune period and frequency, max value, root mean square (RMS) value, Average value, Single phase and three phase voltage. R series and parallel circuits, power in A.C. circuit, generation, transmission and distribution of electric energy.

5. D.C. machines

Construction and working principle of D.C. motor, significance of e.m.f. in D.C. motor types of D.C. motor, characteristics of D.C. series end shunt motor, application of D.C. motor, D.C. motor starter, speed control, efficiency of D.C. motor, Construction of D.C. generator, working principle of D.C. generator, e.m.f. generation, types of D.C. generator.

6. A.C. Machines

Construction of transforme, its working principle and types, efficiency, auto transformer, transformer applications, constructions of A.C. motion and A.C. generator (single phase only), their working principle, synchronous speed, ship and speed control of A.C. motor, 3 phase A.C. motor applications of A.C. motors and selection.

7. Electrical Measuring Instruments

Commonly used electrical measuring instruments (Ammeter, Voltmeter, Wattmeter, Energy meter) their construction and working principle, measurement using these instruments, multimeter and its use.

8. Electrical Wiring and Safety

Domestic wiring, Industrial wiring, types of conductors and their applications. Wiring layout of single phase and three phase (small) motor, electrical accessories and their uses, safety precautions, effect of electrical current on human body, artificial respiration, current protection. Fuse, switches, relays MCB, MCCB, earthing.

LIST OF EXPERIMENTS

1. (a) Varification of OHM's laws.
   (b) Varification of Kirchhoff's laws.
   (c) Experiment on series and parallel connection of resistances.
   (d) Measurement of power in simple circuit.
   (e) Measure resistance of various cross section and length of wire of same material.

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

3. (a) Calculate A.C. & D.C. resitance in R & L series ckt.
   (b) Measure I, V in series R.L.C. ckt. and calculate power factor. Draw vector diagram.
   (c) Measure V, I in parallel R.L.C. circuit and calculate p.f.

4. (a) Study of various parts of D.C. machine.
   (b) Study of motor starters.
   (c) Speed control of D.C. shunt motor by
       (i) flux control
       (ii) armature voltage control
   (d) Reversal of D.C. motor.

5. A.C. machines -
   (a) Study construction of a transformer.
   (b) To find transformation ratio of a given transformer.
   (c) Study construction of A.C. machine (motor & generater) Name main part also study of various types of enclosures.
   (d) Study of various types of A.C. starters.
   (e) Connections of single phase capacitor motor.

6. Measuring instruments -
   (a) Connection of ammeter, voltmeter and wattmeter in A.C. ckt.
   (b) Connection of energy meter.
   (c) Measure current by clip on ammeter.

7. (a) Study of standard wire gauge and to find gauge number of a given wire thereby finding the current from table
   (b) Connection of tube light controlled by switch.

8. Safety, protection & maintenance
   (a) Demonstration of various types of faults (open ckt, short ckt, earth fault)
   (b) Demonstration of artificial respiration (By charts etc.)
   (c) Explain the importance of maintenance on actual machine

REFERENCES

1. Electrical Engineering
basic technology (GTZ [illegible])

2. Fundamentals of Electrical Engineering
by Deltoro (Prentice 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)

Advanced Diploma in Manufacturing Engineering

Second Semester

ELEMENTS OF ~~HEAT ENGINES~~ Thermal engg.

Theory per week: 4 Hrs. Practical per week: 2Hrs.

Topic No	Title	Theory Hrs.	Practical Hrs.
1.	Energy conservation	8	–
2.	Properties of steam	6	–
3.	Steam generators	5	8
4.	Steam Turbine	6	–
5.	Internal Combustion engine	6	6
6.	Gas Turbine and Jet propulsion	5	–
7.	Heat Exchanger and cooling towers	6	4
8.	Compressor, blower and fans	6	4
9.	Refrigeration and Air-Conditioning	8	6
		56	28

-83-32/86

Advanced Diploma in Manufacturing Engineering

Second Semester

ELEMENTS OF ~~HEAT ENGINES~~ Thermal engg.

Theory per week : 4Hrs. Practical per week : 2 Hrs.

COURSE CONTENT

1. Energy Conservation

Introduction, Relation of mass and energy, Types of energy, Potential and kinetic energy, Internal energy, Definition of system, Law of conservation of energy, Flow processes and non flow processes, limitations of the first law, Heat engine, Thermal efficiency of heat engines.

2. Properties of Steam

Introduction, Generation of steam, uses of steam standard and dry steam, Wet and superheated steam, Properties of steam, Quality of steam, Use of steam tables.

3. Steam Generators

Function of generator, Classification, Description and working of cochan, Lancashire Babcock and Wilcox boiler, mounting and accessories, Drought- Natural and Artificial, Application of Boilers.

4. Steam Turbine

Introduction, Flow through nozzle, Principle and working of steam turbine, Classification, Simple Impulse and reaction turbine, Compounding of turbine, Thermal power plant, Its layout and block diagram.

5. Internal Combustion Engine

Introduction, Classification, Components of I.C engine working of petrol and diesel engine (Four stroke and two stroke) Advantages and Disadvantages.

6. Gas turbine and Jet propulsion

Introduction, Classification, Working principle of open and closed cycle gas turbine, Jet propulsion.

7. Heat Exchange and Cooling Towers

Introduction, LMTD, Parallel and Counter flowheat exchanger, Condenser, cooling towers-Natural and Artificial circulation type, Applications and specifications of heat exchangers and cooling towers.

32/87

LIST OF EXPERIMENTS

1. Study by models, charts and actual units of the following:

   (a) Common types of fire-tube and water tube boilers.
   (b) Boiler mountings and accessories.
   (c) Simple Steam engine
   (d) Steam turbine
   (e) Surface Condenser
   (f) Cooling tower.

2. To study different type of water turbine

3. To study of Four Stroke and Two Stroke

   (a) Petrol engine
   (b) Diesel engine

REFERENCES

1. General Mechanical Engineering by Hazra Choudhry; Potation Book Co.

2. Thermal Engineering by P.L. Ballney; Khanna Publishers.

3. Thermodynami and heat Engine by S. Domkundwar; Dhanpa Rai and Sons.

4. Heat Engine and Thermodynamic by pandy and Shah; Charota Book stall.

5. Mechanical Engineering by Mathur & Me . Jain publisher.

Advanced Diploma in Manufacturing Engineering

Second Semester

MACHINE DRAWING

Theory per week : 1 Hr. Practical per week : 6 Hrs.

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Limits and Tolerences	2	8
2.	Assembly & detail drawings.	2	18
3.	Screw threads & Screw fastening	2	12
4.	Permanent Fastenings	2	12
5.	Shafts Couplings	2	14
6.	Bearings	2	10
7.	Pipe joints and valves	2	8
8.	Reading and Interpretation of Working Drawing	2	2
		14	84

Advanced Diploma in Manufacturing Engineering

Second Semester

MACHINE DRAWING

Theory per week : 1 Hr . Practical per week : 6 Hrs

COURSE CONTENT

1. Limits and Tolerances

Definition of tolerances and fits, types of fits, terminology, standard tolerance, Hole and shaft basis systems for fits. Selection of fits, dimensioning to tolerances, tolerance zone, machining symbols, linear and geometric tolerances.

2. Assembly and Detail Drawings

Introduction to detailed drawing and assembly drawings, making assembly drawings of tail stock of lathe, machine vice, tool post, tool holder of shaper from details and vice versa. Methods of indicating surface roughness, roughness grade symbols and their application on assembly & detailed.

3. Screw threads and screwed fastening

Forms of screw threads, conventional representation of screw threads temporary and permanent fastenings devices.

4. Permanent Fastenings

Rivets : Standard forms and proportions, Rivetted joints, common types of joints, terminology, proportions and representation.

Welding : Types of welds and welded joints, edge preparation, specifications, and representation of welds on drawings.

5. Shafts Couplings

Introduction, rigid or fast coupling, non-rigid or flexible coupling, universal coupling flange and odhamins coupling etc.

6. Bearings

Introduction to journal bearings, pivots and thrust bearing. Ball and roller bearning, plumber block prevention of rotation of bushes.

7. Pipe joints and valves

C.I. flanged joint spigot and socket joint, Hydraulic pipe joints, union joint, expansion joint, pipe fittings, holding devices, and symbols used in piping, stop cock, non-return valve and Relief valve.

8. Reading and Interpretation of Working Drawing.

32/92

REFERENCES

1. Machine drawing by N.D.Bhatt; Charotar Book stall, Anand.
2. Machine drawing by P.N.Vijayvargiya
3. Fundamentals of Engineering Drawing by Warren J. Luzzadder; Prentice Hall of India.
4. Engineering Drawing by D.N.Ghosh; Dhanpat Rai and Son Delhi.
5. Intermediate Engineering Drawing by Parkinson; Pitman.
6. Machine drawing by Siddheswar Kannaih and Sastry; T.M.H New Delhi, India.

Advanced Diploma in Manufacturing Engineering

Second Semester

WORKSHOP PRACTICE - II

Theory per week : 1 Hr Practical per week : 6 Hrs.

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Marking and Measuring Instruments	2	8
2.	Pattern Making Shop	2	12
3.	Foundry Shop	2	20
4.	Welding Shop	3	18
5.	General Machine Shop (Lathe & Milling)	4	18
6.	Denting and Painting Shop	1	8
		14	84

Advanced Diploma in Manufacturing Engineering

Second Semester

WORKSHOP PRACTICE - II

Theory per week : 1 Hrs. Practical per week : 6 Hrs.

COURSE CONTENT

1. Marking and Measuring Instruments

Knowledge of use of various marking and measuring instruments such as Vee Block, surface plate, centre punch, spirit level, vernier height gauge, vernier calliper, Bevel protector, micrometer, digital micrometer, Dial indicator, digital indicator and gauges. Application and use of the above instruments for linear and angular measurements.

2. Pattern Shop

Knowledge of carpentry processes like cutting, sawing, planning, marking etc. Preparation of various joints, Dovetail, mortise and tennon, finishing and polishing of jobs.

3. Foundry Shop

Knowledge of Moulds and Moulding sand, use of foundry shop, tools used - cape and drag, vent wire, shovel, runner, riser, lifter, trovel etc.

4. Welding Shop

Knowledge of welding tools and equipments. Knowledge of various types of joints - Butt, V-joint etc. Safety precautions to be observed in welding shop. Preparation of Lap, Butt and Tee joints.

5. General Machines Shop

Knowledge of various cutting tools, understand the function of machine tools such as lathe, Drilling, Safety precautions to be observed while working in general machine shop.

6. Denting and Painting Shop

Use of gas welding in denting, denting equipment and tools, preparation of surface for painting, modern painting techniques used in industries such as: spray painting, powder spraying and electrostatic painting.

32/95

LIST OF EXPERIMENT

1. Study and use of various marking tools in the shops.
2. Two jobs in pattern shop on different types of joints incorporating operations such as - planning, grooving, slotting, sizing etc.
3. Preparation of mould for any job involving the use of different moulding tools.
4. One job on casting involving different foundry operations.
5. To prepare joints using
   (a) Gas welding
   (b) Arc welding
6. Preparation of edges for welding.
7. Welding V-Butt joint.
8. Use of vernier, micrometer and dial indicator in machine shop.
9. Practice of simple turning on lathe.
10. Practice of grooving, knurking, and boring operations on a lathe machine.
11. Simple drilling practice on drilling machine.

REFERENCES

1. Workshop Technology, Vol. I & II by Hazra Choudhary.
2. Workshop Technology, Vol. I & II by Chapman.
3. Workshop Technology, Vol. I & II by Gupta and Kaushik.
4. Manufacturing Processes by Young.
5. Welding Technology Vol. I by Asian Publication.
6. Video Films on welding technology by T.T.T.I., Bhopal.

32/96

(56)

ADVANCED DIPLOMA
IN
MANUFACTURING ENGINEERING

S.No	Name of participants
1.	Shri N.L.Panchbudhe A.W.S. Govt.Polytechnic Balaghat.
2.	Shri B.D.Srivastava W.S. Govt.Polytechnic Damoh.
3.	Shri S.D.Sharma Lect. Govt.Polytechnic Damoh.
4.	Shri B.K.Rajpal Lect. Govt.Polytechnic Gwalior.
5.	Shri Y.K.Varshney Lect. Govt.Polytechnic Gwalior.
6.	Shri L.N.Srivastava Lect. Shri Vishnav Poly. Indore.
7.	Shri R.C.Vishwakarma W.S. Govt.Kalaniketan Polytechnic Jabalpur.
8.	Shri C.L.Pandey A.W.S. Govt. Polytechnic Khurai.
9.	Shri G.S.Bedi Lect. Govt.Polytechnic Seoni.

Editor:
K.K.Jain, Asstt. Prof., Mechanical Engg. Deptt.
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32/98

57

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

THIRD SEMESTER

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

Courses for III Semester

S.NO	COURSE TITLE	THEORY	PRACTICAL	TOTAL
1.	Basic of Computers	4	2	6
2.	Material Science	4	2	6
3.	Manufacturing Processes	5	2	7
4.	Theory of metal cutting	5	-	5
5.	Fluid mechanics and Hydraulic machines	4	2	6
6.	Electronic Engg.	4	2	6
		26	10	36

DETAILED SCHEME OF STUDY AND EXAMINATION OF ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

Third Semester

S.NO	COURSE TITTLE	Hours/week Th. (C1)	Prac (C2)	Sessional marks Term work (D1)	Lab. work (D2)	Progressive Assessment I (E1)	II (E2)	Board Paper (F1)	Exams. Duration hrs. (F2)	Theory marks	Practical Viva (H1)	Duration hrs. (H2)	Practical marks
1.	Basic Computers	4	2	15	25	10	10	1	3	100	1	3	50
2.	Material Science	4	2	15	25	10	10	1	3	100	1	3	50
3.	Manufacturing processes	5	2	15	25	10	10	1	3	100	1	3	50
4.	Theory of metal cutting	5	-	30	-	10	10	1	3	100	-	-	-
5.	Fluid mechanics and hydraulic machine	4	2	15	25	10	10	1	3	100	1	3	50
6.	Electronic Engg.	4	2	15	25	10	10	1	3	100	1	3	50
		26	10	105	125	60	60			600			250

a) Total Theory marks = 600
b) Total marks (Term work, lab work, progressive assessment and practical) = 600

Advanced Diploma in Manufacturing Engineering

Third Semester

BASIC OF COMPUTERS

Theory per week: 4 Hrs. Practical per week: 2 Hrs.

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Introduction to Computers	5	-
2.	Computer organization	8	2
3.	Computer Software	15	-
4.	Pascal programming	22	18
5.	MS DOS	14	12
	Total	64	32

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Advanced Diploma in Manufacturing Engineering

Third Semester

BASIC OF COMPUTERS

Theory per week: 4 Hrs. Practical per week: 2 Hrs.

COURSE CONTENTS:

1. Introduction to Computers

Block diagram of computers, types of computers, features and powers of computers, Application of computers, Concept of Hardware and Software.

2. Computer Organisation

Input/output devices, memory, storage devices: floppy, Hard disk, tape, peripheral devices, ports: serial & parallel, Buses: back plane, process buses, local buses.

3. Computer Software

Concept of program, Machine language, Assembly language, High Level Language, compilation, Interpretation, programming language, problem solving techniques, program development process: flowcharting, Algorithm, program writing, debugging, compiling, executing, program maintenance.

4. Programming in PASCAL

Data types, structure of a pascal program, various programming constructions and loops, functions and procedures, writing simple programs in PASCAL.

5. MS-DOS

Aims and functions of operating system, structure of MS-DOS, basic DOS files and file system. DOS commands: Internal & External, batch files, Auto execute.bat file, Config.Sys.

LIST OF PRACTICALS

1. MS-DOS

   (a) Practice of various internal & external commands of MS-DOS.

   (b) Learn formatting a disk & making it bootable.

   (c) Study of MS-DOS file system.

2. Learn operations & applications of various Input, Output, storage & peripheral devices.

3. Pascal programming.

   Draw flow chart & write programs in PASCAL for following problems

   (a) Find out maximum & minimum of 3 numbers.
   (b) Finding out mean, standard deviation of n numbers.
   (c) Finding out roots of an quadratic equation.
   (d) Finding out sum of individual digits of a number.
   (e) Finding out factorial of a number.
   (f) Searching an element in an array of numbers.
   (g) Addition of two matrices.
   (h) Sorting a list of numbers.

4. Learning to write programs in Pascal to solve various problems in Mechanical & Manufacturing Engg.

Note:

This is only a suggestive list of problems for programming. The instructor on his part may add more problems which are more Manufacturing Engg.application oriented. He can also take small industrial problem & get it solved by students.

REFERENCES

1. Introduction to computers by Balaguruswamy; Tata McGraw Hill

2. Computer programming in Pascal by V.Rajaraman

3. Introduction to system software by Dhamdhere; TMH

4. Computer fundamentals by B.RAM: Willy Eastern Ltd

5. Introduction to Computer Science by Govind Rajalu; Willy

6. Inside the IBM PC by Peter Norton; Brady Books

7. DOS users guide by Peter Nortan

64

Advanced Diploma in Manufacturing Engineering

Third Semester

MATERIAL SCIENCE

Theory per week - 4 hrs Practical per week -2 hrs

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Introduction of Engineering Materials	2	-
2.	Atomic structure and chemical Bonding	3	-
3.	Testing of materials	3	18
4.	Structure of crystalline solids	4	-
5.	Imperfection in solids	6	14
6.	Mechanical properties of metals	6	-
7.	Dislocation and strengthening mechanisms	10	-
8.	Equilibrium diagrams	10	-
9.	Ferrous metals and Alloys	6	-
10.	Non-ferrous metals and Alloys	6	-
11.	Plastics	5	-
12.	Newer Material	3	-
	Total	64	32

(65)

Advanced Diploma in Manufacturing Engineering

Third Semester

MATERIAL SCIENCE

Theory per week -4 hrs Practical per week -2 hrs

COURSE CONTENT

1. Introduction to Engineering Materials

   Different types of engineering materials, characteristics and properties required there of such as formability, physical properties, chemical properties, mechanical properties etc.

2. Atomic Structure and Chemical Bonding

   Atomic structure: fundamental concepts, electrons in atoms, Atomic Bonding: Bonding forces and energies, types of bondings. Ionic, covalent and metallic, characteristics of each, effect of bonds on material properties.

3. Testing of Materials

   Necessity, tensile tests, impact tests, hardness tests and fatigue tests etc.

4. Structure of crystalline solids

   Crystalline and amorphous materials, unit cells, metallic crystal structures or space lattices, allotropy and poly morphism.

5. Imperfections in solids

   Point defects - Vaccancies and self interstitials, impurities in solids, miscellaneous imperfections-Line imperfections, surface imperfections, volume defects. Microscopy, grain size determination.

6. Mechanical Properties of Metals

   Concepts of stress and strain, elastic deformation: stress-strain behaviour for different materials, elastic properties of materials, Plastic deformation: Tensile properties-yielding and yield strength, tensile strength, ductility, toughness, hardness creep, mechanical failure-fatigue, fracture-ductile and brittle.

7. Dislocations & Strengthening Mechanisms

   Dislocations and Plastic deformation-Edge dislocation, screw dislocation, characteristics of dislocations slip & its mechanism, strengthening mechanisms in metals, strengthening by grain size reduction, solid solution hardening, strain hardening.

8. Equilibrium diagrams

Basic concepts - phases, components, degree's of freedom phase equilibrium, phase or equilibrium diagrams, phase rule, interpretation of phase diagrams - phases present, determination of phase composition and phase amounts, Binary eutectic systems, Iron-Carbon equilibrium diagram.

9. Ferrous Metals and Alloys

Flow diagram for the production of Iron and Steel. Classification, composition and uses of cast iron, effects of silicon, sulphur and phosphorous, classification composition and uses of plain carbon steel, effect of alloying elements such as chromium, nickel, tungston, Vanadium etc. composition uses of nickel steel, manganese steel and stainless steel. National and internationals standars of ferrous metals and alloys.

10. Non-ferrous Metal and Alloys

Properties and use of copper and its alloys- Copper, Brasses, Bronzes.

Properties and uses of Nickel, Magnesium, titanium, Zinc, Lead, Tin and its alloys, composition, properties and uses of white metal and babitts. National and international standards of non ferrous metal and alloys.

11. Plastics

Types, characteristics and applications, forming techniques- Molding-compression and transfer molding, injection molding, extrusion, blow molding.

12. Newer Materials

Whiskers and composites - basic concepts, characteristics, types and their applications, Ceramics - Glasses, clay products, refractories, characteristics and applications.

(~~67~~)

LIST OF EXPERIMENTS

1. Tensile test of a M.S. specimen on UTM.
2. Impact tests-charpy and Izod.
3. Hardness tests- Brinell, Rockwell & Vickers.
4. Fatigue test.
5. Study of metallurgical microscope.
6. Preparation of Micro-specimen.
7. Determining the grain structure of a micro-specimen.

REFERENCES

1. Engineering Materials Hand Book by Montell CL; MaGraw Hill Book Company.
2. Metallic Materials by Robert B. Rors; Chapman and Hall.
3. Material Science and Engineering by Callister.
4. Material Science and Engineering by Raghvan.
5. Material Science and Processes by Hajra Choudhary.
6. Material Science by O.P.Khanna.
7. Material Science by G.B.S.Narang.
8. Engineering physical metallurgy by Prof.Y.Lakhtin; PUBLISHERS. MOSCOW.
9. Instructional Material/Learning Package of Electri Engineering Materials and Components; T.T.T.I., Bhopal.

Advanced Diploma in Manufacturing Engineering

Third Semester

MANUFACTURING PROCESSES

Theory per week -3 hrs Practical per week -2 hrs

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Introduction to manufacturing processes	2	-
2.	Casting	16	6
3.	Forming Process	20	6
4.	Metal Joining Process	14	10
5.	Powder Metallurgy	6	-
6.	Coating Process	5	-
7.	Heat Treatment	14	6
	Total	90	32

Advanced Diploma in Manufacturing Engineering

Third Semester

MANUFACTURING PROCESSES

Theory per week -5 hrs Practical per week -2 hrs

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Introduction to manufacturing processes	2	-
2.	Casting	16	6
3.	Forming Process	20	8
4.	Metal Joining Process	14	10
5.	Powder Metallurgy	6	-
6.	Coating Process	6	-
7.	Heat Treatment	14	6
	Total	90	32

LIST OF EXPERIMENTS

1. One job on wood pattern making.
2. Demonstration on metal melting - cupola furnace.
3. One job on sand casting.
4. One job on spinning.
5. One job on drop forging using a power hammer.
6. Sheet metal operations-notching, slitting, nibbling, trimmings, punching, blanking.
7. One job on Arc welding.
8. One job on gas welding.
9. One job on spot welding machine.

32/113

REFERENCES

1. Manufacturing science: Ghose and Mallik.
2. Materials and Processes in Manufacturing: Degarmo, Black Kohser.
3. Manufacturing Processes: Begeman.
4. Manufacturing Processes: Roberts and Lapidge.
5. Production Technology: R.K.Jain.
6. Workshop Technology: Hajra and Chaudhary.
7. Processes of Materials and Manufacture: Lindberg.

(-14)

Advanced Diploma in Manufacturing Engineering

Third Semester

THEORY OF METAL CUTTING

Theory per week - 5 hrs Practical per week -Nil

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Geometry of cutting tools	10	-
2.	Mechanism of metal machining	14	-
3.	Mechanics of multipoint cutting tool	12	-
4.	Machinability and tool life	14	-
5.	Economics of Metal Machining	10	-
6.	Cutting tool materials	12	-
7.	Cutting Fluids	6	-
	Total	80	-

32/115 -103

Advanced Diploma in Manufacturing Engineering

Third Semester

THEORY OF METAL CUTTING

Theory per week -5 hrs

Practical per week -Nil

COURSE CONTENT

1. Geometry of cutting tools

Classification of cutting tools, single point cutting tool, and its parts, reference planes to define the tool geometry, tool nomenclature sytems, geometry of a single point cutting tool, purpose of each of tool angles, nose radius, influence of tool angles, criteria for selecting tool angles, positive and negative rake angles, conditions for positive and negative rake angles, their advantages and disadvantages.

2. Mechanism of metal machining

Elements of a machining process, mechanism of cutting/machining, factors affecting the cutting action, classical metal machining processes-orthogonal and oblique cutting, types of chips produced in machining, factors responsible for the formation of different types of chips, effect of type of chip on surface finish of the machined surface, cutting forces in orthogonal cutting, effect of cutting forces on power requirement, measurement of cutting forces (Mohr's circle), simple effect of cutting variables on surface finish, heat generation cutting forces and power requirement.

3. Mechanics of Multipoint cutting tools

Milling : cutting action in milling, elements of a milling cutter, geometry of a milling cutter, selection of angles for different materials, cutter materials, speeds and feeds.

Drill and Reamers : Cutting action in drilling, elements of a twist drill, type of drills, selection of angles for different materials, types of reamers, elements of a reamer speeds and feeds.

Broaching : cutting action in broaching, elements of a broach, speeds and feed, broach materials.

4. Machinability and tool life

Machinability, variables affecting machinability, parameters used to measure machinability, machinability of common engineering metals and alloys, machinability index.

Tool life : criteria for judging the efficiency of metal cutting operation, definition of tool life, criterion for tool life, factors affecting tool life, tool life specification, Taylor's equation of tool life, measurement of tool life.

(76)

Tool failure and wear, causes of wear and factors affecting the surface finish of machined surface.

5. Economics of Metal Machining

Metal removal rate and its calculation, relationship between mrr and power requirement, optimum cutting speed, total cost of machining-tooling cost, machining cost, calculation of optimum cutting speed for minimum cost, case studies.

6. Cutting Tool Materials

Basic requirements of cutting tool material; different cutting tool materials-plain high carbon steels, low alloy carbon tool steels, H.S.S., stellites, cemented carbides, ceramics, non-ferrous alloys, diamond tools, CBN, coated carbides, cast carbides, cubic boron nitride(CBN) etc.

7. Cutting Fluids

Heat generation in machining, function of a cutting fluid, desirable properties of cutting fluid classification and their detailed study basic action of cutting fluids, methods of application of cutting fluids during machining operation, effect of cutting fluid on tool life, selection of cutting fluid, disadvantages of using cutting fluids.

77

REFERENCES

1. Production Technology by R.K.Jain.
2. Production Engineering Sciences by Pandey and Singh.
3. Workshop Technology by Chapman.
4. Workshop Technology by Hajra and chaudhary.
5. Manufacturing Science by Ghosh and Mallik.
6. Materials and Processes in Manufacturing by Degarmo, Black & Kohser.

Advanced Diploma in Manufacturing Engineering

Third Semester

FLUID MECHANICS AND HYDRAULIC MACHINES

Theory per week - 4 Hrs. Practical per week - 2 Hrs.

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Fluid and fluid properties	4	-
2.	Fluid pressure and its measurements	6	2
3.	Fluid flow and its measurements	8	4
4.	Flow through orifices and mouthpieces	8	6
5.	Flow through pipes	6	4
6.	Hydraulic pumps	8	4
7.	Impact of jet	4	2
8.	Hydraulic Turbines	8	4
9.	Special Hydraulic Machines	10	6
	Total	64	32

Advanced Diploma in Manufacturing Engineering

Third Semester

FLUID MECHANICS AND HYDRAULIC MACHINES

Theory per week - 4 Hrs. Practical per week - 2 Hrs.

COURSE CONTENT

1. Fluid and Fluid Properties

Introduction, definition, types of fluid, fluid properties such as density, specific weight, specific volume, specific gravity, viscosity, viscosity-index, surface tension; definition and their units.

2. Fluid Pressure and its measurements

Introduction, definition of pressure, pressure intensity, pressure head, atmospheric pressure, absolute pressure, vacuum pressure and gauge pressure, measurements of pressure- manometers- simple, differential, inverted, U-tube, piezometer, mechanical gauges, simple numerical problems.

3. Fluid flow and its measurements

Introduction, types of fluid flow, viz-steady and unsteady flow, laminar and turbulent flow, uniform and non-uniform flow. Examples of various types of flow. Reynold's number, rate of flow or discharge, continuity equation, energy in a flowing fluid, Bernoulli's equation-definition, assumption, limitation and practical applications, simple numerical problems, flow measuring devices - venturimeter, orificemeter, flow nozzle, pitot tube, simple numerical problems.

4. Flow through orifices and mouthpieces

Introduction, definition, classification of orifices and mouthpieces, various hydraulic coefficents - Cd, Cc, Cv and Cr and their relations. Vena contracta, calculation of discharge through large circular and rectangular orifices.

Flow through external cylindrical mouthpiece, applications of orifices and mouthpieces.

5. Flow Through Pipes

Introduction, loss of energy in pipes, major and minor losses, head loss due to friction in pipes (a) Darcy-Weisbach formula, (b) chezy's equation. Definition of hydraulic gradient line (HGL), total energy line (TEL), loss of head due to sudden enlargement and sudden contraction of pipes, simple numerical problems.

32/120

6. Hydraulic Pumps

Introduction, definition and classification of pumps, centrifugal pump-construction and working, priming of pumps, types of centrifugal pumps. Layout for a pump, use of footvalve and strainer. Head of pump-static, manometric, suction and delivery head. Total head.

Work done by impeller, losses and efficiencies specific speed and performance of pumps, cavitation in pumps.

Reciprocating pumps - definition, types, main components and working, air vessel, application, comparision between centrifugal and reciprocating pumps.

7. Impact of Jet

Introduction, force of jet impinging normally on a fixed plate, force of jet impinging normally on a moving plate, force of jet impinging on a fixed curved vane, force of jet impinging normally on a moving curved vane. Application of impact of jet.

8. Hydraulic Turbine

Introduction, classification of turbines. Main components and working of Pelton wheel, Francis and Kaplan turbines, specific speed, performance and efficiencies of turbines. Simple numerical problems.

9. Special Hydraulic Machines

Introduction, Hydraulic Accumulators, Hydraulic-Intensifiers, Hydraulic Riveter, Hydraulic Crane, Hydraulic lift, Hydraulic Couplings, Hydraulic Presses.

LIST OF EXPERIMENTS

1. Measurement of small, medium pressures with the help of piezometer tube and U-tube manometer.
2. Study and sketches of various types of pressure measuring instruments.
3. Study and sketch of venturimeter.
4. Study and sketches of discharge measuring instrument viz.
   i) orifice meter
   ii) flow nozzle
5. To verify Bernoulli's Theorem experimentally.
6. Study and sketch of centrifugal pump.
7. Study and sketch of Reciprocating pump.
8. Study and sketch of pelton wheel turbine.
9. To study the construction and working of francis turbine.
10. Study and sketch of various special types Hydraulic Machines, viz.

    i) Hydraulic press
    ii) Hydraulic Rivetter
    iii) Hydraulic Accumulator

-120 - 32/122

REFERENCES

1. A text book of Fluid Mechanics and Hydraulics by Dr. R.K.Bansal; A Saurabh and Co. (P) Ltd., 1983.

2. Applied Fluid Mechanics. III Edn. by Robert L. Mott; Maxwell Macmillan International Editions.

3. Elementary Fluid Mechanics IV Edn. by J.K. Vennard; John Wiley and Sons, Inc. U.S.A. Toppan Company Ltd. Japan.

4. A text book of fluid mechanics by R.S.Khurmi; S.Chand and Company Ltd., New Delhi.

5. Hydraulics and Fluid Mechanics by Dr. P.N.Modi & Dr. S.M.Seth; Standard Book House, Delhi-6.

6. Fluid Mechanics by Dr. A.K.Jain; Khanna Publisher, Delhi.

7. Fluid Mechanics by Dr. Jagdish lal.

8. Hydraulics and Hydraulics Machines (Vol. I & Vol. II) by Prof. V.P.Priyam; Charotar Publishing House, Vallabh Vidyanagar, Anand.

9. Fluid Mechanics for Technicians by Thomas B. Hardison; Restson Publishing House I.N.C. Reston, Virginia.

10. Hand book of fluid dynamics by Streeter V.L.(Ed); McGraw Hill, Newyork, 1961.

11. Fundamentals of Fluid Mechanics by.Dr. D.S.Kumar; S.Chand and Co. Pvt. Ltd., New Delhi.

12. Hydraulic Machines and Fluid Mechanics by Dr. Jagdish Lal; Metropolitan Book.

Advanced Diploma in Manufacturing Engineering

Third Semester

ELECTRONIC ENGINEERING

Theory per week - 4 hrs Practical per week -2 hrs

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Semiconductor diodes and circuits	14	8
2.	Transistor and Thyristors	14	8
3.	Power supply	8	4
4.	Operational Amplifier	8	2
5.	Number system and logic gates	10	2
6.	Sequential Circuits	7	4
7.	Integrated Circuits	3	4
	Total	64	32

32/124

Advanced Diploma in Manufacturing Engineering

Third Semester

ELECTRONIC ENGINEERING

Theory per week -4 hrs Practical per week -2 hr

COURSE CONTENT

1. Semiconductor diodes and circuits

Constructional features and characteristics of diodes, forward reverse bias characteristics of zener diode, tunnel diode, photo diode, light emitting diode, half wave and full wave rectifier, bridge rectifier, various filter circuits, heat sinks.

2. Transistor and Thyristor

Constructional features and characteristics of BJT, FET, MOSFET, UJT, phototransistor, SCR, Diac and Triac, Working of BJT, Transistor as an amplifier.

Controlled rectifier, phase angle control with thyristor.

3. Power Supply

Zener regulator, Voltage doubler, IC regulator circuit using 723, 7805, 7905 etc, Switching Mode Power Supply (SMPS).

4. Operational Amplifier

Opamp characteristics, Basic Opamp circuits and their application like inverting non-inverting amplifier, adder substractor, integrator, differentiator, voltage follower voltage limiter.

5. Number System and Logic Gates

Bit, Byte, Binary, Octal, Decimal, Hexadecimal, 1's and 2's compliment, BID ASCII, EBDIC codes, NOT, AND, OR, NOR, NAND, Ex OR, Ex NOR Gates.

6. Sequential Circuits

RS flip-flop, shift register, updown counter, introduction to 555 times.

7. Integrated Circuits(IC)

Concept and types of IC, SSI, MSI, LSI, VLSI, Advantages of IC.

LIST OF EXPERIMENTS

1. Draw the VI characteristic curve of semiconductor diode.
2. Display on CRO output of simple phase half wave and full wave rectifier.
3. Draw the characteristic curves of Bipolar junction Transistor.
4. Hook up a zener voltage regulator and find the voltage regulation.
5. Assemble an IC voltage regulator and test it.
6. Display on CRO output of controlled rectifier using SCR.
7. Study of operational amplifier as adder, substractor, integrator differentiator.
8. Verify truth table of logic gates.
9. Verify the 5 lift left operation in a register.
10. Generate square wave of given frequency by using 555.
11. Soldering and desoldering components on a PCB.
12. Functional testing of different IC's using IC tester.

REFERENCES

1. Electronic principles, Malrino, T.M.H.
2. Electronic devices and circuits, mottershed, PH India.
3. Digital principles and applications, Malrino and Leach, T.M.H.
4. Digital Electronics, F.P.Jain.
5. TTL CMOS Data Handbook.
6. Electronic devices and circuits, G.K.Mittal; Khanna Publication.
7. Integrated Electronics, Milman and Halkies; T.M.H.

32/127

-125-

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

FOURTH SEMESTER

(88)

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

Courses for IV Semester

S.NO	COURSE TITLE	THEORY	PRACTICAL	TOTAL
1.	Computer Applications	3	4	7
2.	Mechanics of Machines	4	2	6
3.	Machine tool Engg.	4	4	8
4.	Engineering Metrology	3	3	6
5.	Process Planning & Control	3	1	4
6.	Machine Design	1	4	5
		18	18	36

DETAILED SCHEME OF STUDY AND EXAMINATION OF ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

Fourth Semester

NO	COURSE TITTLE	Hours/week Th. (C1)	Prac (C2)	Sessional marks Term work (D1)	Lab. work (D2)	Progressive Assessment I (E1)	II (E2)	Board Paper (F1)	Exams. Duration hrs. (F2)	Theory marks	Practical Viva (H1)	Duration hrs. (H2)	Practical marks
	Computer Application	3	4	15	25	10	10	1	3	100	1	3	50
	Mechanics of machines	4	2	15	25	10	10	1	3	100	1	3	50
	Machine tool Engineering	4	4	15	25	10	10	1	3	100	1	3	50
	Engg. Metrology	3	3	15	25	10	10	1	3	100	1	3	50
	Process planning and control	3	1	15	15	10	10	1	3	100	1	3	50
	Machine design	1	4	40	-	10	10	1	3	100	1	3	50
				115	115	60	60			600			300

a) Total theory marks = 600
b) Total marks (Term work, lab work, progressive assessment and practical) = 650

32/129

Advanced Diploma in Manufacturing Engineering

Fourth Semester

COMPUTER APPLICATIONS

Theory per week : 3 Hrs. Practical per week : 4 Hrs.

COURSE CONTENTS

1. Computer Systems and Hardware

   Technical details and specifications of various range of computers: PC, PC/XT, PC/AT, Mini, Main frame, Computer Network.
   Review of various storage and peripheral devices: floppy, hard disk, tapes, printers, mouse, scanner, digitizers plotters, MODEM.

2. Computer Software

   Application software and system software, Aims, functions of OS. Types of OS: single user, multiuser, batch processing, time sharing, Realtime. Elementary knowledge of various application package available in market.

3. Conventional Application of Computers

   Data processing, Data base management systems, word processing. Study of various packages like wordstar, dbase III +, Lotus 1-2-3.

4. AI and Expert Systems

   Introduction to AI, difference between AI and conventional computing. Applications and Advantages of AI, and applications of expert system.

5. Computer Modelling and Simulation

   Computer simulation and its purpose, Application of computer modelling and simulation.

6. Data Analysis and Forecasting

   Techniques: Introduction to Data analysis and various forecasting techniques. Use of SPSS package for statistical analysis.

(90)

Advanced Diploma in Manufacturing Engineering

Fourth Semester

COMPUTER APPLICATIONS

Theory per week : 3 Hrs. Practical per week : 4 Hrs.

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Computer System and hardware	6	6
2.	Computer Software	9	-
3.	Conventional applications of computers	16	38
4.	A.I. and Expert Systems	5	-
5.	Computer modelling and simulation	5	8
6.	Data analysis and forecasting	7	12
	Total	48	64

REFERENCES

1. Crash Course in AI and Expert System - SAMS Publication by LOUIS Fenzel; SAMS Publication

2. AI and Expert System by Allah Rich; McGraw Hill

3. What every engineer should know about computer modelling and simulation by Don. M. Ingels

4. Introduction to Wordstar by A. Naiman; BPB Publication

5. Introduction to Dbase III+ by Taxli; T.M.H.

6. ABC's of Lotus 1-2-3 by J. Robbins ; BPB Publication

7. ABC's of Dbase III+ by R. Cowart; BPB Publication

8. Lotus 1-2-3 by A.S.S.; BPB Publication

9. Computer Hardware & Software by Sanjay Bose

LIST OF EXPERIMENTS

1. Study the technical specifications of various computer systems.
2. Study the usage and operations of various storage, input, output and peripheral devices.
3. Operating and using wordstar.
4. Operating and using dbase III+.
5. Operating and using Lotus 1-2-3.
6. Study of a Simulation Package.
7. Operating SPSS package for statistical analysis.

Advanced Diploma in Manufacturing Engineering

Fourth Semester

MECHANICS OF MACHINES

Theory per week : 4 Hrs. Practical per week : 2 Hrs.

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Kinematics of Mechanism		
2.	Velocity and Acceleration		
3.	Cam and Cam profile		
4.	Power Transmission.		
5.	Gear and Gear trains.		
6.	Flywheels and Governors.		
7.	Vibration and Balancing of machine parts.		
8.	Direct stresses and strain		
9.	Shear force and Bending moment		
10.	Bending stresses in beams.		
11.	Torsion of Shaft.		
	Total		

(9th) 133 32/135

Advanced Diploma in Manufacturing Engineering

Fourth Semester

MECHANICS OF MACHINES

Theory per week : 4 Hrs. Practical per week : 2 Hrs.

COURSE CONTENTS

1. Kinematics of Mechanism

Kinematic link or element, structure, difference between a machine and a structure, Kinematic pair, types of motion. Types of kinematic pairs, Kinematic chains, Mechanism-inversion types, four bar chain and its inversion, slider crank chain and its inversion, Quick return mechanism.

2. Velocity and Acceleration

Instantaneous centre method, velocity and acceleration diagrams.

3. Cam and Cam profile

Introduction, classification of cams and followers, Displacement velocity and acceleration diagrams.

4. Power Transmission (by belt rope and chain drives)

Belt drives, types, material used for belt, velocity ratio of compound belt drive, slip of belt, creep of belt, length of belt drives, power transmitted by a belt, ratio of tension, Angle of contact, Centrifugal tension, Maximum tension, Maximum power transmission, Jointing of belts, Factor of safety, Belt speeds, centre distance, Losses in transmission, Stresses in the belt, Selection of belt, chain drives, advantages and disadvantages, applications, types designation, Salient features of chain lubrication, Wire rope drives: construction, Rope fasteners, selection of wire rope.

5. Gear and Gear Trains

Gears, Gear terminology, velocity ratio, types of gears gear materials, Types of gear trains.

(96)

6. **Flywheels and Governors**

Introduction. fluctuation of speed, energy stored in a flywheel. Types of governor - Centrifugal. Watt governor. Porter governor. Hartnell. Wilson Hartnell governor. sensitiveness of governors. stability. hunting of governors. effect and power of a governor. differentiate between flywheel and governors.

7. **Vibration and Balancing of machine parts**

Types of vibration. General equation of vibration. vibration in machines. Damping. whirling of shafts. Balancing of machines. balancing of rotating and reciprocating masses and static balancing.

8. **Direct stresses and strain**

Introduction. Types of loads and deformation. Types of stresses and strain. Hook's law. stress - strain diagram for ferrous and non-ferrous materials. modulus of elasticity and rigidity. bulk modulus. stresses in various cross sections - composite sections and compound sections. Thermal stresses and strain. thermal stresses in composite section, poisson's ratio. volumetric strain. Relation between E, M and K. strain energy. resistance. proof resistance, modulus of resistance, suddenly applied loads and impact loads.

9. **Shear force and Bending moment**

Definitions. Types of loading. Types of beams. Shear - force and Bending moment. sign convention. SF and BM for cantilever beam. simply supported and overhanging beams with point or concentrated load. uniformly distributed load.

10. **Bending stresses in beams**

Theory of simple bending. Assumptions made in simple bending, Neutral axis and neutral surface. Modulus of section of different sections. bending stresses beam of uniform strength. Deflection of beam strength and stiffness of beam.

11. **Torsion of Shaft**

Definition, relation between stress, strain and angle of twist, Assumptions made. solid and hollow shaft. calculation of shaft diameter. power transmitted.

LIST OF EXPERIMENTS

Study of mechanisms such as four bar chain, slider crank chain and their inversion.

Study of cam and followers.

Study of whith-worth quick return mechanism.

Study of different types of governors.

Study of different power transmission drives.

Determination of MI of flywheel.

Determine the velocity ratio, mechanical advantage and efficiency of simple gear train.

Determine the velocity ratio, mechanical advantage and efficiency of epicyclic gear train.

(98)

REFERENCES

. Theory of machine by P.L. Ballaney: Khanna Publisher

. Mechanics of machine by Jagdish lal

. Theory of machine by R.S.Khurmi: S.Chand and Co

. Theory of machine by Thoms Bevan

. Strength of material by R.S.Khurmi: S.Chand and Co

. Strength of material by S. Timoshenko: East West Press Ltd

. Strength of material by Ryder; ELBS Publishing

. Strength of material by R.K.Saxena: Rajpal Publication

. Theory of machine by Pandya & Shah

0. Theory of machine by Ryder: ELBS Publishing

32/139

Advanced Diploma in Manufacturing Engineering

Fourth Semester

MACHINE TOOL ENGINEERING

Theory per week - 4 hrs Practical per week -4 hrs

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Fundamentals of machine tools	4	-
2.	Capstan and Turret lathe	6	10
3.	Milling Machine	8	9
4.	Gear Manufacturing	6	6
5.	Shaper, Slotter, Planer	8	6
6.	Drilling and Boring Machine	6	6
7.	Grinding	10	9
8.	Broaching	4	6
9.	Thread cutting	2	5
10.	Non-conventional Method of machining	8	6
11.	Installation and testing	2	-
	Total	64	64

Advanced Diploma in Manufacturing Engineering

32/140

Fourth Semester

MACHINE TOOL ENGINEERING

Theory per week - 4 hrs Practical per week -4 hrs

COURSE CONTENT

1. Fundamentals of Machine tools

Elements of machine tools- structure, slides and slideways, spindle, drive regulators, materials for different elements, types of slideways/guideways, types of spindles, drives in machine tools- functions and types - stepped pulley and cone pulley drives, geared drives, norton's mechanism, chip collection and disposal.

2. Capstan and Turret Lathes

Comparison with engine lathe, Turret lathes and its types capstan lathe and its types, difference between the parts, work holding devices, attachments, cutting tools, tool holders, tool layout.

3. Milling Machines

Classification, Principal parts, column and knee type milling machine, vertical milling machine, universal milling machine, Bed-type milling machine, special milling machines e.g. Rotary table, Drum milling, Profile milling, Tracer milling and planetary milling machines. Specification, Attachments, types of cutters and their applications, up and down milling, work and cutter holding devices, indexing and dividing heads, methods of indexing - direct, plain, compound, differential and angular indexing.

4. Gear Manufacturing

Methods - milling, broaching, hobbing, shaping, rolling, casting, stamping, powder metallurgy, gear finishing shaving or burnishing, grinding, lapping, phosphate coating.

5. Shaper, Slotter and Planer

Shaper and slotter principal parts, size, classification, quick return mechanism, working, applications, shaper tools, slotter, relieving tool used with slotters.

Planer - parts, size, classification, accessories and attachments, quick return mechanisms, tools for planer, work clamping methods, planning operations.

6. Drilling and Boring Machines

Drilling machines : Specifications, operations that can be performed, classification - sensitive drilling machine, upright drilling machine, radial drilling machine, gang drilling machine, multi-spindle drilling machine, turret type drilling machine, tool holding devices, work holding devices, deep hole drilling.

Boring Machines - size, parts, types-Horizontal, Vertical fine boring machines, boring tools, deep hole boring, Jig boring - types, parts, applications.

7. Grinding

Cutting action, abrasives, Bonding materials, grain size, grade and structure of a grinding wheel, classification of grinding wheels, specification of grinding wheels, selection of grinding wheels, balancing, glazing and loading of grinding wheels, dressing and truing, grinding machines - different types of grinding machines e.g. - cylindrical-grinder, internal grinder, surface grinder, tool & cutter grinder, centreless grinding, coolants used in grinding, grinding defects, super finishing operations - lapping, honing, buffing, polishing etc.

8. Broaching

Types, broaching machine size, applications, advantages and limitations, broaching techniques.

9. Thread cutting

Methods - casting, rolling, chasing, die and taps, milling, grinding, scrobroaching.

10. Non-Conventional Methods of Machining

Electro discharge machining (EDM)-Basic principles, application limitation, electro chemical machining-basic principles, application and limitation, advantages and disadvantages, ultrasonic machining-basic principles, applications, limitation, laser beam machining-principle, application of laser, accuracy and surface finish, Electron beam machining- application, advantages and disadvantages.

11. Installation and Testing of Machine Tools

Installation method and acceptance tests for machine tools like: lathe, milling machine, shaper etc.

32/142 - 1210 -

(112)

LIST OF EXPERIMENTS

1. Making a Hexagonal bolt on a capstan lathe.
2. Making a flanged bush on a capstan lathe.
3. Making a square block on a milling machine.
4. Making a V-block on a milling machine.
5. Spur gear cutting on a milling machine.
6. Gear Hobbing on a hobbing machine.
7. Making a spline/keyway on a broaching machine.
8. Square and V-block on shaper.
9. Cutting a key slot on a slotter.
10. Location of drill holes and boring on a Jig borer.
11. Producing pins (Taper/Plain) on a centreless grinder.
12. Grinding a internal hole.
13. Surface grinding on a flat surface.
14. Practice on thread rolling.
15. Producing threads using a tap and chaser.
16. Demonstration on EDM/USM.

32/143

REFERENCES

1. Production technology by R.K.Jain.
2. Workshop technology by Chapman.
3. Workshop technology by Hajra and Choudhury.
4. Production Engineering and Science by Pandey and Singh.
5. Manufacturing Science by Ghosh and Mallik.
6. Fundamental of Metal Cutting and Machine tools by Juneja and Shekhon.

~~104~~

Advanced Diploma in Manufacturing Engineering

Fourth Semester

ENGINEERING METROLOGY

Theory per week - 3 hrs Practical per week -3 hrs

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	General measurement concepts	3	-
2.	Linear Measurement	6	8
3.	Limits. fits and gauges	4	2
4.	Comparators	5	4
5.	Straightness, flatness and squareness	6	8
6.	Angular Measurement	6	6
7.	Measurement of surface finish	6	4
8.	Measurement of screw threads	6	8
9.	Measurement and testing of gears	6	8
	Total	48	48

Advanced Diploma in Manufacturing Engineering

Fourth Semester

ENGINEERING METROLOGY

Theory per week - 3 hrs Practical per week -3 hr

Topic No.	Title	Theory Hrs.	Practice Hrs.
1.	General measurement concepts	3	-
2.	Linear Measurement	6	8
3.	Limits, fits and gauges	4	2
4.	Comparators	5	4
5.	Straightness, flatness and squareness	6	8
6.	Angular Measurement	6	6
7.	Measurement of surface finish	6	4
8.	Measurement of screw threads	6	8
9.	Measurement and testing of gears	6	8
	Total	45	45

Comparators

32/146

Introduction, characteristics of comparators, uses of comparators, mechanical comparators, dial indicator, johanson mikrokator, sigma comparator, mechanical optical comparator, principle of optical comparator. Working principle and application of pneumatic comparators electrical comparators and fluid displacement comparators.

Straightness, Flatness and Squareness

Definition of straightness, flatness and squareness.

Tests for straightness, the wedge method, the level method, autocollimator method, beam comparator, comparison with liquid surface.

Flatness testing of small surfaces by optical flat, flatness testing of a surface table by the method of marking grid of lines on the surface, the liquid wedge method.

Squareness testing, dial indicator method, engineer's square tester, autocollimator method.

Angular measurement

Introduction, instruments for angular measurements, angle gauges, combination of angle gauges to achieve required angle, sine bar, sine table, bevel protractors, spirit level or precision level, clinometer, autocollimator, angle dekkor.

Measurement of Surface Finish

Meaning of surface texture, primary texture, secondary texture, lay, traversing length, sampling length, mean line of the profile, surface roughness parameters, the maximum peak to valley height of roughness, RMS value, CLA value, simple numerical problems.

Methods of measuring surface roughness, direct instrument measurements stylus probe instruments, profilemeter, Tomlinson surface meter, the Taylor-Hobson Talysurf.
'M' and 'E' systems of evaluating surface roughness.

Measurement of Screw Threads

Introduction, screw threads terminology, errors in threads, pitch errors in screw threads.

Measurement of various elements of thread, measurement of major diameter, minor diameter, measurement of effective diameter, thread micrometer method, two wire method and three wire method.

Advanced Diploma in Manufacturing Engineering

32/147

Fourth Semester

ENGINEERING METROLOGY

Theory per week - 3 hrs Practical per week -3 hrs

COURSE CONTENT

1. General Measurement Concepts

Introduction, need of inspection, accuracy and precision, relation of accuracy to cost, principles for achieving accuracy, systematic and constant errors, precision vs. accuracy.

standards of measurement, line standards, end standards, wavelength standards, international system-of-units (SI).

2. Linear Measurement

Introduction, graduated manual measuring tools, rules, vernier calipers, vernier height gauge, vernier depth guage, outside micrometers, interchangeable anvil micrometer, dial indicating micrometer, direct reading micrometer, V-anvil micrometer, screw thread micrometer, inside micrometer, micrometer depth gauge, bench micrometer.

Non-graduated manual measuring tools, calipers, dividers, transfer calipers, hermophrodite calipers, surface plates, surface gauge, straight edge, V-block, engineer's square, gauge blocks or slip gauges, sets of gauges, selecting slip gauges for required dimension.

3. Limits, fits and gauges

Introduction, tolerances, reasons for specifying tolerances, interchangeability, selective assembly limits of size.

Terminology of limits and fits, basic size, zero line, limits, tolerance zone, allowance, fits, clearance fit, interference fit, transition fit, upper deviation, lower deviation, fundamental deviation, basic shaft, basic hole,

systems of limits and fits, hole basis system, shaft basis system, Indian Standard (919-1963), ISO system of limits and fits.

Types of gauges and their application, 'GO' and 'NOT GO' gauges, plain plug gauges, plain ring gauges, snap gauge, profile gauge, thread gauge.

Taylor's principle for gauge design, gauge tolerance and wear allowance.

9. Measurement and Testing of Gears

Introduction, the involute curve, terminology of gear tooth, measurement of tooth thickness by gear tooth vernier callipers, constant chord method, addendum comparative method, base tangent method (David Brown Base Tangent Comparator) checking of profile or involute shape of gear, involute profile measuring machine, inspection of profile using dividing head and height gauge. Determination of error in the eccentricity, measurement of gear pitch by the use of two dial gauges, circular pitch measuring machine, Parkinson gear tester, simple numerical problems.

LIST OF EXPERIMENTS

1. Measurement of the diameter of a step-turned rod by neans of vernier callipers and micrometer.
2. Measurement of a gap by means of slip gauges.
3. Making a required dimension by wringing of slip gauges.
4. Setting of a roller type of adjustable thread gauge and inspection of a given screw as per nominal size.
5. Checking the roundness of a cylindrical component by means of a dial gauge and vee-block.
6. Given a set of slip gauges, straight edge, and surface plate, the student will test the straightness error in the given straight edge.
7. Testing the flatness of a surface table by the method of marking grid of lines on the surface.
8. Checking the squareness of a block by dial indicator method.
9. Checking the straightness of a machine bed by auto-collimator.
10. Checking of an unknown angle with the help of sine bar and slip gauges.
11. Measurement of an unknown angle with the help of angle gauges.
12. Use of Bevel protractor for checking of vee-block and measuring an unknown angle.
13. Measurement of surface roughness of a surface plate by means of Tomlinson surface meter.
14. Determination of effective diameter of screw with the help of screw thread micrometer and three wire and hand micrometer compare these two methods.
15. Determination of screw plug core, diameter with the help of two vee-shaped steel pieces and micrometer.
16. Determination of outside diameter of a screw by a micrometer.
17. Determination of core diameter of an internal screw gauge with the help of a pair of precision wedge parallels and outside micrometer.
18. Determination of chordal thickness and constant chord for a gear by using a gear tooth vernier callipers.
19. Determination of error in the eccentricity for a gear by using a precison roller and a dial indicator.

0. Measurement of tooth thickness of a gear tooth by Davi
Brown Base Tangent Comparator.

1. Determination of errors in the tooth form, pitch a
concentricity of pitchline for a gear by using a Parkinso
gear tester.

REFERENCES

1. Practical engineering metrology by K.W.B.Sharp; Pitman Paper Backs.
2. Hand book of industrial metrology, ASTME; Prentice Hall of India Pvt. Ltd.
3. Engineering Metrology by R.K.Jain; Khanna Publisher.
4. Instrumentations by F.W.Kirk and N.R.Rimboi; D.B.Taraporevala Sons and Co. Pvt. Ltd.
5. Industrial Instrumentations and Control by S.K.Singh; McGraw Hill Publishing Co. Ltd.
6. Metrologyfor engineers by J.F.Galyer and C.R.Shotbolt; E.L.B.S.
7. Mechanical Engineering Measurements by Mark B. Moore; D. Van Nostrand Co., Inc.
8. Instrument technology Vol.-I by E.B.Johns; Newnes Butter Worths.
9. Engineering Metrology by K.J.Hume; Kalyani Publishers.
10. Learning Package in Metrology and Instrumentation; C.D.C., T.T.T.I., Bhopal.

Advanced Diploma in Manufacturing Engineering

Fourth Semester

PROCESS PLANNING AND CONTROL

Theory per week -3 hrs Practical per week 1 hrs

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Introduction to process planning	6	-
2.	Selection and planning the process of manufacture	8	4
3.	Determining the manufacturing sequence	8	-
4.	Selection of equipment	8	-
5.	Workstudy	8	12
6.	Production planning and control	10	-
	Total:	48	16

32/153 150-

Advanced Diploma in Manufacturing Engineering

Fourth Semester

PROCESS PLANNING AND CONTROL

Theory per week -3 hrs

Practical per week-1 hrs

COURSE CONTENT

1. Introduction to Process Planning

Purpose, contents of process plan, ways to express plans, procedure of process planning- requirements of conditions of the process, improvement of the specifications, dimensioning principles, critical areas, operation of a process, sequence of operations in process, basic types of processes.

2. Selection and Planning the Process of Manufacture

Function, fundamental rules for the manufacturing process, basic design of product, influence of process engineering on product design, rechecking specifications, affect of material selection on cost, economy in use of materials, material cost balance sheet, eliminating operations, availability of equipment, make or buy decisions.

3. Determining the Manufacturing Sequence

Operation, classifications and the manufacturing sequence, determining the major process sequence, purpose of major process sequence.

4. Selection of Equipment

Relationship between process selection and machine selection, requirements for selecting equipment, sources of information for process engineer, special purpose versus general purpose equipment, basic factors in machine selection - cost factors, design factors, approaches to selection among alternatives cost analysis of proposals, comparative cost analysis.

5. Workstudy

Purpose, scope, method study- definition, objectives, analytical approach of method study, method study activities, symbols, recording techniques - graphs, tables, schematic models, flowcharts, templates, histograms, -etc - process charts- outline process chart, flow process chart, two handed process chart, multiple activity chart, flow diagram, string diagram etc, micromotion study - therbligs, simo charts, principles of motion economy.

Work measurement - objectives, techniques, rating and its assessment, work sampling, case studies on method study and work measurement.

6. Production Planning and Control 32/154

Concepts and functions of production planning and control P.P.C.- a management function, organisation of P.P.C., objectives, determination of capacity, division of capacity, sequential load statements, scheduling of unforeseen work and material difficulties, information required for production planning & control- purpose, production control systems, chasing, progress reporting, principles and procedure of production control, mechanism of production control - routing, scheduling, dispatching and follow up.

LIST OF EXPERIMENTS

1. Outline process chart.
2. Flow process chart.
3. Two handed process chart.
4. Man-machine chart.
5. Stop watch time study.

32/156

REFERENCES

1. Production planning, control and Industrial management by K.C.Jain and L.N.Agarwal.
2. Production management by K.K.Ahuja.
3. Production Control by F.G.Moore.
4. Modern Production Management by Baffa.
5. Production and Operations Management by Gaither.
6. Industrial Engineering by O.P.Khanna.
7. I.L.O. publication.

Advanced Diploma in Manufacturing Engineering

Fourth Semester

MACHINE DESIGN

Theory per week -1 hrs Practical per week -4 hrs

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Fundamentals in machine design	3	-
2.	Some important machine element	2	-
3.	Design of shafts	2	12
4.	Design of keys and couplings	2	10
5.	Design of Mechanical Springs	2	10
6.	Design of Welded Joints	1	10
7.	Design of Rivetted Joints	1	10
8.	Miscellaneous	2	12
	Total	16	64

III

Advanced Diploma in Manufacturing Engineering

Fourth Semester

MACHINE DESIGN

Theory per week -1 hrs

Practical per week -4 hrs

COURSE CONTENT

1. Fundamentals in Machine Design

Introduction and importance, varous steps in designing a machine element, factors influencing the design of a machine element, factors influencing the selection of material. Types of loading - static and dynamic loading, fatigue loading and endurance limit. Introduction to limits, fits, tolerances, standardisation and interchangeability. Ultimate yield and design stresses. Factor of safety.

2. Some Important Machine Elements

Threaded Machine Members - Standard thread forms, types of threaded fastenings, locking devices, screws for power transmission.

Bearings - Introduction, classification-radial and thrust bearings, rolling and sliding contact bearings, advantages of rolling contact bearings over sliding contact bearing.

3. Design of Shafts

Introduction, various shaft meterials, standard sizes of shafts, solid and hollow shafts (circular shafts only). Design of shafts on the basis of strength, design of shafts on the basis of rigidity. Design of shafts subjected to both twisting and bending moments.

4. Design of Keys and Couplings

Introduction, various types of keys, effect of keyway, materials for keys, stresses in keys. design of keys, function of couplings, various types of couplings, materials for couplings. Design of flange coupling.

5. Design of Mechanical Springs

Introduction and function of springs, materials for springs, various types of springs.

Tension and compression helical springs, close coiled and open coiled helical springs, arrangements of helical springs- series and parallel.

Design of helical springs. Design of semi-elliptical and quarter elliptical leaf springs.

6. Design of Welded Joints

Introduction, important aspects of various welding processes, types of welded joints, welding symbols, strength of welds. Design of welded joints under static and dynamic loadings.

7. Design of Rivetted Joints

Introduction, rivet and rivet heads, various types of rivetted joints, failure of rivetted joints, strength and efficiency of rivetted joints, caulking and fullering. Design of rivetted joints for boiler work according to Indian Bioler Regulations (IBR).

8. Miscellaneous

Constructional details and applications of - piston and piston rings, crank and crank pin, pressure vessels, bell crank levers, Design of hydraulic press, design of crane-hook, design of connecting rod, design of C-clamp, design of centrifugal clutch.

REFERENCES

1. Fundamentals of mechanical design by Richard M. Phelan; McGraw Hills Book Company Inc.
2. Machine design by Donold J. Myatt; McGraw Hills Book Co. Inc.
3. A course in machine design by Dr. Kewal Fujara and Dr. B.L.Juneja; Dhanpat Rai & Sons, Delhi.
4. Machine Design by R.S.Khurmi; S.Chand & Co., New Delhi.
5. Machine Design by R.B.Gupta; Satya Prakashan, New Delhi.
6. Elements of Machine Design by N.C.Pandya and C.S.Shah; Charotar Publishing House, Anand.
7. Machine design exercises by S.N.Trikha; Khanna Publisher Delhi.
8. Machine elements in mechanical design (II-edition) by Robert L. Mott; Maxwell, McMillan International Editions.
9. Design of machine elements (III-edition) by M.F.Spotts; Prentice Hall of India, (Pvt.) New Delhi.
10. Fundamentals of machine component design by Robert C. Juvinall; John Wiley and Sons New york, Chichester, Brisbane, Toronto, Singapore.

32/161

-158-

GOVT. POLYTECHNIC DHAR

(C.P.S. CAMPUS, DHAR)

Phone No.- 35140

Fax No.-07292-35140

GUIDE LINES FOR INDUSTRIAL TRAINING

1. INTRODUCTION

2. COURSES

3. SUPERVISION OF INDUSTRIAL TRAINING

4. OBJECTIVE OF INDUSTRIAL TRAINING

5. ASSESSMENT SCHEME FOR INDUSTRIAL TRAINING

   * RECORD OF PROGRESS OF EMPLOYEE
   * DAILY DIARY

"APPRENTICESHIP TRAINING IS MUST FOR TECHNICIAN

EMPLOYEE AS WELL AS LOCAL INDUSTRIES"

~~174~~

GUIDELINES FOR INDUSTRIAL TRAINING

INTRODUCTION

The Govt Polytechnic [illegible] has been started from the session 1994-95 under World Bank Assisted Project for Development of Technical Education . The basic objective of this institute is to produce technicians in emerging 'Hi-Tech Areas'. Today the process of Industrial Modernization has gathered momentum. The emphasis in production is shifting from the older labour intensive industries to ones requiring more automation. The changing man power pattern within Industry in terms of the middle level technical manpower with diverse occupations and the changing role of technicians with varying mix of JR knowledge and skill, indicate that there is a need for introducing diversified programmes with multiple combinations of courses. This Polytechnic will have a distinctive character and would develop as a centre of excellence having a networking relation with other Polytechnics in the state Industries, Technical Teachers' Training Institute, Professional

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GUIDE LINE FOR INDUSTRIAL TRAINING

INTRODUCTION

The Govt. Polytechnic, [illegible] has been started from the session 1994-95 under World Bank assisted Project for development of Technical Education. The basic objective of this institute is to produce technicians in emerging Hi-Tech Areas. Today the process of industrial modernization has gathered momentum. The emphasis in production is shifting from the older labour intensive industries to ones requiring more automation. The changing man power pattern within Industry in terms of the skills level technical manpower with diverse occupations and the changing role of technicians with varying mix of old knowledge and skill, indicates that there is a need for introducing diversified programmes with multiple combinations of courses. This Polytechnic will have a distinctive character and would develop as a centre of excellence having a networking relation with other Polytechnics in the state Industries, Technical Teachers' Training Institute, Professional

[illegible] technology and

Out of these three courses, the course in Advanced Diploma in Manufacturing Engg. was started from the Session 1994-95. The first batch of 30 students was admitted in the First sem. of this course. The other two courses i.e. Advanced Diploma in Mechatronics and Advanced Diploma in Industrial Electronics were started from the session 1995-96.

The above mentioned Hi-Tech courses begin with basics and gradual progress to full automation in simple environment. The special feature of the Advanced diploma courses is its four year (Eight Semesters) duration, out of which two semesters are devoted for In-plant Industrial Training in two phases. This in-plant training will be very much useful for a budding technician to learn about the practices and environment of industries.

It is envisaged that above courses will give a unique opportunity for developing upto date technicians in Hi-Tech Areas. The Industries will also be benefitted by utilising services of such technicians.

A brief discription for each of the above courses is given below :-

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

The modern industries now a days are being equipped with latest technology like CAD/CAM, CNC Machines, Industrial Automation etc. to ensure better quality and quantity of their products. In this course apart from the basic subjects like manufacturing

Provision Of Industrial Training:-

One Polytechnic faculty member will plan Industrial training of students in consultation with training manager of the Industries as per the predefined objectives of training.

- During training students will maintain a daily diary properly. (format enclosed) . The main purpose of daily diary is to inculcate the habit of systematic recording of learning experiences and events etc. The section incharge of the Industry be requested to sign the daily diary at the end of the week and offer his comments about the initiative and participative attitude of trainee during training.

Details about how to write daily diary will be provided by the institute to the students.

- Attendence record of each trainee may please be kept in the industry. Absence without permission may please be communicated to Polytechnic at Dhar.

- Monitory visits will be made by training and placement officer of the Polytechnic within fortnight of a month.

OBJECTIVE OF INDUSTRIAL TRAINING

In Pursuance of the objectives of the World bank Assisted Progremue for strengthening the technicion Eluestion system Industrial training of the students is necessary to bridge the ~~wide~~ wide gap between the classroom and industrial environment By the industrial training students will enrich the practical learning and they will be better equipped to integrate the practical expenences in the classroom learning process.

LEARNING THROUGH INDUSTRIAL TRAINING

Duting Industrial training students will learn following points :-

- Industrial environment and work culture.
- Organisational stracture.
- Organisational and inter personal communication.
- Products and their Specifications.
- Machines /equipment/instruments - working and Specification.
- Manufactuting /Construction/Erection/Commissioning processes and techniques.
- Cutting tools, jigs and fixtures and other detraces
- Engg. Materials - standards and uses
  Material festing.
- Productionplanning and control.
- Project planning,monitoring and control.
- Quality control and assurance
- Maintenance system.
- Costing Systems.
- Industrial safety.
- Inspection methods.
- Stores and purchase systems.

- Design of product/m/c tools etc.
- Layout of plants/factory/shop floor/sub stations.
- Selection of plants/systems/machines/equipment/materials/ instruments.
- Reading intrepretation and communication of production/ construction/electrical drawings.
- Environmental problem and pollution control.
- Inventory control.
- Roles and responsibility of different categories of personnel.
- Roles and responsibility of Technician.
- Customer services.
- Problems related to various areas of work etc.

The above points should be covered by the students during 16 weeks, Industrial training in planned manner (This will be prepared in latter stage) with the help of Industry Institute faculty members. They will acquire the knowleige as mentioned above.

- By observing - Products, processes etc.
- By interacting with supervisors, engineers & managers.
- By reading Literature available in industry like operation manual, maintenance schedule, standards etc.
- go "Hand's on" experience.
- By undertaking a project work.
- By solving an industrial problem.
- By presenting a seminar.
- By participating in a group meeting.
- By gathering primary/secondary data/ information through various sources and analysis.
- By assisting engineers and managers in their work.
- By undertaking a short action research work.
- Consulting current technical journals and periodicals in the library.
- By discussing with peers.

Assessment Scheme for Industrial Training. (7)

For the assessment of industrial training of the students following components are considered with their weightages.

(a)	Marks allotted
1. Attendance and General Discipline	25
2. Daily Diary Maintainance	25
3. Initiative and Participative attitude during training	50
4. Assessment of training by Industrial Supervisor	100

(b) In Institution	Marks allotted
1. [illegible]	100
2. Seminar	50
3. Viva-voce	50

Marks in various components of Industry will be awarded to the students in consultations with the Training Placement officer of Institute and Industry Training Manager. During training Students will prepare a first draft of Training report in consultation with section incharge. After training they will prepare prepare typed final draft with the help of T.P.O. of the Institute. Then they will present a seminar on their training and they will face viva-voce on training in the institute.

******* ***

 32/169

RECORD OF PROGRESS OF STUDENT

Roll No. : . . . . .

Name :- . . . . .

Subject Held in Engineering or Technology Under Training:- . . . . . .

Date of Commencement:- . . . . . .

Progress Report for Training from . . . . . To. . . . . .

(i) Aptitude for Training :- . . . . . .

. . . . . .

(ii) Performance During the Training :- . . . . . .

. . . . . .

(iii) Shortcomings if Any :- . . . . . .

. . . . . .

(iv) Reaction of Trainee to Corrective Action at(iii) Above:-

. . . . . .

. . . . . .

(v) Assessment
Excellent/Above Average/Average/Below Avecrage(Strike out not applicable)

. . . . . .

. . . . . .

Signature of Officer/Executive incharge of Training

Remarks :-

SIGNATURE OF MANAGER OF THE INDUSTRY/ESTABLISHMENT

32/179 for correction 12/3

ANNEXURE-A

Advanced Diploma in Industrial Electronics

FIFTH SEMESTER

Inplant Training(Duration 16 weeks)

	Component of Assessment	Marks Alloted
A.	In Industry	
	I Attendance and General discipline	25
	II Daily diary Maintenance	25
	III Initiative & Participative attitude	50
	IV. Assessment of Training by Industrial Supervisor	100
B.	In Institution	
	V. Training report	100
	VI Seminar	50
	VII Viva-Voce	50
	Total	400

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(B.K.Rawat)

Sd/-
(K.C.Mahajan)

Sd/-
(A.K.Joshi)

ADVANCED DIPLOMA
IN
MANUFACTURING ENGINEERING

(SIXTH SEMESTER)

STATE CURRICULUM DEVELOPMENT CENTRE

M.P. BOARD OF TECHNICAL EDUCATION

A/4, OFFICE COMPLEX, GAUTAM NAGAR, BHOPAL - 462023

TEL : 583656, 583673, 513627

Recommended restructring of Advance Diploma Course in Manufacturing Engineering

By the Board of Studies on 20.3.1997

VI Semester

1. Instrumentation
2. Tool Engineering
3. Control Engineering
4. Quality Control
5. Business Communication

VII Semester

1. Production Management
2. CAD/CAM
3. Maintenance Engineering
4. CNC Technology
5. Environmental Engineering

VIII Semester

1.	Industrial Training	10 Week
2.	Entrepreneurship Project	06 Week

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION, BHOPAL.

ADVANCED DIPLOMA PROGRAMME IN MANUFACTURING ENGINEERING VI SEMESTER To be implemented from Jan.1997

(To be introduced in 1996-97)

S.No.	NAME OF SUBJECT	SCHEME OF STUDY. CONTENT HRS PER WEEK(YEAR)			SCHEME OF EXAMINATION										
					SESSIONAL MARKS		PROGRASSIVE ASSESMENT		BOARD EXAMINATION						
		THEORY	LAB.	TOTAL	TERM WORK	LAB. WORK	I	II	THE. PAPER	DURATION HRS	MKS	PRACTICAL	DURATION HRS.	MKS	REMARKS
6.1	Instrumentation	3 (45)	2(32)	5(80)	20	20	10	10	1	3 Hrs.	100	1	3 Hrs.	50	Common VI Sem Mech Revised
6.2	Tool Engineering	6 (96)	4(64)	10(160)	20	20	10	10	1	3 Hrs.	100	1	3 Hrs.	50	
6.3	Quality control	5(80)	2(32)	7(112)	20	20	10	10	1	3 Hrs.	100				
6.4	Business Communication	4 (64)	2(32)	6(96)	20	20	10	10	1	3Hrs.	100	1	3 Hrs.	50	
6.5	Control Engineering	6(96)	2(32)	8(128)	20	20	10	10	1	3 Hrs.	100				
6-															
7-															
8-															
9-															
10-		24 (384)	12 (192)	36 (576)	100	100	50	50	5		500	4		200	

NOTE:- (1) No. of Theory paper: 05

(2) Total theory marks: 500

(3) No. of Practicals : 4

(4) Total Pract.Marks : 200

(5) Inplant Training Mks: Nil

(6) Total Mks.of Sessional+ Prog.Assessment,+Pract. &Inplant Training : 500

(7) Ratio of theory marks : 1:1 and(Sessional+prog.Assess +Practical +Inplant Traingin Marks)i.e.

(8) Total Marks: 1000

(8) Passing marks for :
(a) Theory-33%
(b) Practicals-40%
(c) sessionals-60%
(d) Inplant Trg-50%

32/173 - 1997

32/174 — 170 —

VI SEMESTER MANUFACTURING ENGG.

Subject :- Instrumentation ~~& Control~~

Th+PaT THEORY HRS

TOPIC No 1 : MEASURING SYSTEM 06+00=06

Elements of a measuring system,block diagram, performance,standards,time lag,error,distortion,noise and noise factor,Measurement of distortion.

TOPIC No 2: TRANSDUCERS 17 18+12=30

Importance and characteristics,Actuating mechanism classification-self generating mangento electric m.c. ~~microphone,turbo.alternator and~~ magnetic flow meters.Thermo-couple-laws,type & ranges.Photo electric transducer-characteristics and application Piezoeletric effectpiezo-electric materials & transducers-their application,Variable parameter transducers classification as R.L.& C.,Strain gauge gauge factor,classification and fixing of straim gauges and measurement by strain gauge. Potentiometric transducers. Resistance thermometer matericls,Characteristics,range and measurement of temperature by bridge methods.Thermistors ranges & application. Magneto striction transducer. Inductance transducer ~~classification &~~ application. Differential type self inductance transducer,mutu-al inductance transducer and L.V.D.T. connection,operation & application, Capacitance transducers working & applica: ion condenser microphone working advengage & application,frequency generating transducers classification & application Digital transducers cla-sification,principle and application,.

TOPIC NO 3: SIGNAL CONDITIONERS : ~~02+00~~ 02

Purpose,classification,input modifier,frequency range

TOPIC No 4: INDICAT-OR & RECORDERS: ~~04+02=06~~ 04

End devices-classification,precision of analog indicators and classification,Digital indicators modes of display 7 segmentL.E.D. display Nixie tube L.C.D.display. Recorders types and objective Chart recorders.

—2—

TOPIC No 7: ~~PROCESS~~ CONTROL system Control System ~~10+02=12~~ 10

Importance and definitions of variables.Open loop and closed loop control system-block diagram Servomechanism Characteristics of control ,gain stability and accura-cy. effects of instability, time lag and its effect on control. Mode of control ON-OFF, proportional integral and derivative,Electrical application of Control.

VI SEMESTER MANUFACTURING ENGINEERING

Subject - Instrumentation

SCHEME OF STUDIES

S.No.	Topic	Th. Hrs.	Pr. Hrs.	Total Hrs.
1.	Measuring System	06		
2.	Transducers	17		
3.	Singal Conditioner	02		
4.	Indicators & Recorders	04		
5.	Measurement of Physical Quantities	09		
6.	Process System	10		
		48	32	80

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श्री आर. एल. श्रीमाली

VI SEMESTER MANUFACTURING ENGINEERING

Subject - Instrumentation Theory Hrs.

Topic 1. Measuring System - 06

Elements of a measuring system, block diagram, performance, standards, time lag, error, distortion, noise and noise factor, measurement of distortion.

Topic 2. Transducers - 17

Importance and characteristics, Actuating mechanism classification self generation mangento electric m.c. magnetic flow meters. Thermocouple-laws, type & ranges. Photo electric transducer characteristics and application piezoelectric effectpiezo-electric materials and transudcers their application, Variable parameter transducers classification as R.L. & C.,Strain gauge factor, classification and fixing of strain gauges and measurement by strain gauge. Potontiometric transducers. Resistance thermometer materials, Characteristics, range and measurement of temperature by bridge methods. Thermistors ranges & application. Magneto striction transducer. Inductance transducer application. Differential type self inductance transducer, mutual inductance transducer and L.V.D.T.connection, operation & application, Capacitance transducers working & application condenser microphone working advantage & application, frequency generating transducers classification & application digital transducers classification, principle and application.

Topic 3. Signal Conditioners - 02

Purpose, classification, input modifier, frequency range.

Conted...2

Topic 4. Indicator & Recorders - 04

End devices classification, precision of analog indicators and classification, digital indicators modes of display 7 segment L.E.D. display Nixie tube L.C.D. display. Recorders types and objective chart recorders.

Topic 5. Measurement of Physical Quantities - 09

(a) General Characteristics of Instruments -

* Static terms and characteristics of instruments.
* Dynamic terms and characteristics of instruments.
* Zero, first and second order instruments/systems.

(b) Pressure Measuring Instrument -

* Introduction
* Terminology used in pressure measurements.
* Types of pressure gauges.
* Mechanical diso;acement type pressure gauge.
  1. Ring balance manometer.
  2. Bell type pressure gauge.
  3. Bourdon tube pressure gauge.

(c) Temperature Measuring Instruments -

* Introduction.
* Types of temperature measuring instruments.
* Solid expansion of bimetallic strip thermometer.
* Filled system thermometers.

(d) Flow Measuring Instrument -

* Introduction.
* Types of Pressure measuring instruments.
* Rotameter.
* Hot wire anemometer for flow measurements.

Topic 6. Process System -

Importance and definitions of variables. Open loop and closed loop control system block diagram servomechanism, characteristics of control, gain stability and accuracy. Effects of instability, time lag and its effect on control.

हस्ता/-	हस्ता/-	हस्ता/-
प्रो. मनीष चौबे	श्री आर.के. मुंदड़ा	श्री आर. एन. श्रीमाली

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

VI SEMESTER

Subject - Instrumentation & Control

List of Experiments

1. Measurement of Temperature by Thermocouple & resistance Thermometer

2. Measurement of pressure using
   a) Capacitance transducers
   b) Straingauge
   c) LVDT

3. Measurement of displacement by LVDT

4. Measurement of displacement by LDR

5. Study of synchro transmittor and receiver.

6. Measurement of level using
   a) Potential divider
   b) LVDT
   c) Capacitance transducers

7. Measurement of speed using
   a) Stroboscope
   b) Frequency generating transducers

8. Study and use of following transducers
   a) Bonded straingauge for finding Load-Deflection of a cantilever Beam.
   b) LVDT-Its characteristic for output voltage Vs Diplacement.

9. Characteristics of thermocouple and thermister.
   Study of various types of indicators & recorders.

10. Study of Pyrometers and flowmeters.

11. Study of Electronic PID controller.

12. Study of pneumatic PID type controller.

13. Study of pneumatic and electronic valve positioner.

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

SIXTH SEMESTER

Subject - Tool Engineering

66

S.No.	Topic	Th. Hrs.	Tut./Lab Hrs.	Total Hrs.
1.	Introduction	04	05	09
2.	Tool Material	06	06	12
3.	Metal Cutting Tools			
	a) Turning, shaper and planer tool	08	14	22
	b) Milling tools	08	14	22
	c) Drill tools	05	12	17
	d) Grinding tools	05	12	17
	e) Dies	07	12	19
4.	Cutting Fluids	06	04	10
5.	Jig and Fixture	08	14	22
6.	Tool mechinability and Economy	06	04	10
	Total	64	96	160

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MANUFACTURING ENGINEERING

VI SEMESTER SUBJECT:-TOOL ENGINEERING

CONTENT OUTLINE:-

TOPIC NO 1 INTRODUCTION

Development of tool engineering.Duties of tool engineer from design to finished product.General classification of production tools like cutting tools (Single and Multi point),press tools,forming tools, bending tools,drawing tools etc.

TOPIC No 2 TOOL MATERIALS

Characteristics of tool materials,cutting tool materials,plain high carbon tool steels,low alloy carbon tool steels,high speed steels,cast cobalt base alloy tools, cemented carbides,ceramics,non-ferrous & alloys,non-tungsten materials(Titanium carbidesand Titanium Nitrides) coated carbides,Micro-Grain carbides, cast carbides,cemented oxides(Ceremic) Diamond tools Abbrasives,Role of coating of HSS tools.

TOPIC No 3 METAL CUTTING TOOLS:

(a) Turning shaper and planer tools:

Single point tools-Basic angle,Recommended tool angles. Cutting tool shapes,Tool Nomenclature, Auxiliary and working angles,tool holders:turning tools, factors governing the general shapes of turning tool, effect of tool setting on tool angles,cutting speed,feed, depth of cut.cutting forces in turning,Cutting Forces and power during cutting,factors influencing cutting forces, selection guides for cutting tool signatures,shaper and planer tools, Relieving tool used with slotters tools for planing operations.

(b) Milling Tools:

Milling cutter classification and type,geometry of milling cutter,cutting force in milling effect of various factors on Horse Power,No. of teeth on Milling cutter,Selection of Milling cutter.

(c) Drill tools

Classification and types,basic tool geometry,drill holding device, Drill wear and sharpening a boring tools Reamers,types,nomenclatures,feed and speed Broching tools types and nomenclatures.

..2..

32/181

(d) Grinding tools

Nomenclature of grinding wheels, type of grinding wheels, Manufactering of grinding wheel, selection of grinding wheel, Honing tool

(e) Dies

Types-simple, compound and transfer
classification - Piercing, blanking, bending, forging, forming and drawing.
Shear action in Die, cutting operation, Design of cutting Dies, Energy required for cutting, Die Clearance.

TOPIC NO. 4 Cutting Fluids:

Types and Classifications of cutting fluids, chemical coolants, action of cutting fluids, Application and selection of cutting fluids.

TOPIC No 5 JIGS AND FIXTURES:

Introduction, Elements, types of jigs, types of fixtures, General design princiles, Design steps, location and locting devices and locating principle, Clamping devices Principle and methods, Quick acting clamps Indexing device, complete design of jig and fixture for given ob.

TOPIC No. 6 TOOL MACHINABILITY AND ECONOMY:

Machinability, Various variables affecting machinability tool life and Tool wear, measurement of tool life, factors upon which tool life depends, Tool failure and wear, Causes of wear, Economics of machining, Ecomomic factors in tooling, Economics of metal removals.

...

(11)

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

SIXTH SEMESTER

SUBJECT:-TOOL ENGINEERING

List of Experiments

1- Prepare a complete list of various tools,you are likely to come across.

1- Prepare the classified list of different tools on the basis of

(1) Construction(2)Material(3)Operation given as a mixed lot and measure the cutting angles any three of them.

3- Recognise the various tool materials and list them categeorywise

4- Prepare a Drawing to show tool geomentry of Turning,Shaper and Planer tools.

5- From given tool material,prepare cutting tool,one for each of the following,using rcommonded cutting angles,

a.Turning tool. b. Shaper tool c. Planer tool

6- Prepare jobs using each of the above three tools.

7- Prepare a classified list of given various milling cutters on the basis of

(1) Shape (2) Function(3) Profile

8- Prepare a job by using gang milling.

9- Prepare a job by up and down milling.

10- Select a milling cutter for preparing a gear of given specifications.

11- Prepare a flat/fluted drill bit from given material

12- Recondition the (1) Loaded(2)Glazed grinding wheel

13- Prepare a die for making washer of given specifications.

14- Prepare a list of jigs and fixtures,available in work - shop or you might have seen else where.

15- Prepare a template jig for given specifications.

16- Identify reasons of fault/failure of given tools.

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

VI SEMESTER

SUBJECT:- TOOL ENGINEERING

REFERENCE BOOKS

1-	Tool Design	Cvril & George H.Le.Cain	Mc Graw Hill London
2-	Machine Tool Operation (Part-II)	Henery D. Burghardt	Mc Graw Hill
3-	Jig and Fixture	Joshi	Standard Publisher
4-	Tool Design	Donaldson	Standard Publisher
5-	Tool Engineering	S.E.Rusinoff	
6-	Manufacturing Technology	R.N.Rao	Standard Publisher
7-	Production Technology	P.C.Sharma	
8-	Production Technology	R.K.Jain	Khanna Publisher
9-	Machine Tool Design	Mehta	Std.Publisher
10-	Machine Tool Design	Hand Book	Tata McGraw Hill
11-	Machine Tool Engg.	G.R.Nagpal	Khanna Publisher
12-	Machine Tool Tech.	Kundaswamy	Khanna Publisher
13-	Fundamentals of Tool Engineering	-	Prentice Hall
14-	Introduction to Jig and Tool Design	Kemps.Te.	Eng.Press
15-	Die Design Hand Book	Wilson & other	Tata Mc Graw Hill

32/184

(B3)

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

VI Semester

Subject - Quality Control (ISO 9000) Total Hrs. 64

SCHEME OF STUDIES

S.No.	Topic	Th. Hrs.	Pr. Hrs.	Total Hrs.
1.	Introduction to Quality control	15	-	
2.	Control chart for variables	10	-	
3.	Control chart for attributes	10	-	
4.	Acceptance sampling and Q.C.Curves	15	-	
5.	ISO : 9000	15	-	
6.	Total Quality Management (TQM)	15	-	
	Total	80	32	112

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ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING
VI SEMESTER

Subject - Quality Control (ISO 9000)

Total Hrs. 64

Topic 1. Introduction to Quality Control 15 Hrs.

Define the terms Quality, Total Quality, Quality control, Statistical Quality control and Quality Assurance Engg. Differentiate between the terms with examples. Three stages of quality, Gen.quality factors. Quality assurance Engg. Cycle covering quality control cycle (schematic diagram) to differentiate between QAE and QC. Differentiate between quality control and inspection in its concept and practice. Natural veriation concept, its imoortance, differentiate between natural and assignable variation. Concept of natural variation as a result of chance. Concept of variables and attributes, their significance in practical situations. Significance and calcution of 'Z' areas under the NDC. Concept of 'O' give curves. Concept of process capability,its significance specifications limits. Statistical tolerances, its significance and calculation in straight line assemblies like rods and pipes. Techniques/tools of statistical quality control. Concept of parato-analysis,cause and effect diagram.

Topic 2. Control chart for variables - 10 Hrs.

Define variable quality characteristics with examples, concept of natural variation & variable quality characteristics. Concept and significance of $\bar{x}$ & R charts, steps of $\bar{x}$ & R chart plotting,decisions preparatory to $\bar{x}$ & R charts, choice of variables. Decision on the basis of subgrouping, size and frequency of subgroups, forms for recording data, determining the method of measurement. Calcution of trial control limits, Drawing preliminary conclusions from the charts by interpretation of the plotted $\bar{x}$ & R control chart. Practical uses of control chart for variables. Calculation of control limits for $\bar{x}$ & R chart the sigma primevalue ( ) and percent of normal/defective products.

Contd...2

(15)

ADVANCED DIPLOMA IN MANUFACTURING ENGG. VI SEMESTER
QUALITY CONTROL (ISO 9000)

Topic 3. Control chart for attributes - 10 Hrs.

Differentiate between variables and attributes with examples, use of attribute chart in place of variable chart and its reason their of. Forming sub groups setting up forms, collection of data and entry, calculation of control limits, construction of P chart its interpretation, Significance of P chart in reducing percent defectives in practical situation. Concept of Pn chart, difference between P chart and Pn chart, calculation of control limits for Pn chart. Need for calculation of revised control limits for P chart and Pn chart.

Concept of control chart for defects per unit of production (C chart). Necessity of C chart in place of P chart and Pn chart. Calculation of mean value of C chart and its control limits, plotting. Need to calculate revised control limits for C chart for quality improvement i.e. reduction of number of defects per unit of production. Use of poissons distrubition in C chart.

Topic 4. Acceptance Sampling & O C curves 15 Hrs.

Different techniques for acceptance sampling of material. Concept of acceptance sampling. Benefits of acceptance sampling over 100% and 0% inspection. Significance of Acceptance sampling in mass manufacturing plants using destructive and non destructive tests for material/finished products.

Single and double sampling plans with single line diagram. Termionology used in I.S.2500:1963 acceptance its procedure (for single and double sampling plans) for accepting/ rejecting the submitted lot for inspection with know lot size and AQL percent/number of defets. Comparison of AQL with LQ, AOQL, IQ concept of inspection levels, normal, tightened and reduced types of inspector and their switching procedures.

Operating characteristics curves concept, definition relationship with acceptance sampling plans. Terms related to OC curves, use of OC curves for given acceptance sampling plan, producers and consumers risks.

(16)

DIPLOMA IN MANUFACTURING ENGINEERING VI SEMESTER

QUALITY CONTROL (ISO 9000)

Topic 5. ISO 9000 15 Hrs.

Introduction to quality standard, evaluation of ISO:9000 series. Quality vecubulary. System documentation triangle, system documentation relationship. Concept of designing and documentation of system. Assembly of quality mannual, work instructions. Audit requirements and audit plans.

Third party assesment, certification of ISO:9000 standards.

Topic 6. Total Quality management (TQM) 15 Hrs.

Introduction to TQM. Quality objectives and policy. Quality planning and quality systems. Employee participation and concept of quality circle. Focus on customer relationship role of top management in TQM. Quality implementation, monitoring and control. Integration of planning. Implementation and control feed back.

Five absolutes of Quality management Deming's approach about improving quality. Concept of other improvement, techiques - just and time, kaizen and S-S. Logic structures its defination, purpose, proceedure and areas of application. Trends in modern management techniques.

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ADVANCED DIPLOMA IN MANUFACTURING ENGG. VI SEMESTER

QUALITY CONTROL Total 32 Hrs.

List of Experiments

1. Use of shew-harts normal bowl for calculation of $\bar{x}$ and and plotting frequency Histogram.
2. $\bar{x}$ & R control chart by using shew-harts normal bowl.
3. Calculation of process capability of Lathe machine.
4. Control chart for defectives (P chart).
5. Control chart for defects/unit of production (C chart).
6. Single and Double sampling plan by using IS:2500:1963 sampling taste.

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32/189 -185-

ADVANCED DIPLOMA IN MANUFACTURING ENGG.VI SEMESTER
QUALITY CONTROL (ISO:9000)

Reference Books -

1. Statistical Quality control by Engene L.Grant and Richard S.Leaver-nworth.
2. Statistical Quality control by R.C.Gupta.
3. Quality Circle: latest edition by S.R.U. Pa Tata Mc Graw.
4. Quality circle: Durgesh chandra etc.Tata Mc Graw.
5. ISO:9000 concept method and implementation by Bagchi.
6. Industrial Engg. by Dr.S.C.Saxena.

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ADVANCED DIPLOMA IN MANUFACTURING ENGG.VI SEMESTER

QUALITY CONTROL Total 32 Hrs.

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ADVANCED DIPLOMA IN MANUFACTURING ENGG.

Subject - Business Communication

S.no.	Topic	Th. Hrs.	Lab/Tut. Hrs.	Total Hrs.
1.	Communication	14		
2.	External Barriers	12		
3.	Oral Communication	08		
4.	Professional Interviews	10		
5.	Written Communication	20		
		64	32	96

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BUSINESS COMMUNICATION

TOPIC 1:- COMMUNICATION: 14

Definition-nature-importance to managers-communication theor ies and process-sysbolic interac-tionalism-Information theory-Interaction theory-transaction theory-elements of communication process Importance, feedback.

TOPIC 2:- EXTERNAL BARRIERS: 12

Psychological barriers-linguistic barriers Hechanical barriers-making communication effective. Communication methods-oral media written media non verbal communication.

TOPICS3:- ORAL COMMUNICATION: 08

Speeches for different occasions-guidelines -listening value problem and guidelines-Interview-types of information.

TOPIC 4:- PROFESSIONAL INTERVIEWS: 10

Interview process-problems-guidelines-group discussions-purpose and problem guideline. conference responsibility of chairman and participant effective use of non verbal communication.

TOPIC 5:- WRITTEN COMMUNICATION : 20

Writing techniques and guidelines-letter writting-basic principles-purpose-types of business letter-handling negative ideas effectively-report writing, types of reports-structure of report-drafting report.

Books Recommended: 1. Jerry C.Wofferad, A Gerloff & Robert C.Cumins: Organisational communication, Megraw Hills New York
2 Haston, Sandberg & Mills:
Effective speaking in Business prentice Hall, New York
3. George L. Morrisey:
Effective business and technical presentations, Addission wesley Publn.,
Co., London. 4. Raymond Lesikar:- Busi. Comm., theory&Practice
5. Essential of Business Communication by Rajendra Pal, &J.S. Korlahalli.
6. Business Communication-U.S. Rai& S.N.Rai.
7. Business Communication- Momai Pradhan, D.S.Bhende, Vijay Thakur.

32/193 -188-

advanced Diploma in Manufacturing Engineering

Subject - Control Engineering

VI SEMESTER

S. no.	Topic	Th.	Tuto/ Pr.	Assesment Kn.	Comp.	High. level	Total
1.	Control & regulation						
2.	Introduction to Pneumatic control system						
3.	Production of compressed air its treatment & distribution.						
4.	Pneumatic control components & circuits & their maintenance.						
5.	Introduction to Hydraulic control system						
6.	Hydraulic power unit.						
7.	Hydraulic cylinders, motors & accessories.						
8.	Hydraulic control circuit						
9.	Proportional control systems.						
10.	Hybrid control systems.						

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32/194 - 189 -

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

CONTROL ENGINEERING

VI SEMESTER

S. Topic/Sub Topic

1. CONTROL AND REGULATION

- Scope, Elements of control chain.
- Working media for control systems.
- Close and open loop system.
- Flow diagram for steps/mechanism of control chain.

2. INTRODUCTION TO PNEUMATIC CONTROL SYSTEM

- Meaning and scope of pneumatic control system.
- Limitations.
- Fluid and its properties
- Unit of Measure in pneumatics.

3. PRODUCTION OF COMPRESSED AIR ITS TREATMENT & DISTRIBUTION.

- Need and characteristics of compressed Air.
- Compressors positive-displacement compressors.
- Method of conditioning.
- Filtration of compressed Air.
- Compressed Air lubrication.
- Service Unit.
- Air filter
- Pressure Regulator with pressure.gauge
- Compressed Air lubricator.

4. PNEUMATIC CONTROL COMPONENTS AND CIRCUITS.

- Pneumatic cylinders. Single acting cylinders. Double acting cylinders.
- Pneumatic valves, their construction & use.

MAINTENANCE OF PNEUMATIC EQUIPMENT AND SYSTEMS.

- Fault tracing
- Fault localization (list of faults)
- Rectification of fault

Contd...2

5. INTRODUCTION TO HYDRAULIC CONTROL SYSTEM

- Recapitulate the principles of Hydraulics.
- Various working media used their characteristic, properties & limitations.

6. HYDRAULIC POWER UNIT.

- Construction of Hydraulic power pack and function of its sub-units.
- Types of pump used.
- Types of valve used.

7. HYDRAULIC CYLINDERS, MOTORS AND ACCESSORIES.

- Working of Hydraulic cylinders (SA & DA) with their sketches, symbols & applications.
- Accessories used in Hydraulic control system.

* SA = Single acting
  DA = Double acting

8. HYDRAULIC CONTROL CIRCUIT.

- Application of Hydraulic control systems.
- Symbols used.
- Design & assemble Hydraulic control circuits for simple industrial situations.
- Time motion diagram.

9. PROPORTIONAL CONTROL SYSTEM

- Importance and its scope
- Advantages and limitations
- Industrial applications

10. HYBRID CONTROL SYSTEMS.

- Electro-pneumatic control
- Electrically actuated solenoid valves.
- Air-hydraulic control (Hydro-pneumatics)

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(24)

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING

CONTROL ENGINEERING

Proposed List of Experiments

1. A Single acting cylinder has outward stroke, by manually operating a Pneumatic valve.
2. Setting up of service unit for control circuits operation.
3. Assemble a pneumatic circuit with a 3/2 way manually operated valve in line with a pilot operated 3/2 way valve to control a single acting cylinder.
4. Design pneumatic circuits under a-some each of the following conditions for a single acting cylinder -
   1. Travels out slowly.
   2. Returns to initial position very quickly.
   3. Operated through a shuttle valve & two 3/2 way valve
   4. Operated through two pressure valve & two 3/2 way valves.
5. Design a pneumatic circuits under each, a some of the following conditions for a double acting cylinder.
   1. Through 4/2 way valve.
   2. Through 4/2 or 5/2 way valve & metering-in or metering out of air.
   3. On operating a push-button & after having traveled out to full extent automatically travel in again & for continuous cycle.
6. Design a pneumatic circuit such that a workpiece when fed via a magazine is clamped by a cylinder and second cylinder stmaps the component.

HYDRAULIC CONTROL SYSTEM

7. Setting up of a power pack for Hydraulic control circuits operation.
8. Assemble and test for function-designed in simple hydraulic control circuits using single acting cylinder.

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ADVANCED DIIPLOMA PROGRAMME IN MANUFACTRING ENGINEERING TO BE IMPLEMENTED FROM JULY 1997.

VII SEMESTER (TO BE INTRODUCED IN 1997)

S. NO.	NAME OF SUBJECT	SCHEME OF STUDY			SCHEME OF EXAMINATION										
		CONTENT HRS PER WEEK			SESSIONAL MARKS		PROGRASSIVE ASSESMENT				BOARD EXAMINATION				
		(YEAR) TH.	LAB.	TOTAL	TERM WORK	LAB WORK	I	II	TH. PA.	DURATION HRS	MKS	PRACTICAL	DURATION HRS	MAS	REMARKS
1.	PRODUCTION MANAGEMENT	128	32	168	20	25	10	10	1	3	100	1	3	50	
2.	C.N.C.	64	64	128	20	25	10	10	1	3	100	1	3	50	
3.	C.A.D. & C.A.M.	48	80	128	20	25	10	10	1	3	100	1	3	50	
4.	MATNTENANCE ENGG. (same as maintenance & safety of VI sem. Production engg. For Theory paper only)	80	32	112	20	25	10	10	1	3	100	1	3	50	
5.	ENVIRONMENTS ENGG. (common to C/M/E BASED ON MPCES)	48 --	—	48	20	—	10	10	1	3	100	--	--	--	

NOTE:-

(1) NO O THEORY PAPER : 5
(2) TOTAL THEORY MARKS: 500
(3) NO. OF PRACTICALS : 4
(4) TOTAL PRACT. MARKS: 200

(7) RATIO OF THEROY MARKS : 1:1 AND (SESSIONAL + PROG. ASSESS +PRACTIAL +INPLANT TRAINGING MARKS)i.e.

(8) TOTAL MARKS: 1000

(9) PASSING MARKS FOR
(a) THEORY -33%
(b) PRACTICAL-40%
(c) SESSIONAL -60%
(d) INPLANT TRG. 50%

INPLANT TRAINING MKS: --
TOTAL MKS. OF SESSIONAL +(100+100+100-200)
PROG. ASSESSMENT + PRACT. =500
& INPLANT TRAINING:

32/1997 -192-

VII

(1)

Advanced Diploma in Manufecturing Engineering.

Seven Semester Manufecturing Engg.

32/198

SCHEME OF STUDIES

S.No.	Subject	Theory Hrs.	Practical Hrs.	Total Hrs.
1-	Production Management	128	032	160
2-	C.N.C.	064	064	128
3-	CAD/CAM	048	080	128
4-	Maintenance Engg. (Maintenance & Safety Visem Bhd)	080	032	112
5-	Environmental Engg.	048	---	048
	Total	368	208	576

PRODUCTION MANAGEMENT

Working Group

PRODUCTION MANAGEMENT

1. Prof. Mrs. Manju Saxena, TTTI, Bhopal.
2. Prof. Dr. V.K.Khare, MACT, Bhopal.
3. Mr. Shamim Uddin, HOD (Maint.), S.V.Govt. Polytechnic,Bhopal.
4. Mr. B.K. Saxena, Sr.Lecturer, S.V.Govt. Polytechnic, Bhopal.
5. Mr. A.K. Tuli, Lecturer, S.V.Govt. Polytechnic, Bhopal.
6. Mr. T.N. Shrimali, Sr.Lecturer, S.V.Polytechnic, Indore.
7. Mr. K.C. Verma, Co-ordinator, PDU, Bhopal.

PRODUCTION MANAGEMENT

RATIONALE

The optimum operation of any industrial organization demands its staff to share the administrative and technical responsibilities efficiently and effectively. The great technological and sociological advances that have occurred in all segments of our society have forced the developments of new management concepts, techniques and tools to cope up with complexity of growth and change. To meet the challenges of complexity, the systematic and organized approach in every discipline is indispensable in a society which is producing more technically qualified persons, newer materials and complex products and more information than ever before.

The production function should be seen as a system in which no element can be significantly altered without affecting the other parts. Attempt has been made to familiarize the students with each key factor and explain how production managers can improve efficiency within a frame work related to knowledge, skills, attitude and objective of their organizations.

Keeping in view of the competencies identified during discussions with a group of industrialists and academicians the following new topics have been added.

- Productivity, Total Quality Management (Various approaches- philip Croby, Deming, Juron, Taguchi, Kaizan Etc.), Just-in-time concepts, Ishikawa diagram, SWOT analysis, Logic structures and Communication Skills etc.

This subject will go a long way towards helping him to remove some of the obstacles to improved productivity.

32/202

PRODUCTION MANAGEMENT

SNo.	TOPICS	HRS. THEORY	LAB./TUTORIALS	
1.	Management an overview	8	2	
2.	Organization & Organizational Climate	8	2	
3.	Human Factors in Production	14	2	
4.	Materials Management	16	4	
5.	Production Planning & Control	10	4	
6.	Project Planning by Network Analysis	12	4	
7.	Work Study	14	18	
8.	Plant Layout & Materials Handling	4	–	
9.	Operation Research	6	4	
10.	Application of Computers in Management.	4	–	
11.	New trends in Management	4	–	
		100	18	22
		100	40	

- 197 -

29/6/96

29.6.96 (K.K. PURI)

NAME OF SUBJECT :- PRODUCTION MANAGEMENT Code:

S.No.	Topic/Sub Topic	Intended Learning Outcome (ILO) (Objective)	Remark
1.	MANAGEMENT AN OVERVIEW:		
1.1	What is Management ?	- Knows about Management. - Defines Management.	
1.2	Brief history of Management	- Knows the history of Management.	
1.3	Function of Management - Planning - Organizing - Staffing - Directing - Co-ordinating - Controlling - Reporting - Innovating - Budgeting - Evaluation	* Understands the concepts of Management. - Explains the functions of Management.	
1.3.1	Management Phases - Preplanning,Planning, Implementation and control.	- Explains the different phases of management. - Explains that the planning is a continuous process.	
1.4	Applications of management in different areas such as Finance, Personnel,Marketing,Purchasing, Storing,Production etc.	* Understand the universality of the concept of application of management in defferent areas. - Outline the area of application of Management concepts in practice.	

1.5	System Approach - Definition - Parameters	* Applies the concepts of system approach. - Defines the term system. - Lists the parametes of a system
	- Classification of system a) Open,closed and isolated systems b) Production,Non-productive and service systems.	
	- System design procedure - Evaluation of system by considering productivity and effectiveness.	- Explains the different types of systems with examples. - Explains the system design procedure. - Given a situation,applies the concepts to design a system. - Defines the terms productivity and effectiveness of a system. - Justifies the importance of measuring effectiveness of a system.
2.	ORGANIZATION AND ORGANIZATIONAL CLIMATE.	
2.1	Introduction - Definition - Illustration	* Knows about the oragnisation.
2.2	Principles of Organization	* Understands the principles of organisation. - Explain the principles of organisation.
2.3	Organisational structure and organisational chart.	* Understand the basic elements of organisational structure.

32/204 - 197 -

		- Prepare an organisational chart for an organisation you are familiar with.
2.4	Types of Organisation	* Understand different type of Organisations. - Distinguish between different types of organisation. - Show examples of different type of Organization from real life.
	Formal Organisation - Line - Functional - Line & staff - Committees - Project - Matrix Informal organisation	
2.5	Classification of organisation	* Know the classification of organisations. - Classify organisation on the basis of Function, Product, Customer and location. - Show examples of the organisation based on above parameters.
2.6	Authority and Delegation of authority.	* Know the basic principles of Authority & Delegation. - Define authority. - Explain process of delegation of authority.
	Centralisation and Decentralisation.	- State the purpose of centralisation and Decentralisation.
	Authority and Responsibility.	- Define relationship between authority and responsibility.
2.7	Group Dynamics	

32 | 2055

-207-

	- Concept - Characteristics of groups.	- Know the concept of group dynamics - Define basic characteritics of groups.	
	- Reason for formation of groups.	- Explain reson for formation of groups	
	- Types of groups	- List different type of groups such as formal,informal groups.	
	- Advantages and disadvantage of groups.	- List advantages and disadvantages of groups.	
2.8	Organisational change	* Applies the concepts of managing change in a given situation.	
	- Introduction - Causes of organisational change.	- Define organisational change. - Identifies the causes of organisational change.	
	- Response to change		
	- Process of change - Resistance to change	- Explain the process of change. - State the causes of resistance to change.	
	- Overcoming resistance to change.	- Given a situation,suggests the method of overcoming resistance to change.	- Through case study.
2.9	Organisational Conflict	* Understand the concept of organisation conflict and its management.	
	- Concept - Types of conflict	- Define conflict. - Recognise different type of conflicts.	
	- Conflict between individuals - Conflict between an invidual and group. - Conflict between groups within an organisation. - Conflict between organisation.		
	- Process/Stages of conflict	* Describe the process of conflict.	

32/206

-201-

- Source of conflict
- Impact of conflict
- Resolution of conflict or modes of conflict management.

- Identify the sources of conflict.
- Give the strategies for resolution of conflict.

3. HUMAN FACTORS IN PRODUCTION.

3.1 Managing Men:

3.1.1. Motivation:
- Introduction
- Factors affecting motivation

* Understands the importance of motivation.
- Defines motivation.
- List the important factors that influence human behaviour.

- External Job/Company environment.
- Internal- Human needs.

3.1.2. Motivation process.
3.1.3. Secondary motivation drives

- Explains the motivation process.
- Explains the secondary motivating devices.

- Aggressiveness
- Acquisitiveness
- Self assersition
- Constructiveness
- Gregouriousness

3.1.4. Outlet for drives
- Expression
- Repression
- Control and re-direction.

- List outlet for drives
- Explain outlet for drives

3.1.5. Behavioural Theories

- Maslow's need Hierarchy
- Heizberz Theory
- Douglas Mc Gregar Theory (Theory X and Y)
- Personal skill required such

- Disscuss importance of Behavioural Theories.
- Explain behavioural theories.

- List the ingrediients of leadership

32/207

- 202 -

as persuassion, influence and Rapport. - Leadership qualities - Relationship between motivation and leadership.	- Identify qualities in a leadership - Establish relationship between motivation and leadership.
3.1.6. Morale. - Definition - Importance 3.1.7. Morale and Productivity.	* Understands the concepts related with Morale. - Defines morale. - Explains the importance of Morale. - Corvelate morale with productivity etc.
3.1.8. Job - satisfaction. - Importance - Factors	* Understands the concepts related with job satisfaction. - Explains the importance of job satisfaction. - List the factors, to be considered in designing a job, for giving job satisfaction.
3.1.9. Training. - Concept of Training - Need of Training - Benefits of training	* Understands the concepts of training - Explains the need of training - Explains the benefits of training.
3.2 Leadership. - Definition.	* Understand leadership. - Define leadeship.
3.2.1. Personal skill required such as persuassion, influence and Rapport.	- List the ingredients of leadership.
3.2.2. Leadership qualities. 3.2.3. Relationship between motivation and leadership.	- Identify qualities in a leadership. - Establish ralationship between motivation and leadership.
3.2.4. Kinds of leadership Traditional	- List types of leadership styles.

- Autocratic - Democratic - Free Rein	- Describe different types of leadership styles.
3.3. MANAGEMENT BY OBJECTIVES	- Knows the concept of MBO
3.3.1. Introduction to MBO	
3.3.2. Application of MBO - Advantages and disadvantages of MBO.	- Describes the MBO - State the various applications of MBO. - List the advantages and dis-advantages of MBO.
3.3.3. Recent- Result centered (Management by objectives MBO - Cantigency or situational	
3.4. Management Grid	- Explain chart of management grid
3.5. Supervision:	* Understand the importance of supervision. - Define the role of Supervisor - Identify personal attitudes required in a Supervisor. - List the duties and responsibilities of a Supervisor.
3.5.1. Definition of Supervisor 3.5.2. Personal attitudes of supervisor. 3.5.3. Duties and responsibilities of a Supervisor.	
3.6. Time Management:	* Appreciate the importance of time management. - Justify that time is a valuable resource. - Explain the Steps which could be taken for Managing the time resource effectively. - Explain the techniques employed for
3.6.1. Importance	- Importance. - Main features: a) Learn management and organization principles, communication Techniques and Work study. b) Use logical approach.
3.6.2. Techniques employed. - Steps to be taken. - Avoiding time wastas. - Communication as peets.	- (A) Steps.

32/209

- NOV -

- Using diaries.	time management. - List the various electronic gadgets used for better time management.	Initial check - 1) Records roles & activities. 2) Establish priorities. 3) List omitted tasks. 4) Analyse and rearrange items from the above three points. B) Applying Principles and techniques of management. C) Other aspects- 1) Using diaries. 2) Delegating. 3) Avoiding time wasters a) Avoid needless switching from one activity to another. b) Take action emmediatly. c) Attempt to restrict interuption d) Determine quiet and busy period and plan tasks accordingly. e) Choose appropreate time to contact others, as to ensure sufficient time availability. f) Do not rely on memory,write every-thing down immediat-tly, recording in your notes in the appropreate places
3.7. Communication: - Definition	* Understand Communication - Define communication.	
- Communication Process - Communication types - Communication Channels - communicatioin Barriers	- Explain the process of communication. - Describe channels of communication. - List the barriers in communication.	
3.7.1. Effective communication - Person to Person - With Groups - In meetings/Committies	- Explain the method of communication with - a person - in groups - in meetings/committies.	

32/2/8 - T203 -

32/211

later if it is difficult to do so at the time.

4) Communication aspects-
-Ensure clear communications.
-Conduct all meetings effectively, avoid unnecessary debate, justify the presence of those who do attend.
-Always listen attentively and write down important points.
-Choose times interrupt carefullyand avoid loss of concentration.
-Laise with other sections to check that work is not duplicated.
-Seek out all sources of information and advice.

5) Management-Supervisor relations :-
-Attempt to manage with superior, aiming to avoide spending unnecessary amounts of time with him or hir.

6) Check results:-
-Aiming to improve

constantly by checking results and adjusting plans accordingly. only the individuals can solve time management problems by being self disciplines and persevering.

* Writing a letter.
- Categories of letter.
a) Important.
b) Routine.
- Organization of the letter (Four section).

i) Information
- Starting with the most important point.
ii) Supporting details, evidence and view.
iii) Summary starting the conclusions actions needed to follow.
iv) Closure- Thanks giving etc.

* Knows the concepts related with written Communication.
- States the Categories of letter.

* Describes the organization of letter with suitable example.

32/2/2

* Memoranda :-
- Definition.
- Difference between a letter and memorandum.

* Defines Memoranda.
* Illustrate difference between a letter and a memorandum.

-Memos used for interdepartmental communication with in an organization.
-Bussiness letter is an external communication.
-No solutation at the start and end.
-Both memos and letters are structured

32 | 213

* Reports :-

- Definition.
- Task involved in writing reports to include the following aspects-
  - Collection of material.
  - Selection of material.

- Ordering sections.
  - Classification of materials.
  - Placing sections in a logical order.
  - Deciding Headings and Sub-headings.

- Writing the report.
- Choosing a style appropreate to the audience.
- Choise of illustrations,table, grafhs, diagramms.

- Presentation of the report.
  - A possible layout may include.
  - title page.
  - Summary.
  - Table of contents.
  - Introduction.
  - Text of main body of the report.
  - Conclusions.
  - Recommendations.
  - Appendices containing tables, technical conclusios, references etc.

* Knoes about report writing.

- Defines a report.
- List the tasks involved in writing a report.
- Describes the step-by-step procedure of report writing.

- Summarizes the presentation of a report.

* Presentation skills.
- Introduction

* Understands the importance of presentation skill in group

- Scope	interaction and the methodology to be adopted. * illustrate the occasion where as a e.g.- Team briefing. * Supervisor one needs to address a group- Imparting instructions to workers. of people. - training activities - Formal presentation	
* Verbal Communicating media (Body Language)	* Explain the important role played by body language in verbal communication.	* Body language to includ - Posture - Gesture - Voice - Dress
* Phases for group interaction. - Preparation phase - Subject metter - Visual aids - Psychological (Overcome nervousness) - Presentation phase - Pace - Timing - Voice modulation - Eye contact - Star/ Introductory pleasantries - Strss on the main theme. - Keeping on track. - Closure (Summarize).	* Explain the phases and elements to be taken cure in group interaction. * Given a situation display the presentation skills.	
3.8. Grievances: - Definition. - Causes of grievences . - Recognising grievences.	* Comprehend the phenomenon of grievances. - Define grievances. - Identify causes of grievances.	
3.8.1. Solving greivances of a) Indivisual - knowing the individual - Watching for changes	* Explain method of solving greivances for an individual and group.	* Through case studies.

32/214

-209-

- Analyse change and information.
- Consult with employee
- Treatment
- Follow-up

b) of Group
- Group Disscussion:

* Expalin the method of leading a group disscussion in a given situation.

* Conduct a group disscussion on greivence handling.

- Introduction
- Stating the case
- Controlling the disscission
- The conclusion

3.9. PROBLEM SOLVING & DECISION MAKING.

3.9.1. Steps in Problem solving.
- Define the Problem.
- Collect relevant information
- List Possible causes.
- Select the most likely cause.
- Suggest alternative solution.
- Evaluate alternatives
- Choose ane solution
- Plan for implementation
- Receive feed back.
- Replan and implement.

* Uderstand the process of problem solving and dicision making.
- Explain systametically the steps involved in problem solving.

3.9.2. Methods of Problem solving.
- Institution
- Analytical thinking
- Creative Thinking
- Group discussion and Brain storming.
- Lateral Thinking.
- Logic Thinking

- Describe the method of problem solving with their tros & cons.

(Cause-Effect diagram) - Synectics. * Swot Analysis:- - Definition (Factors involved) (S - Strengths) (W - Weakness) (O - Opportunities) (T - Threats) - Procedure. - Application areas.	* Understands the concepts related with SWOT analysis. - Define the terms. - Explain the procedure by illustrating Examples.
3.9.3. Importance of Problem Solving	- Outline the importance of problem solving.
3.9.4. DECISION MAKING: - Introduction and - Definition	- Define decision making.
3.9.5. Types of Decisions. - Programmed and Non-programmed decision. - Major and Minor decisions - Routine and strategic decisions. - Organizational and personal decisions. - Policy and operation decision - Long term, Departmental and Non-economic decisions.	- Classify the decision in different types.
3.9.6. Decision Making Process.	- Explain the right process of decision making.
3.9.7. Barriers in decision making.	- List & Describe the Barriers in Dicision making.
3.9.8. Quantitative methods in decision making. - Introduction. - Deterministic models - Break Even Analysis. - Linear Programming	- Explain the use and omportance of Quantitative methods in dicision making.

32/216

	- Capital Budgeting - Inventory Management		
3.9.9.	Probabilistic Models. - Expected value model - Decision Tree - Simulation	- Define Probabilistic models. - Explain different types of models.	
3.9.10.	Other Techniques. - Waiting line theory - Game Theory - Information Theory - Utility Theory - Heuristic problen solving.	- List other commonly used techniques in dicision making. - Explain each of these, with their specific area of application.	
4.	MATERIAL MANAGEMENT.		
	- Functions of Materials Management system encompassing (A) The purchasing (B) Storing and (C) Inventory - control functions (D) Waste management.	* Understand the concepts about materials management system in an industry. - State the areas included in the materials management system. - Justify the importance of the role of Materials Management system in an industry etc.	
	(A) Purchasing - Objectives of Purchasing - Decissions to be made before purchasing (Apply systems Approach)	- List the objectives of purchasing. - Given a situation, identify the decisions to be made before the actual purchases are made.	System approach as applied for such decision making. (1) Input: Purchase requisition, speci-specifications. (2) Constraints: Legal considerations, Management policies (centralised/ Decentralised), Resource limitaions, Marketing conditions, Demand factors

32/217

		(3) Purchasing decision - Supplier selection, - Timing of purchase, Pricedetermination (F.O.B. - Free on board C.I.F. - cost of materials insurance and Frieght) - Quality and quantity.
4.2.	Material Requisition Planning.	
	- Definition. - Importance. - Factors to be considered.	- Understands the term M.R.P. * Explain the Importance of material requisition planning. * Describes in brief the factors to be considered for material requisition planning etc.
4.3.	Buying Techniques such as Batch,Speculative,scheduled and purchasing by sole supplier agreement	- Explain the different types of buying techniques with examples.
4.4.	Purchasing Procedure	* Understand the purchasing procedure - Explain the purchasing procedure etc.
4.5.	Purchase Documentation	- know about the different types of formats/related with purchasing - state the different types of proformas/formats used in purchasing etc.
4.6.	Computerised Purchasing system	* Know about the application of computer in purchasing function. - Illustrate the application of computer in purchasing etc.

32/218

-213-

4.7. Purchasing Organization;
Based on the principle of
- Function
- Product
- Location
- Stage of manufacturing

* Know about the purchasing organization.
- Classify purchasing organization.

4.8. (B) Stores Management
- Stores functions
- stores organization centralized and Decentralized.

* Understand the working of stores
- state the stores functions
- state the types and characteristics of stores organization.

4.8.1. Stores systems and procedures.
(1) Identification system
- Arbitrary approach
- Symbolic approach

- State the importance of identification systems related with storage of items in an industry.

4.8.2. Use of Engineering drawing number.

- State the characteristics of each of the different systems involved in storage give examples.

(2) Receipt System
(3) Storage system:
(a) Physical system- closed, open and Random access stores.
(b) Stores Records system: Bin cards, Storage Ledger.

- Display the different types of formats used in record keeping and working of stores.

32/219

(4) Issue System
(5) Stores according includes
- FIFO (First-In-First-Out)
- LIFO (Last-In-First-Out)
- Average cost system
- Market value systems

- Standard cost system
- System of costing the closing stock.

(6) Stores verification system includes
- Annual or Periodic verification
- Perpectual Inventory and continuous stock taking system.
- Low point inventory system

(7) Stores Address system

Stores Location and layout

* Know about stores location and layout related concepts.
- state the factors to be considered for locating the stores in any industry.
- State the different type of layouts used in the stores etc.
- State the different types of equipments used for storing and material handling etc.

4.8.3. Standardization, Codification and variety Reduction.

* Understand the importance of standardization, Codification and variety Reduction.
- Explain the terms standardization, Codification and variety Reduction and emphasise their importance.

4.9. (C) Inventory control

- Definition
- Function of inventory

* Understand the concept of inventory control.
- Define the term inventory
- State the functions of inventory

- Economic Order Quantity

- Derive an expression for the Economic Order Quantity.

- Stock Turnover

- Understands the term stock Turnover.

32/220

- 215 -

- Definition. - Importance.	* Defines the term stock turnover ratio. * Explain the importance of stock turnover. * States its applications on inventory control etc.
4.9.1. Inventory Models: Order Quantity, buffer stock, Reorder point, Lead time, Stock out.	- Define the terms model, inventory model and different terms used in relation to Inventory models. - State the functions of inventory models.
4.9.2. Fixed Order Quantity Model Wilson model) without and with bufferstock.	- Derive an expression for Economic Order Quantity (EOQ). - Given data,compute EOQ.
4.9.3. Fixed Time Period (Replenishment) model. 4.9.4. Two-bin Model.	- Explain the inventory models (Wilson, Replenishment and Two-bin) with graphical representations.
4.9.5. ABC,VED (Vital,Essential and Desirable),FSN (Fast,Slow and Non-moving) analysis. SDE (Scarce, Difficult and Easy) analysis.	- Explain the ABC, VED ,FSN and SDE analysis and their importance. - Given the necessory data. Plot the Pare to Curve for ABC analysis.
4.10. VALUE ENGG. AND VALUE ANALYSIS. - Introduction to value Engg.and value analysis. - Difference between value Engg. and value analysis. * Scope and objectives * Reasons for unnecessary costs	* Understands the concepts of value Engineering and value analysis. - Defines the term value,value engg. and value analysis. - Gives the types of value. - State the objectives of Value Engg. - State the reasons for unnecessary costs.

32/221

* DARSIRI method for value analysis.	- Explains the DARSIRI method for value analysis etc.	* Concepts can be re-inforced by taking a case-study.
4.11. (D) Waste Management. - Introduction. - Complimentarity of Waste management and Resource management. - Taxonorry of waste. a) On the basis of resource wasted. b) On the basis of source of origin. c) On the basis of property. d) On the basis of recoverability.	* Understand the concept of waste management. - Define waste management. - Establish the complimentarity of waste management and resource management. - Classify waste on the basis of different criterion.	
- Westivity. - Gross and Net Westivity.	- Define Westivity. - Explain gross and Net Westivity.	* Westivity = $\frac{\text{Waste}}{\text{Input}}$ * Gross Westivity = Net Waste generate / Total Input. * Net waste = Total waste generated - Waste recycled within the system . * Wet Westivity = Net Waste generated / Total Input.
- Functional classification of waste management. - Generation of Waste. - A systematic approach to waste reduction. - Waste collection system. - Recycling of Waste. - Waste disposal system. a) Guide lines for disposal of solvable waste. b) Processing and Disposable technique for non solvable waste.	- Identify the fundamental elements of Waste management. - List the causes of generation of waste. - Explain the systematic approach of waste reduction. - State the importance of waste collection. - Define the meaning of recycling of waste. - Classify waste disposable system on the basis of soluable and Non soluable waste. - List the techniques of Waste	

32/222

disposal systems.

5.0.	Production Planning and control. - Introduction - Productivity. - Definition. - Importance. - Factors to be considered.	* Understand the functions of PPC. - Explain the functions of PPC. - Understands the concepts related Productivity. - Defines the term Productivity. - Explain the importance of productivity. - Describe in brief the factors to be considered for improving productivity. etc. - Correlate the functions of PPC with the three phases of work completion, i.e. planning,implementation and control.	* Suitable examples can be quoted.
5.1.	Functions of Production Planning and control (PPC) to include the following:		
5.2.	Planning for Men,Machines, Materials,Estimating,Routing, Scheduling,Despatching,Follow-up,Inspection and Evaluation. - Sequencing	- Define the terms sequencing and loading. - Establish that scheduling is preceded by sequencing and loading etc.	
5.3.	Loading and Scheduling * Critical Ratio. - Definition. - Importance.	- Know about critical ratio. * Defines the term Critical Ratio. - States the importance of Critical Ratio in the scheduling of activities. etc.	
5.4.	Types of Production system; Job,Batch,Mass/Flow,Group Technology,FMS project.	* Know about Production Systems - Classify the production systems - State the characteristics of different types of production systems etc.	
5.5.	Determination of optimum/ Economic batch size for production.	* Understand the method of finding Economic Batch size for production given the necessary data,compute the	

32/223

- 218 -

		optimum batch size for production.	
5.6.	Documents used in production - Production order - Work Ticket - Job card - Job Ticket	* Know about the different types of formats used for PPC in an industry. - State the different types of formats used in the PPC and their functions in an industry.	* Display the different type of formats for work execution.
5.7.	Machine and labour utilization chart.	* Prepare machine and Labour utilization chart for a given data.	
6.0.	PROJECT PLANNING BY NETWORK ANALYSIS:		
	Introduction & Definition	* Understand the concepts of Project Management.	
6.1.	Steps/Phases of project management; - Preplanning - Planning to include scheduling - Implementation - Controlling - Reviewing and updating.	- Define the term project. - Explain the steps/phases of project management.	
6.2.	Tools/Techniques applied for project management	- Apply the techniques used for Project Management. - Explain the procedure of drawing a Gantt chart.	
	- Bar charts & Milestone shants (Gantt chart)	- Interpret the Gantt chart. - Given necessary data draw the Gantt chart	
	- Network methods,i.e.C.P.M. & P.E.R.T. Development of Network. - Fulkerson's Rule for numbering events. - Updating,Crashing	- Explain the procedure for developing a Network,Updating and Resource levelling. - Differentiate between C.P.M. and P.E.R.T. - Given necessary data,develope the	

	- Resource profile - Resource smoothening/Resource levelling.	network giving numbers to events according to Fulkerson's Rule, Update the network,draw Resource profile, and smoothen the Resource profile etc.
7.0.	WORK STUDY	
	* Introduction * Objectives * Components - Method study and work measurement.	* Knows about work study. - States objectives of work study - List the types of studies performed in work study.
7.1.	Method study * Introduction * Objectives * Steps for method study	* Understands Method Study. - States objectives of method study performing. - Describes procedure of performing method study. * Applies the concepts of method study in practice.
	* Work Measurement * Procedure	- Given the situation,performs method study.
7.2.	Work Measurement - Procedure - Techniques to include the Time study,Work sampling Predetermined motion time system.	* Understand Work Measurement. - Describes procedure of work measurement. - States techniques of work measurement
7.3.	Principles of motion economy.	- States principles of motion economy.
8.0	FACILITIES LAYOUT AND MAINTENANCE OF FACILITIES.	* Understand the concepts related with Facilities Layout in an industry.
	- Introduction: Importance and function	- Explain the importance,functions and the objectives of proper

32/225

-210-

	– Objectives	facilities layout in an industry etc.
8.1.	Basic types of plant layouts such as: – Product or line layout – Process or Functional layout – Cellular or Group layout – Job shop layout – Project or Fixed Position layout.	* Understand about the different types of plant layout and related facts. – Describe the types of layouts and their characteristics by taking live examples of different types of industry.
8.2.	Plant layout factors.	– State the factors to be considered in selection of plant layout.
8.3.	(B) Maintenance of the facilities:	*Understand the concepts about Maintenance of facilities.
8.3.1.	Objectives	– State the objectives of maintenance of facilities.
8.3.2.	Types of maintenance Such as: Scheduled (Planned) Maintenance Preventive Maintenance Condition based/Protective Maintenance. Running Maintenance Corrective Maintenance Design out.	– Correlate the importance of proper maintenance of facilities installed in an industry with the growing competitive market (cost,quality of product and morale of the workers points of views) – State the different types of maintenance practices and their characteristics etc.
8.3.3.	Maintenance Documentation such as: History card,Lubrication card, Preventive maintenance schedule etc.	* Know about the different types of maintenance records kept in an industry. – State the different types of records kept about Maintenance of facilities and their importance. – Display formats of different types of records kept in Maintenance Department of an industry.
8.4.0.	Materials Handling.	* Knows about the concepts of material handling.

32/226

-221-

	- Introduction
	- Importance
	- Materials Hanling equipments
	  - types
	  - areas of application
		- States the importance of materials Handling in the industry.
		- States the functions of various material handling equipments and their areas of application.

9.0.	OPERATION RESEARCH.	
	Introduction to operation research.	- knows basic concepts
9.1.	Application areas of operation such as: Inventory Control Project Management (Network analysis) Decision Theory Queveing Theory Simulation Game Theory Optimisation etc.	- List specific areas of Application - Illustrates the various application areas with examples.
9.2.	Linear Programming Problems Characteristics and limitations Identification and formulation for solving the problems by graphical method.	* Understands the method of linear programming. - States the characteristics and limitations. - Given necessary data, solve the problem etc.
10.0.	APPLICATION OF COMPUTERS IN MANAGEMENT.	* Understand the managerial applications of Computers.
10.1.	Role of Computers in effective performance of various management functions.	- Describe the role of Computers in management functions.

	things, to attack cronic problems; and control- Preventing the occurance of bad things, to attack sporadic problems)	
11.6.	Feigenbaum's Concepts about total quality cost comprising of -Appraisal cost, Prevention cost and Failure Cost.	- Explains Feigenbaum's approach about total quality.
11.7.	Taguchi Quality System cycle- off-line and on-line; and Quadratic (Taguchi) quality/ loss function.	- Explains Toguchi Quality System Cycle. - Explains Toguchi's loss function.
11.8.	Japanese Quality Management Culture :-	- Appreciates Japanese concepts about TQM.
	-Kaizen strategy (continuous improvement)	- Explains Kaizen strategy.
	-Quality Circle	- Explains the concept of Quality Circle.
	-Ishikawa's Cause and Effect Diagram (Fishbone Diagram)	- Explains the Ishikawa's Cause and effect diagram with suitable illustrations.
11.9.	JUST-IN-TIME (JIT)	* Understand the concepts about JIT.
	Concepts and application area in Materials Management and and Production control.	- Explains the important role played by JIT approach in materials Management and Production Control.
11.10.	Logic Structures	* Understands the concepts related with Logic Structures.
	- Definition	- Define the term.
	- Purpose - Procedure - Application area	- Explain the purpose and procedure of developing of Logic Structure by giving illustrations.
11.11	TRENDS IN MODERN MANAGEMENT TECHNIQUE TQM (Total Quality Management) SWOT analysis	* Understands different concepts of modern management techniques.

32/229

10.2.	Application of Computer in: - Finance. - Production - Inventories - Maintenance. - Marketing. - Personnel. - Process-Planning.	- List the application of Computers different functions of management. - Explain, how Computers can be used to enhance effectiveness of management of these functions. - List the commonly used and latest soft ware packages for application of computers. - List the important features of these packages.
11.0.	NEW TRENDS IN MANAGEMENT.	
11.1.	TOTAL QUALITY MANAGEMENT * Introduction.	* Understands the importance and related concepts about Total Quality Management.
11.2.	Stages of development. -Inspection -Quality control -Quality assurance -Product assurance -Total Quality Control (TQM) -Total Quality Management.	- Explain the different stages of development of T.Q.M.
11.3.	Philip Crosby's five absolutes of Quality Management.	- List the five Philip Crosby's essentials in regard to quality management.
11.4.	W.E. Deming's fourteen point approach about improving quality and Deming's PDCA cycle (plan,Do, check,Action)	- States the Deming's approach about improving quality. - Explains Deming's PDCA cycle.
11.5.	The Juron trilogy (Quality-Planning, Control and improvement) and two major kinds of quality management (break through-encouraging the occurance of good	- Explains the Juron Trilogy. - Explains the two majors kinds of quality Management.

* Ref: Management Quality. Edited by - B.G.Dale & J.J. Plunkett.

FINAL YEAR PRODUCTION ENGINEERING

PRODUCTION MANAGEMENT.

1. Belts,P.W., Supervisory Management, 6th edition, (ELBS with Pitman Publishing,1994)

2. Khanna,O.P., Industrial Engineering and Management (Dhanpat Rai and Sons 1995)

3. Koontz, O'Donnell, Weihrich, Essentials of Management, 4th Edition, (Mc Graw-Hill Book company 1986)

4. Indira Gandhi National Open University, module published for Diploma in Management Course.

5. Buffa, Modern Production operations Management, 7th edition (Wiley Eastern Ltd.,1983)

6. Goel,B.S.,Production Operations Management (Pragati Prakashan,1986)

32/231

Advanced Diploma in MANUFACTURING ENGINEERING

SEVENTH Semester

CNC TECHNOLOGY

Theory per week : 4 Hrs. Practical per week : 4 Hrs.

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Basics of Numerical Control	3	-
2.	Constructional features of CNC machines	8	8
3.	CNC machine tool measuring system.	2	2
4.	CNC Machine control.	5	4
5.	Electronic Data Processing	3	4
6.	Axis designation and programming Geometry.	4	4
7.	Machining considerations.	4	-
8.	Manual part programming	6	20
9.	Computer Aided programming.	4	10
10.	NC organisation	5	-
11.	Recent Advances in CNC machines.	2	-
12.	Ecgnomics of CNC machine tools.	5	4
13.	Retrofitting of CNC system on conventional machine tools	3	4
14.	Installation and maintenance of CNC machines.	6	-
15.	Programmable logic controllers (PLC)	6	4
		64	64

10/7/97
(Sharad Saxena)

10.7.97
(B. K. Saxena)

10.7.97
(Shanmugam)

10.7.97
(R. M. Khan)

based, Executive program, Data input/ output, other features, Axis calib ion, Reversal error compensation, Machine Set up Data : Memory features, Programme features, PLC features, Diagnostic features, Advance features, CNC System elements : Control Panel-Display unit, keyboard, status, indicators, control circuits, Control circuits, Tape Reader, Power supplier, Logic elements and memory devices (Just revision of what has been taught in digital electronics) Actual study of control system of major international manufacturers of CNC systems.

32/233

5. Electronic Data Processing

Introduction, its advantages, Data, Data processing cycle, Binary codes, types of storage, media - sequential, random, alphanumeric characters, ISO & EIA codes punched tape, parity and parity checking, Principle of mechanical punched tape reader, magnetic tape, Magnetic Disk, Magnetic Drum and their advantages and disadvantages, Floppy disket, structure of EDP Data transmission, RS232 interface Comparison of main CNC system on the basis of EDP.

6. Axis Designation and Programming Geometry :

ISO Standards, Axis identification, objective of Designation, Block diagrams of different CNC machines with axis identified, Co-ordinate system with 2 axes, 2 1/2 and 3 axes machine co-ordinate system, Detailed drawing for CNC, NC related dimensioning- Absolute and incremental dimensioning, choice of workpiece zero point, Reference points-machine zero point, tool reference points, machine traverse and interpolation, Linear and circular interpolation.

7. Machining Considerations

Tooling for CNC, Cutting tool materials, Hard metal insert and non insert filling, Chip breakers, Qualified and pre-set tooling, Machining forces for drilling, turning and milling, Cutting speed/spindle speed, calculation and feed rate calculations Horse power, Torque surface roughness, Acceleration and deacceluation distance for thread turning, Trailing Ener and precision stop, Tool life calculation, Work holding and setting, Workholding, Principle of location, Principle of clamping, Workholding devices, Setting of CNC machine tool.

8. Manual Part Programming

Part program, flow chart, Address format-word adolress, fixed, sequential and tab sequential format, Basic Machine codes-Prepatory function, Miscellaneous functions, Dimensional word, Tool function, Feed rate word, spindle speed word, EOB, Tape coding of these functions, Arc-centre off set, Decimal point programming, programming examples on CNC milling machine, CNC-turning centre, Cutter centre line programming, Tool off-sets for tool length compensation, cutter diameter compensation, position of a fixture or part, multiple part machining tool radius compensation.

10.7.97 (Shamim Uddin) 10.7.97 (R.M. Khan) 10.7.97 (B.K Saxena)

Thread radius compensation, Thread cutting, canned cycles, subroutines, parametric subroutines, safety zones, users macros. Proving of part program : verification, visual inspection, single step execution, Dry run, Graphical simulation. Pen slot, FMST - off Manual Data Input (MDI) digitising.

9. Computer Aided Programming

Introduction, Post Processors, Programming, languages, APT programming, APT-commands, other important computer aided programming.

10. NC Organisation

Programming procedures, programming in planning deptt., programming in workshop, Structure of CNC organisation, Programming data, workpiece drawing operation sequencing, cutting data tables programming and operating handbook tool card index, work holding equipment, card index, programming schedule, set-up schedule.

11. Recent advances in CNC machines

In process gauging, diagnostic programmes, Adaptive controls, Need block diagram, Tool wear sensing, Brokers tool detection, conversational programming.

12. Economics of CNC machine tools

CNC versus conventional machining, Profitable applications of CNC, Adopting CNC, Drawbacks of CNC, Calculation of cost per piece elements of cost, Economic batch quantity, Use of CNC in special cases, Case studies on justification of CNC machines.

13. Retrofitting of CNC system on conventional machine tools

Judging suitability of conventional machine tools cost considerations, Retrofitting procedures.

14. Installation and Maintenance of CNC machines

Installation of CNC machines - Introduction, pre-planning, installation, location, Foundation, installation equipment, proving of machine, Maintenance of CNC machines: Introduction, Need for maintenance, preventive measures, Replacement parts inventory, the level of maintenance operations, fundamentals of NC maintenance, CNC self diagnostic, Trouble shooting, documentation of maintenance programmes.

15. Programmable logic controllers (PLC)

Definition, PLCs versus PC, Elements of a PLC, operation of PLCs, programming and documentation, Applications Reason for using PLCs, Economics of PLCs.

10-7-97 (Shamim Uddin)

10.7.97 (R.M. Khan)

10.7.97 (B.K Saxena)

LIST OF EXPERIMENT

1. Indentify the electronics & mechanical components of CNC machines of main constructional features of CNC machines.
2. Study of various parameters of CNC -Material cut. feed/speed /depth of cut.
3. Study of tool measuring system.
4. Study of CNC machine control features of different manufactures.
5. Designation of CNC machine axes of drilling,milling,shaper,grinder lathe,planner,machining centre,drafting machines with block diagrams and working envelope of different machines with different reference points.
6. Setting up procedures ior CNC machines and pre-set tooling.
7. Preparation of simple part-programs and actual machining of components on CNC milling machine/machining centre.
8. Preparation of part-programs with different tool of set compensation and actual machining of components on CNC milling/machining centre.
9. Preparation of part-program with cauned cycles and subrautines and there on actual machining on CNC willing/machining centre.
10. Preparation of part-program on CNC lathe with roughing cycle and actual machinging of component.
11. Preparation of part-program for thread cutting on CNC lathe and actual machining of component.
12. Preparation of part programme for different contours and taper turning on CNC lathe and there on actual machining.
13. Preparation of user Macros and then utility for some components.
14. Proving of Part programmes on CNC milling/CNC machining centre.
15. Prooving of part programmes on CNC lathe machine.
16. Computer Aided programming of the practicals from S.NO. 7 to 14 in more than are popular programming language such as AP II ,compact II etc.
17. Study of CNC co-ordinate measuring machine.
18. A case study on selection of job for CNC machine.
19. Study and preparation of maintenance system for CNC machine.
20. Programming and integration of PLCs.

LIST OF EXPERIMENT

1. Study of main constructional features of CNC machines.
2. Study of feed and spindle driver.
3. Study of tool measuring system.
4. Study of CNC machine control features of different manufactures.
5. Designation of CNC machine axes of drilling, milling, shaper, grinder, lathe, planner, machining centre, drafting machines with block diagrams and working envelope of different machines with different reference points.
6. Setting up procedures for CNC machines and pre-set tooling.
7. Preparation of simple part-programs and actual machining of components on CNC milling machine/machining centre.
8. Preparation of part-programmes with different tool-off set compensation and actual machining of components on CNC milling/machining centre.
9. Preparation of part-program with cauned cycles and subroutines and there on actual machining on CNC willing/machining centre.
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10.7.97 (Shamim Uddin)

10.7.97 (R.M.Khan)

10.7.97 (B.K.Saxena)

REFERENCES

1. Numerical Control and Computer Aided Manufacturing by Kundra Rao & Tiwari; Tata McGraw Hill. New Delhi.

2. CNC Technology and Programming by Krar; McGraw Hills Book Co.

3. Computer Numerical Control by Pusztai Sava; Prentice Hall.

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5. Numerical Control and Computer Aided Manufacturing by Roger S. Pressman, Johan E. Williams; John Wiley and Sons.

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11. Introduction to ... ter numerical control ... y Barry Leathan Jones, Pub.; Pitman London (John Wiley and sons).

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13. Self Learning Module on NC/CNC machine tools by Prof. K.K.Jain, TTTI, Bhopal.

14. CNC Machines by B.S. Pabla and M. Adithan, Wiley Eastern Ltd., New Delhi

10.7.92
(Shamim Uddin)

10.7.97
(R.M.Khan)

10.7.97
(B.K. Saxena)

ADVANCED DIPLOMA IN MANUFECTURING, SEVENTH SEMESTER.

Subject:- CAD/CAM

Topic No. 1- Basics of CAD/CAM 1+2

Trends in manufacturing. Role of Computer in design, drafting and manufacturing. Meaning of CAD and CAM, CADD and CADDM. Introduction to a CAD system and a CAD and CAM combined system. Basic tasks performed by each system. Fields of application and benefits of CAD/CAM techniques.

Topic No. 2- Computer Graphics 2+5

Graphics theory Algorithm for generation of drawing elements like point line, curve and circle Computer graphic workstation requirements, Hardware options, Graphic display, graphic softwares.

Topic No. 3- CAD Softwares : 5+2

Introduction to different popular CAD Softwares viz. Auto CAD(Auto Desk Inc. USA). I-DEAS(Integrated Design & Engineering Analysis Software)(Sturctural Dynamis Research Corporation USA) STARDYNE(Research Engineers Inc.USA) Pro/ENGINEER(Parametirc Technology Corporation USA) CATIA(Integrated Business Machines USA) & CADAM(Integrated Business Machiners USA) etc.

Topic No. 4- Introduction to Auto CAD 2+5

Introduction, getting familiar with Auto CAD, starting and exiting, main menu organisation, Auto CAD command syntax.

Topic No. 5- Creating Drawing: 2+12

Drawing editor-Screen organisation, coordinate system, setups-units, limits, status axis and snap commands for drawing point, line, polygon circle, are, ellipse and other 2d figures.

Topics No. 6 Editing Drawing : 2+10.

Editing commands -Move, drag, erase, copy, mirror, zoom, pan, view, rotate, chamfer, trim, break, extend, change, array stretch, divide and measure.

Topic No. 7 Other Drawing techniques : 2+10

Screen refeshing commands - redraw, regen, blipmode, dragmode, osnap, fillet, offset, undo, redo, layer, color.

Text Commands-Text, Dtext, Qtext, sytle, Block Commands

--2--

Block, insert, explode, base, purge, Dimensioning Commands - Dim, Dimvars (dimensional variable) dimscale(Drawing to various scale), hatch.

Topic No -8 Adcance features of Auto CAD: 2+10

3D Entities-(3D drawings) : 3line, 3D face, elve, 3Dviewing, VPoing, plan, use of point filters view ports and meshes, Dview, VPort, CVPort, 3DMesh LAYERS, RENDERING.

Topic No-9 Introduction to Aotolisp: 2+2

Introduction to AutoLISP, other softwaries conpatible with Auto CAD VIZ- Auto SHADE, Mech CAD etc.

32/240

-235-

Advanced Diploma in Manufacturing Engineering

Seventh Semester

CNC TECHNOLOGY

Theory per week : 4 Hrs. Practical per week : 4 Hrs.

Topic No.	Title	Theory Hrs.	Practical Hrs.
1.	Basics of Numerical Control	3	-
2.	Constructional features of CNC machines	8	8
3.	CNC machine tool measuring system.	2	2
4.	CNC Machine control.	5	4
5.	Electronic Data Processing	3	4
6.	Axis designation and programming Geometry.	4	4
7.	Machining considerations.	4	-
8.	Manual part programming	6	20
9.	Computer Aided programming.	4	10
10.	NC organisation	5	-
11.	Recent Advances in CNC machines.	2	-
12.	Economics of CNC machine tools.	5	4
13.	Retrofitting of CNC system on conventional machine tools	3	4
14.	Installation and maintenance of CNC machines.	6	-
15.	Programmable logic controllers (PLC)	6	4
		64	64

10/7/97
(Sharad Saxena)

10.7.97
(B. K. Saxena)

10.7.97
(R. M. Khan)

32/241

ADVANCED DIPLOMA IN MANUFACTURING ENGG.
SEVENTH SEMESTER
CNC THECHNOLOGY

Theory per week : 4 Hrs

Practical per week : 4 Hrs

COURSE CONTENT

1. **Basics of Numerical Control**

Intruduction ,Convertional machine tool and their limitation, special purpose machines, Need for CNC machines, History of the origin of NC/CNC machines, Definition of NC,CNC and DNC ,difference between NC/CNC and DNC ,Advantages and disadvantages, comparison to CNC & converntional machines, industrial.

2. **Construction features of CNC machine tools**

Unsuitability of conventional machine, Constructional features,structural configuration,slide ways, Ball screus, vee and flat roller,linear ball bushings, Rotax, Tychoway,Dexter ball slide. Hydrostatic slideways,Spindle drives: DC drives and AC drives, spindle mounting, Feed drives:DC servo motor frequency drive, linear motors & stepper motors, Automatic Tool Clamping and work clamping, Tool magazines and Ayutomatic Tool Changesrs (ACT) -Drum ,chain and Egg. box type tool selection from a magazine,tool identification, location of tool magazine, Automatic work changers (AWC),Dual pollet changers, multiple pallet pool & types,Special features:

3. **CNC Controllers**

Tybes of CNC controllers, clontrolling of machines in spindle .Machine tool control: Control of spindle speed, control of slied movement and velocity control of slide position, controlers MCU. down loading of Program to CNC ,Axis calib:tion, Reversal error compensation, Machine Set up Data : Memory features Programme, features, Diagnostic features , Advance features, CNC System elements: Control Panel -display unit keyboard, status, indicators, control circuits, control circuits, Tape Reader, Power supplier,Logic elements and memory devices(Just revision of what has been taught in digital electronics)Actual study of control system of major international manufacturers of CNC Systems.

Advanced Diploma in MANUFACTURING ENGG.

SEVENTH Semester

32/242

CNC TECHNOLOGY

Theory per week : 4 Hrs. Practical per week : 4 Hrs.

COURSE CONTENT

1. **Basics of Numerical Control**

Introduction, Conventional machine tools and their limitations, special purpose machines, Automats, transfer lines and their limitation, Need for CNC machines, History of the origin of NC/CNC machines, Definition of NC, CNC and DNC difference between NC/CNC and DNC, Advantages and disadvantages, comparison to CNC & conventional machines, industrial application of CNC machines, Classification of CNC machines.

2. **Constructional features of CNC machine tools**

Design of CNC machine tool, unsuitability of conventional desigr, Constructional features, structural configuration, slide ways, Recalculating Ball screws, vee and flat roller, linear ball bushings, Rotax 'Tychoway', Dexter ball slide, Hydrostatic slideways., Spindle drives : DC motor with silicon controlled rectifier, AC motor with variable frequency drive, Bearing used for spindle mountings, Feed drives : DC servo motor with silicon controlled rectifier, Brushless DC servo motor, AC motor with variable frequency drive, linear motors, stepper motors, Automatic Tool Clamping and work clamping, Tool magazines and Automatic Tool Changers (ATC) - Drum, chain and Egg box type tool selection from a magazine, tool identification, location of tool magazine, Automatic work changers (AWC), Dual pallet changers, multiple pallet pool type, Special features: Lubrication system, coolant system, chip handling of CNC machines.

3. **CNC Machine Tool Measuring System**

Introduction, Axis measuring system, Direct and Indirect measuring system, Absolute and incremental measuring system, Inductive path measuring system elements, Resolvers, Rotary and Linear Induction, Photo electric system, Encoders, Tachometer, Digital to Analogue convater.

4. **CNC Machine Control**

Open and close loop control, Problems in control : Repeatability, Instability, Response, Damping, Machine Control Unit (MCU) : Function and Block diagram, Machine tool control : Control of spindle speed, control of slide movement and velocity control of slide position, Control system features : Technology of system, micro computer based, single micro-processor based, multi micro processor

10-7-97 (B.K. Saxena)

10-7-97 (R.M. Khan)

10-7-97 (Bhanuprasad Vaddin)

4. **Axis Designation and Programming Geometry:**
ISO Standards,Axis identification, objective of Designation, Block diagrams of different CNC machines with axis identified, Co-ordinate system with 2 axes,2 1/2 and 3 axes machine co-ordinate system, Detailed drawing for CNC ,NC related dimensioning-Absolute and incremental dimensioning, choice of wokpiece zero point,Reference points-machine zero point,tool reference points, machine traverse and interpolation, linear and circular interpolation.

5. **CNC Machining & Tooling**
Selection & Tools ,tool magsine ,tool loading & planning ,Cutting tool materials,Hard metal insert and non-nsert filling, chip breakers, Qualified and preset tooling, Machining forces for drilling, turning and milling, cutting speed s/spindle speed, calculation and feed rate calculations Hores power ,Torque surface roughness, Acceleration and deacceluation distance for thread turning Trailing Ener and precision stop,Tool life calculation Work holding and setting,workholding,Pr-inciple of location,Principle of clamping, Woprkholding devices, Setting of CNC machine tool.

6. **Manual Part Programming**

Part program, flow chart Address format-word adolress, fixed, sequential and tab sequential format, Basic Machine codes-Prepatory function, Miscellaneous functions, Dimensional word Tool function, Feed rate word, spindle speed word ,EOB,Tape coding of these function, Arc-centre offset, Decimal point programming, programming examples on CNC milling machine, CNC -turining centre, Cutter centre line programming, Tool off-sets for tool length compensation, cutter dimmeter compensation, position of a fixture of part, multiple part machining tool radius compensation.

based, Executive program, Data input/ output, other features, Axis calibration, Reversal error compensation, Machine Set up Data : Memory features, Programme features, PLC features, Diagnostic features, Advance features, CNC System elements : Control Panel-Display unit, keyboard, status, indicators, control circuits, Control circuits, Tape Reader, Power supplier, Logic elements and memory devices (Just revision of what has been taught in digital electronics) Actual study of control system of major international manufacturers of CNC systems.

5. Electronic Data Processing

Introduction, its advantages, Data, Data processing cycle, Binary codes, types of storage, media - sequential, random, alphanumeric characters, ISO & EIA codes punched tape, parity and parity checking, Principle of mechanical punched tape reader, magnetic tape, Magnetic Disk, Magnetic Drum and their advantages and disadvantages, Floppy disket, structure of EDP Data transmission, RS232 interface Comparison of main CNC system on the basis of EDP.

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Tooling for CNC, Cutting tool materials, Hard metal insert and non insert filling, Chip breakers, Qualified and pre-set tooling, Machining forces for drilling, turning and milling, Cutting speed/spindle speed, calculation and feed rate calculations Horse power, Torque surface roughness, Acceleration and deceleration distance for thread turning, Trailing Ener and precision stop, Tool life calculation, Work holding and setting, Workholding, Principle of location, Principle of clamping, Workholding devices, Setting of CNC machine tool.

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10.7.97 (Chairman (Addl.))

10.7.97 (R.M. Khan)

10.7.97 (B.K Sareen)

Thread radius compensation, Thread cutting, canned cycles, subroutines, parametric subroutines, safety zones, users macros. Proving of part program : verification, visual inspection, single step execution, Dry run, Graphical simulation. Pen slot, FMST - off Manual Data Input (MDI) digitising.

9. **Computer Aided Programming**

Introduction, Post Processors, Programming, languages, APT programming, APT-commands, other important computer aided programming.

10. **NC Organisation**

Programming procedures. programming in planning deptt., programming in workshop, Structure of CNC organisation, Programming data, workpiece drawing operation sequencing, cutting data tables for programming and operating handbook tool card index, work holding equipment, card index, programming schedule, set-up schedule.

11. **Recent advances in CNC machines**

In process gauging, diagnostic programmes, Adaptive controls, Need block diagram, Tool wear sensing, Brokers tool detection, conversational programming.

12. **Economics of CNC machine tools**

CNC versus conventional machining, Profitable applications of CNC, Adopting CNC, Drawbacks of CNC, Calculation of cost per piece elements of cost, Economic batch quantity, Use of CNC in special cases, Case studies on justification of CNC machines.

13. **Retrofitting of CNC system on conventional machine tools**

Judging suitability of conventional machine tools cost considerations, Retrofitting procedures.

14. **Installation and Maintenance of CNC machines**

Installation of CNC machines - Introduction, pre-planning, installation, location, Foundation, installation equipment, proving of machine, Maintenance of CNC machines: Introduction, Need for maintenance, preventive measures. Replacement parts inventory, the level of maintenance operations, fundamentals of NC maintenance, CNC self diagnostic, Trouble shooting, documentation of maintenance programmes.

15. **Programmable logic controllers (PLC)**

Definition, PLC versus PC, Elements of a PLC, Operation of PLC, Programming and documentation, Applications Reason for using PLCs, Economics of PLCs.

LIST OF EXPERIMENT

1. Study of ma... ...nstructional features of CNC machines.
2. Study of feed and spindle driver.
3. Study of tool measuring system.
4. Study of CNC machine control features of different manufactures.
5. De.ignation of CNC machine axes of drilling, milling, shaper, grinder, lathe, planner, machining centre, drafting machines with block diagrams and working envelope of different machines with different reference points.
6. Setting up procedures for CNC machines and pre-set tooling.
7. Preparation of simple part-programs and actual machining of components on CNC milling machine/machining centre.
8. Preparation of part-programmes with different tool-off set compensation and actual machining of components on CNC milling/machining centre.
9. Preparation of part-program with cauned cycles and subroutines and there on actual machining on CNC willing/machining centre.
10. Preparation of part-program on CNC lathe with roughing cycle and actual machining of component.
11. Preparation of part-programme f... thread cutting on CNC lath. and actual machining of component.
12. Preparation of part programme for different contours and taper turning on CNC lathe and there on actual machini..
13. Preparation of user Macros and then utility for some components.
14. Proving of Part programmes on CNC milling/CNC machining centre.
15. Prooving of part programmes on CNC lathe machine.
16. Computer Aided programming of the practicals from S.No. 7 to 14 in more than are popular programming language such as AP II, Compact II etc.
17. Study of CNC co-ordinate measuring machine.
18. A case study on selection of job for CNC machine.
19. Study and preparation of maintenance system for CNC machine.
20. Programming and integration of PLCs.

10.7.97 (Chairman (Uddin)) — 10.7.97 (R.M. Khan) — 10.7.97 (B.K. Saxena)

REFERENCES

1. Numerical Control and Computer Aided manufacturing by Kundra Rao & Tiwari; Tata McGraw Hill, New Delhi.

2. CNC Technology and Programming by Krar; McGraw Hills Book Co.

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10-7-97
(Shamim Uddin)

10.7.97
(R.M.Khan)

10.7.97
(B.K.Saxena)

MAINTENANCE ENGINEERING

(MAINTENANCE AND SAFETY)

6th Sem.

32/248

-243-

WORKING GROUPS

MAINTENANCE AND SAFETY

1. Prof. Dr. A.D.Telang, MACT, Bhopal.
2. Mr. Raj Mohan, HDME, S.V.Govt. Polytechnic, Bhopal.
3. Mr. B.K.Saxena, Sr.Lect., S.V.Govt. Polytechnic, Bhopal.
4. Mr. R.M. Khan, Sr. Lect., S.V.Govt. Polytechnic, Bhopal.
5. Mr. V.K. Jain, W/S Supdt., S.V.Govt. Polytechnic, Bhopal.
6. Mr. S.G.Deo, Expert Teacher, PDU, Bhopal.
7. Mr. K.C.Verma, Course Co-ordinator, PDU, Bhopal.

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(46)

MAINTENANCE AND SAFETY

RATIONALE

Job of maintenance is similar to that of a physician which has a vital effect on productivity of the industry as a whole. The curricula provides the basics of maintenance and general practices in the industry.

A knowledgeable production engineer appreciates the importance of maintenance in planning and scheduling production by collecting and using the information (e.g. keeping downtime to a minimum and its estimate) to meet the production targets.

Safety practices are equally important.

Any amount of lectures will not help to develop the skill to diagnose the maintenance problem, thus the subject must be profusely supported by demonstrations and laboratory work.

MAINTENANCE AND SAFETY

CONTENTS

		THEORY 84	PRACTICAL 56
SNO.	NAME OF CONTENTS	TOTAL	THEORY+PRACT.
1.	Introduction to Plant Maintenance -	12	(8+4)
2.	Fundamentals of Basic Maintenance - Practices	24	(12+12)
3.	Organizational Structure of Maintenance- Department and Organizing the Maintenance Function.	12	(10+2)
4.	Wear and its Effects. -	16	(8+8)
5.	Maintenance Cost. -	8	(6+2)
6.	Maintainability -	8	(6+2)
7.	Fault Tracing, Trouble shooting and Remedies. -	16	(6+10)
8.	Lubrication -	20	(12+8)
9.	Safety Engineering -	12	(8+4)
	Total hrs.-	140	

-216-

32/251

NAME OF SUBJECT - MAINTENANCE AND SAFETY

SNo.	TOPICS/SUB-TOPICS	INTENDED LEARNING OBJECTIVES (I.L.O.)	TREATMENT/REMARKS
1	2	3	4
1.	INTRODUCTION TO PLANT MAINTENANCE		
1.1.	Introduction to Maintenance, its need and economic significance, effects on productivity, energy conservation, man-machine relationship, increased life of machines, equipments and their enhanced availability.	* Understand the significance of maintenance function in an industry. - Explain the need and importance of maintenance function in terms of increased productivity, and quality of product produced. - etc.	
1.2.	Scope and Functions of Maintenance.	* Know about the Scope and functions of maintenance.	
1.2.1.	scope of maintenance function depends on plant Size, Type, company policy etc. - Encompasses the maintenance, construction, utilities generation and distribution and miscellaneous servicing phase of plant operations.	- State the factors on which the scope of maintenance function depends. - State the activities area considered in maintenance.	
1.2.2.	Classification of functions (a) Primary function such as : - Maintenance of existing plant Equipment. - Maintenance of existing plant Buildings. - Equipment inspection and lubrication. - Utilities generation and distribution - Alteration to existing equipment and buildings.	* Classify the maintenance functions. - State the Primary and Secondary functions. - etc.	

-247- 32/252

- New installation of equipments and buildings.
- etc.

(b) Secondary functions such as :

- Store Keeping
- Plant protection
- Waste disposal
- Salvage
- Insurance administration
- Other services including janitorial service, property accounting, Pollution and noise control etc.

1.3. Responsibilities of Maintenance inquiring department, to include, e.g. :

- Engineering and execution of planned maintenance, repairs, minor installations, and replacements.
- Generation and distribution of power other utilities.
- Administration and supervision of craft groups.
- Technical consultation on Mechanical problems with production supervision.
- Providing adequate plant fire protection.
- Establishing and maintaining adequate property and accounting records covering plant, equipment and property.
- etc.

* Understand the responsibilities of maintenance department.

- Explain the responsibilities of maintenance department.
- etc.

1.4. General nature of maintenance problems in industries in reference to :

- Machines and equipments.

* Know about the general nature of problems in industries.

- State the different types of problems normally met in field.

* Give suitable examples.

- Methods and procedures for maintenance of reciprocating parts. - Reasons for more maintenance requirements in reciprocating parts as compared to rotating parts.	* Explain the methods and procedures for maintenance of reciprocating parts. * Give reasons for more maintenance requirements in reciprocating parts. * etc.
1.6.4. Maintenance of fixed joints. - Definition - Maintenance problem of; - Threaded - Keyed - splined - etc.	* Understand the methods of maintenance of fixed joints. * Define the term fixed joint. * Give the types of wear occurring in threaded, keyed, splined joints and the methods of restoration.
1.7. Pipe Joints. - Methods of joining. - Leak proofing. - Reclaiming of leaking pipes.	* Understand the maintenance methods of pipe joints. - Give the methods of joining of pipes. - Give the methods of making a pipe joint leak proof. - Explain the methods of reclaiming of leaking pipe joint. - etc.

2. FUNDAMENTALS OF BASIC MAINTENANCE PRACTICES.

2.1. Different Maintenance practices such as : - Normal or routine maintenance. - Corrective maintenance. - Scheduled maintenance. - Predictive maintenance. - Design-out-maintenance. - Break down maintenance. - Servicing. - Preventive maintenance. - Overhauling/Re-conditioning.	* Understand the different maintenance practices in vogue in industries. - List the different maintenance practices as used in practice. - Explain the principles for the different types of maintenance practices. - Describe the procedures of the different maintenance practices. - etc. * Understands the significance of equipment repairs history [illegible]

- Inter departmental co-ordination problems.	- State the inter- departmental co-ordination problems. - etc.	
1.5. Development trends in maintenance. - Application of computers in maintenance. - Advantages of a computerized system such as :- - Standardization - Development of a data base - Analytical capabilities - Historical data - etc.	* Understand the importance of computerization and concepts of CPM and PERT as applied to maintenance activities. - Explain the increasing role of computers in maintenance activities. - Enumerates the advantages of computerization.	
- Application of C.P.M. and P.E.R.T. in maintenance activities.	- Illustrate the application of the concepts of CPM and PERT in maintenance field.	
1.6. General nature of Maintenance problems.	* Understand the general nature of maintenance problems occurring in industry.	
1.6.1. Introduction.		
1.6.2. Maintenance of rotating parts such as : Shafts,Spindles, Bearings, Couplings,Clutches, Gear wheel, Worm wheel, Pulleys etc. Possible defects normally occurring and repair.	* State the different types of maintenance problems faced in industry. * Enumerate the different rotating components. * Explain the different types of defects occurring in rotating components and reasons. * Describe the procedure for repair of these defects.	- Provide information about the functions of the different rotating components. - Display the components with defects.
1.6.3. Maintenance of reciprocating parts such as : - Machine tool bed ways of different machine tools, Piston and cylinder, reciprocating pump, compressors etc. - Possible defects their reasons and repair undertaken.	* Enumerate the different types of reciprocating components. * Explain the different types of defects occurring in the reciprocating components and reasons.	- Display the defective reciprocating components.

32/255 -249-

2.6. Principles and procedure for Preventive maintenance(P.M.) - Definition. - Significance and advantages. - Criteria of P.M., cost and criticality. - Cost of P.M. to include downtime and repairs/ replacements. - Inspection. - What to inspect ? - Process equipments. - Safety equipments. - Utility equipments. - Tanks and auxiliary equipments, gauges and instruments. - Plant buildings including transportation equipments. - Fire protection equipments.	* Understand the concepts of P.M. and procedure adopted. * Give definition of P.M. * Explain the significance of P.M. * State the advantages of P.M. * State the criteria of P.M. * Define criticality in relation of machines and equipments. * Explain the cost factors of P.M. * State the various equipments to be inspected from P.M. point of view in an industry.	* Illustrations can be given of various equipments where P.M can be applied such as : - Process equipments- Furnaces, Heat exchanges, piping,pumps, motors, instruments etc. - Safety equipments- Vacuum and pressure relief valves, flame arresters, emergency relief equipments. - Utility equipments- Main boilers, electric generators, Supply and distribution system for water steam and compressed air pipe lines etc.
- What not to inspect ? - Non-critical equipments - Where stand by units are available. - Cost of P.M. exceeds down time and cost of repair or replacement.	* State the equipments which need not to be inspected for P.M.	
- What to inspect for ? - Check list	* State the purpose of check list.	

32/256

- etc.	maintenance function) for different equipments and the methods followed.	
2.2. Equipment- repairs history (records keeping) and history analysis. - Significance and methods.	* Explain the importance of equipment- repairs history and history analysis. - Explain the methods employed for records keeping. - etc.	
2.3. Condition monitoring of equipments through : - Oil/Wear particle analysis. - Vibration - Noise - Temperature - Data obtained from instrumentation on line/Off line (Signatures) - etc.	* Understands the condition monitoring of the machines/ equipments. - Explain the sources for monitoring the condition of equipments. - etc.	
2.4. Sequence of activities in Break Down maintenance such as : - Location of fault. - Prepare to disassemble. - Disassemble components. - Clean components. - Inspect and measure amount. and nature of wear. - Decide reusability. - Fit-in/ repair/ replace. - Lubricate components, - Prepare to assemble, make assembly .	* Know about the sequence of activities of Break Down maintenance. - Describe the steps to be followed in case of a break down maintenance.	- Display the method adopted for break down maintenance by creating a simulated situation in practical class.
2.5. Servicing and overhauling - concept and procedure.	* Understand the concept and procedure of servicing and overhauling of machines & equipments. - Explain the concept of servicing and overhauling. - Describe the servicing and overhauling procedure normally adopted.	

- Inspection reports - Significance, - Information content.	* State the significance of inspection reports. * State the information content to be contained in inspection reports.	* Proformas used for inspection report to be displayed.
* Factors to improve effectiveness of inspection Methods such as : - Planning of step-by-step procedure. - Application of concepts of industrial engg. such as Time and Method studies. - Provision of better tools and instruments. - Redesign of equipment. - etc.	* State the factors which can be applied to improve effectiveness of inspection method.	
* Aids to good P.M. to include : - Materials research to make use of better materials. - Design changes. - Maintenance training of maintenance personnels. - Equipment study. - Standard practice manuals. - Standardization of tools, methods, process standards, materials etc. - Protective methods- Surface coatings etc. - Well organized maintenance store room. - Record analysis. - Avoid over maintenance. - Get accurate costs. - Check inspection frequencies. - Use modern diagnostic tools (Stethoscope, Vibration analyzer, non-destructive tests etc.) - Apply Industrial Engg.concepts. - Utilize statistical aids.	* Explain the significance of different contributing factors for a good P.M. programme.	

32/260

- Design for low-cost maintenance. - etc. * Group replacement concept.	* Understand the concept of group replacement. - Explain the concept of group replacement with suitable example.	
3. ORGANIZATIONAL STRUCTURE OF MAINTENANCE DEPARTMENT AND ORGANIZING THE MAINTENANCE FUNCTION.		Refer Maintenance Hand Book by Lindly R. higgins.
3.1. Factors to be considered for maintenance operation.	* Understand the factors to be considered for maintenance operation. - Explains the factors to be considered for maintenance operation.	- Lowest manufacturing cost per unit produced. - Minimum Scrap or off-standard material during maintenance. - Minimum downtime for maintenance (Critical equipment). - Minimum maintenance cost (Non-critical equipment) - Separation of functions- - Administrative - Engineering support
3.2. Basic concepts of good organization (Correlate with and recall from the subject of production Management)	* Understand the basic concepts of good organization. - Define the term organization. - State the basic concepts of good organization.	- Basic concepts of good organization 1. Establish reasonably clear division of authority with little or no over lap. 2. Keep vertical lines of authority and responsibility as short as possible. 3. Maintain optimum

number of people (three to six in most of the cases) reporting to one individual.
-etc.

local problems affecting maintenance organization:
- Type of operation
- Continuity of operation.
- Geographical situation.
- size of plant.
- Scope of plant maintenance department.
- Reliability of work force.
- etc.

3.2.1. Organization chart of maintenance Department for large and small industries.

- Show the organization chart for maintenance department.

3.2.2. Controls in Maintenance department by using suitable planning and scheduling.
- Definition.
- Advantages.
- Procedure.

* Understand the importance of proper planning and scheduling of the maintenance activity.
- Define the planning and scheduling.
- State the advantages.
- Explain the procedure.

planning & Scheduling
- Collect data necessary for making a maintenance schedule.
- Estimate maintenance time with consideration for various time allowances and delays.
- Take cognizance of backlog.
- Decide urgency of work normal, urgent

- How often to inspect ?
  (Frequency)
  - Factors to be considered such as :
    - Engineering analysis based on age, condition and value of equipment.
    - Severity of service.
    - Hours of operations.
    - Susceptibility to wear, damage and losing adjustment.
    - Other sources- Manufactures recommendations, service record analysis, Quality control charts.

  * Explain the different deciding factors for frequency of inspection.

  - Statistical check to decide for P.M.
    - Over, under or right amount of maintenance.

  * Explain the economic significance of statistical checks to decide the amount of maintenance done on an equipment.

  - When to inspect (Schedules) ? such as to undertake;
    - Routine upkeeps
    - Periodic inspection
    - Contingent work.

  * State the situations for undertaking P.M.

  - Types of schedules for P.M. to include :
    - Overall charts for all machines and equipments.
    - Individual cards for each machine/ equipment.
    - Master schedule
    - Detailed scheduling.

  * State the types of schedules prepared for P.M. programmes.

* Job scheduling for P.M. items to include :
  A definite day, method, tools, equipments, level of skill and time required.

  * Explain the items to be considered for scheduling of job under P.M.

- Size of P.M. work force and local conditions.

  * State that the size of P.M. work-force depends on local conditions.

		as to or emergency. - Prepare master schedule. - job assignment ticket. - weekly plan and manpower schedule. - etc.
3.3. Maintenance records. 3.3.1.Reference cards for machine and equipments. - Purpose.	* Understand the significance of the various records pertaining to maintenance function. - State the purpose of reference cards for machines and equipments. - etc.	
3.3.2. Maintenance records. - Machine certificate - Machine reference cards - Maintenance log book - Lubrication plans for machines - Histograms.	* Understand the importance of Maintenance records keeping. * Explain different type of maintenance records and its significance. * Illustrate the use of Histograms.	
3.3.3.Lubrication plans, Log books.	- State the purpose of lubrication plans. - State the purpose of log book.	
3.3.4. Maintenance Catalogues(manuals) - Definition. - Purpose. - Types. - advantages and Disadvantages.	* Understand the importance of maintenance manuals.	- Maintenance manual A Maintenance manual outlines the policies, organization and management, concepts, procedures, standard methods, for maintenance repair of plant facilities and equipments. Types :- -Instructional manual,

32/263

-258-

-Procedural manual
-Policy manual
-Technical manual
-organizational manual
-etc.

Advantages :-
-Elimination of duplication of effort.
-Elimination of overlapping organizational responsibilities.
-establishment of a control mechanism.
-Ready reference for the guidance.
-etc.

Disadvantages :-
-Rigid adherence results in reduced efforts for innovation.
-Continued revision is a must. for the manual to be effective.

3.4. Work simplification in maintenance
- (Recall from the method study part of industrial engg. and correlate)
- Definition
- Approach and procedure

* Understand the significance and procedures of work simplification as applied to maintenance function.
- Define the term work simplification.
- Explain the approach and procedure.

- Procedure:-
1) . Select the task look' for
- bottlenecks,
- Time consuming operations,
- Chasing around,
- Waste.
- Observing the present way
- Exploring opportunities for improvement

		- implementing the new method. 2) Observe the present way of task performance. 3) Challenge everything being done - what, where, when, who, how. 4) Explore opportunities for improvement- - Elimination/ Combination of tasks performed. - evaluate, compare and select the best alternative. 5) Implement the new method.
3.5. Principles of Motion economy (Recall from motion study and correlate) Approach and procedure.	* Understand the significance of Motion economy as applied to maintenance function. - Explain the approach and procedure of affecting motion economy in maintenance field.	-Principles of Motion Economy (Correlate) 1) Physical activities or motions should be productive. 2) Path of all motions involved should be rhythmic and smooth. 3) Motion should be as simple as possible. 4) Worker should be at ease.
3.6. Maintenance stores and inventory control (Refer and Recall the knowledge pertaining to this topic as taught in the subject of Production Management) - Store keeping of consumable and non-consumable materials	* Understand the significance of proper methods followed in maintenance stores keeping inventory control. * State the items normally stored in maintenance stores. * Define inventory. * Explain the significance of inventory control.	

32/269

-259-

and spare parts. - Inventory and inventory control - Methods of storing different classes of materials. - Centralized and decentralized stores and associated advantages with each.	* Explain the methods of storing different classes of materials. * List the advantages of centralized and decentralized stores.

32/265

4. WEAR AND ITS EFFECTS.

4.1.- Definition. - Causes of wear. - Types of wear with examples. - Effects of wear on performance.	* Understand the phenomena of Wear and Measurement methods. - Define Wear. - Give the Causes of Wear. - Give the types of Wear with examples. - Explain the effects of Wear on performance.
4.2.- Methods of measurement of wear on : - Flat surfaces - Cylindrical surfaces - Gear.	* Explain the methods of Wear measurements on different types of surfaces.
4.3. Significance of concept of permissible Wear and amount of permissible wear on different surfaces such as Guide ways, Shafts in different type of bearings, gears, etc.	* Give the significance of concept of permissible wear. - Give the amount of permissible wear on different surfaces.
4.4. Factors upon which permissible Wear depends.	* Explain the factors on which permissible wear depends.
4.5. Wear reduction factors.	* Explain the factors on which control of Wear depends.
4.6. Component replacements	* Explain the deciding factors to repair/

- Deciding factors.	replace the worm out parts.	
4.7. Vibrations. - Types Mechanical and Electrical. - Ill effects of Mechanical Vibration. - Methods of determination of presence of Vibration. - Causes of Mechanical Vibration. - Vibration meter analyzer.	* Understand the phenomena and effects vibration. * Give the types of vibration. * Give the ill effects of Mechanical vibration. * Explain the methods of determination of vibration . * Explain the Causes of Mechanical vibration. * Describe the working of vibration meter analyzer.	
5. MAINTENANCE COST.		
5.1. Maintenance cost estimate.	* Understand the concepts related with estimation of maintenance cost. - Define the cost estimate for maintenance.	
5.1.1.- Definition.		
5.1.2.- Maintenance job classification. i.e. planned, repetitive and emergency services.	- Classify the maintenance job .	
5.1.3.- Maintenance cost components to include labour, material and & overheads costs.	- State the cost components.	
5.1.4.- Estimation of maintenance labour cost methods. - analysis(resolving into elements) - Judgment based on personal experience. - Slotting (job classified within a cost or time bracket and compared with common jobs for which actual cost is known termed " bench marks")	* Explain the different methods applied for estimation of labour costs.	- Slotting is based on the classification of job within a cost or time bracket using judgment and compared with"bench marks" common jobs for which actual cost is known. - Spreadsheets- similar to slotting but"bench marks" are based on

32/268

-261-

32/262

5.1.5. Estimation methods of material cost. (a) For repetitive jobs with the help of Past records of machine repair. (b) For non-repetitive jobs by comparing with similar jobs. (c) Establish ratios based on labour estimates.		
5.1.6.Overhead cost.	* Define overhead cost. * Give the procedure for finding overhead cost.	* Procedure : Dividing the total overhead cost for a given period by the total maintenance labour hours charged to specific jobs and establishing an overhead rate per maintenance direct labour hour.
	* Given necessary data prepare an estimate for the maintenance of a job.	
5.2. Maintenance cost control -Significance, control indices.	* Understand the significance of maintenance cost control.	
5.2.1. Productivity index. - Definition. - Factors affecting maintenance Productivity index.	- Explain the significance of effecting control on maintenance cost. - State the use of control indices. - Define the term Productivity index. - Explain the various factors affecting Maintenance Productivity index.	
5.3. * Maintenance Budget.	* Explain the importance of Maintenance budget.	
6. MAINTAINABILITY .	* Understand the concepts related with maintainability and their significance.	

32/269

- Definition of Maintainability.
- Object of maintainability.
- Cost effectiveness - definition and significance.

- Variables of cost effectiveness to include system effectiveness, acquisition cost and utilization cost.
- Factors related with maintainability such as :
  - Mean time between maintenance (MTBM),
    Mean time between replacement (MTBR),
    Mean time between failure(MTBF),
    Maintenance down time, Mean time to repair(MTTR),
    Maintenance indices (to include maintenance man-hours/equipment operating hour(MMH/OH)
    Maintenance man minutes -MMM/OM and maintenance cost per operating hour -Cost/OH).
    Logistic time or Supply time,
    Wait or Administrative time,
    - Definition and significance of all these factors.
  - Availability factors to include inherent availability, availability (achieved), operational availability,
    - Definition and significance, and related mathematical expressions concerning maintainability.
    * Reliability indices for equipment.
      - Definition and application.
    * Reliability index number.
      - Definition and significance.

* Define the term maintainability.
* State the object of maintainability.
* Explain the variables involved in cost effectiveness.
* Define cost effectiveness.
* List the various factors on which maintainability depends.
* Explain the factors related with maintainability.

* Explain the various availability factors.

* Give the various mathematical expressions concerning maintaibility.

- Define the terms reliability indices and reliability index number.

- Give the significance of these terms.

* Factors on which reliability index number depends.	- Explain the factors on which reliability index number depends.	
* Replacement Economics. - Age of equipment, and significance of life-expectancy curve (bath-tub curve- drawn between failure rate vs. life of equipment) - Significance of total cost curve comprising of operating cost and Capital cost of equipment drawn between annual cost vs. age of equipment.	* Understand the concepts related with replacement economics. - Explain the concepts involved with replacement economics. - Explain the life expectancy curve and total cost curve and their importance.	
* Kelvin's graph. - Purpose and description.	* Understand the Kelvin's graph and its significance. - State the purpose of Kelvin's graph. - Explain the Kelvin's graph and its significance.	
* Optimum volume of maintenance.	* Understand the concepts of Optimum volume of maintenance. - Explain the concepts and its implications.	

7. FAULT TRACING, TROUBLE SHOOTING AND REMEDIES.

7.1. Definition and purpose.	* Understand the concepts about Fault tracing. * Define the term fault tracing, trouble shooting. * State the purpose.	- The concepts of drawing a decision tree and also developing a logical structure be explained.
7.2. Sequence of activities in fault finding - drawing of a Decision tree and logical structure. - Methods and procedures of repair.	* Give the logical sequence of activities in fault tracing by developing a decision tree and logical structure. * Describe the methods and procedures of repair. * Given a situation applies the concept to locate the fault and take remedial action and also measures to prevent the	- The decision tree in provide a logical sequence for proceeding to trace the fault from the easy to difficult stages. -The logical structure

32/270

7.3. Measures to prevent repetition of similar faults.	repetition of similar faults.	method is based on cause and effect relationship. - Suitable examples be taken for developing a decision tree and logical structure.
8. LUBRICATION.		
8.1. Functions of Lubrication. Primary - Reduce friction and wear. Secondary - Cooling and prevention of corrosion.	* Understand the concepts and significance of lubrication. * Sate the function of lubrication.	- Refer Book lubrication A Practical Guide to Lubricant Selection by A.R. Lansdown Publisher : Pergamon press U.K.
8.2. Principle of liquid lubrication relationship of thickness of film, shaft speed, viscosity, load and friction.	* Explain the Principle of lubrication. * Correlate the thickness of film with shaft speed, Viscosity, Load and friction.	- Example of plain journal bearing can be taken.
8.2.1.Hydrodynamic Lubrication. - Definition. - Relationship with speed.	* Define the Hydrodynamic lubrication. * State the relationship with speed in hydrodynamic lubrication.	
8.2.2.Boundary Lubrication. - Definition. - Function of coating of oxide (alluminium/iron) film on contact surfaces.	* Define boundary lubrication. * Give the function of oxide coating film.	
8.2.3.Externally pressurized (Hydrostatic) lubrication. - Definition. - Purpose.	* Define the term hydrostatic lubrication. * State the purpose.	
8.3. Choice of Lubricants.	- Classify the lubricants. - List different types of oil lubricants.	

32/271

-266-

B.3..1.-Basic types of lubricants to include- - oils - Greases - Dry (solid) lubricants - Gases.	- State the application area of different type of lubricants.	- Lubricants oils includes - circulating oils. (Steam turbine grade, oils, Hydraulic oils, Heavy duty internal combustion engine oils) - Gear oils - Machine or engine oils - Refrigeration grade oils - Spindle oils. * Air is used as a lubricant for Dentists drills.
B.3..2 Additives. - Definition - Purpose. - Types.	- Define the term additives. - Give the purpose of additives. - State the different types of additives.	- Different additives include - - Pour point depressants, - Viscosity index improves, - Antioxidants, - Foam depressants, - Anticorrosion additives, - Extreme pressure the lubricant - Engine cleanliness, - Detergents, - Dispersant.
B.4.-Important properties of lubricants. (Recall of knowledge imparted in earlier semesters in the subject of Applied Chemistry)	- State the important properties of lubricants.	
B.5.-Main factors considered in choosing-	List main factors in the selection	- As speed is

32/272

-267-

include speed and of lubricant.
additives load.
- Relationship of speed and load with type of lubricant.

- Correlate the speed and load with the type of lubricant.

increasing selection of lubricant used in sequence is shifting from grease- oil- deceasing velocity- gas and opposite in the sequence in case of increase in load contact pressure.

8.6.-Oil feed systems to include
- Direct and indirect systems, oil mist or fog systems, wick and pad system, Ring, Disc and Splash systems.

- State the different types of oil feed systems.
- Give the application area of different type of systems.

8.7. Carrying out oil changes.
- Need
- sequence.

- State the necessity of changing of oil.
- State the sequence to be followed in carrying out the oil changes.

- The sequence to be followed for change of oil is ;
- Draining
- Flushing using special flushing oil
- Dismantling the system if needed.
- Cleaning of reservoirs only in case large systems.
- Refilling the system.

8.8. Laundering.
- Definition
- Method.

* Define the term Laundering.
- State the method employed for laundering.

- Laundering is the process of removing the undissolved contaminants from the used oil to make it again fit for use.
- It is done by filtering through screens and high speed centrifuging.

lubricants.

8.8.1. Re-refining. - Definition	- Define the term Re-refining.	- Re-refining is done to remove dissolved contaminants.
8.9. Means provided for lubrication such as : - Hand pressure grease guns - Power guns - Centralized pressure for oil pumping and grease lubrication.	- State the different means employed for lubrication. - Give the situation for the different means adopted in practice.	-Centralized oil pumping systems are employed in paper and steel industries. - Centralized pressure grease lubrication system employed for steel rolling mill machinery and heavy units.
8.10. Timing of lubrication: significance, Methods:- schedules of lubrication,(daily, weekly, Monthly etc.) -Use of charts for lubrication.	- Explain the significance of lubrication timing. - State the purpose of lubrication schedule and charts.	
8.11. Causes of lubrication failures.		- Lubrication failures occurs due to- - Unsuitable grade of oil. - Wrong type of lubrication system. -Contamination by dust, dirt, water or dilution by fuel oils. - Oxidation of lubricating oils at high temperatures(Oxidation inhibitors not used) - Fixed conditions of speed and load are changed by operator. - Internal friction of lubricant

32/275

8.12.- Blotter (blotting-paper) Test. - Purpose. - Procedure.	* Give the purpose of Blotter test. * Describe the Procedure of conducting a blotter test.	higher speeds comes in to play. - Blotter test may be displayed in the practical class. The test is to performed as given below :- If a drop of oil is placed on a sheet of blotting paper or thick filter paper, it will spread slowly giving a more or less circular spot or blot. A new oil without any insoluble additives will give a uniform pale yellow, slightly transparent spot. An oil with solid additives or contaminants will leave them as opaque flecks near the centre of the spot. A degraded oil,or one containing dark contaminants, will give a darker brown spot, or may produce one or more brown or black rings.
8.13. - Lubricant handling and storage. - Procedure adopted for storing. - Safety precautions in storing. - Colour coding. - Date labelling(Shelf life)	* Understand the significance of proper storing procedure to be followed for lubricants. - Describe the procedure for storing the lubricants. - State the precautions to be observed. - State the purpose of colour coding of lubricants. - State the purpose of date labelling.	- Colour coding :- A particular colour is marked on machine, dispensing equipment, drum, rack position. Date labelling:- Sealed drums or cans of oil should be scheduled for use

0.14. Sealing. - Purpose. - Techniques, to include Static seal; semi-static Seal; sealing rotating shafts; Rotary seals; Sealing reciprocating shafts.	* Know the function of sealing. * State the purpose of sealing. * State the techniques used for sealing.	within a maximum of 1 year of purchase and greases within 6 months. This is done to ensure that containers are used in the same sequence as they are bought. Sealing Purposes:- To prevent a fluid from escaping from one place to another. Sealing techniques:- Static sealing :- Surrounding shaft with stationary container, e.g.:- Magnetic stirrer. Semi-static sealing :- used for movement of low amplitude e.g. Flexi sleeve is used for sealing in gear-change lever. Rotary Seals:- Rubber lip- Seal :- They include used to Crankcase sealing reciprocating shaft also termed as dynamic sealing- O-rings, chevron packings, Piston rings etc. * Compression Packings or packed glands, Bearing seals, Mechanical seals, O-rings.

32/276

32/277

-272-

9. SAFETY ENGINEERING.

	* Understand the underlying principles of safety engineering and significance.
9.1. - Safety Principles and practices.	- State the safety principles. - Explain the importance of safety principles being put in practice.
9.2. - Safe layout.	- Explain the significance of safety aspects in plant and machines/equipments layout.
9.3. - Safety aspects of machines/ equipments, to include putting guards, provision of interlocking and vibration damping etc.	* Explain the necessity of taking care of safety aspects in regard to individual machines/ equipments.
9.4. - Safety arrangements during manufacturing processes like welding, Grinding, Machining, Handling of chemical etc.	* Illustrate the steps taken to provide a safe working environment during various manufacturing processes.
9.5. - Regular Plant inspection and safety audit.	* Explain the importance of regular plant inspection from safety point of view. - Explain the terms safety audit and the various factors considered.
9.6. - Hazard analysis.	* State the purpose of hazard analysis.
9.7. - Safety of electrical installations and general electrical safety practices.	* Explain the steps taken in regard to safety aspects for electrical installations and general electrical safety practices.
9.8. - Machine maintenance, Lubrication.	* Explain the safety aspects taken care in machine maintenance & lubrication. - etc.
9.9. - Safety during material handling in shops.	* Explain the methods adopted for safety during material handling in shops. - etc.

9.10.- Safety Management - accidents and their classification (Minor, reportable, fatal, dangerous occurrences)	* Understand the aspects of safety management. - State the meaning of accidents with illustrations. - Classify the accidents.	
9.11.- Salient points of safety regulations for with Mechanical and Electrical Machines/ Equipments and chemical products etc.	* Describe the salient points of safety regulations.	
9.12.- Fire safety measures. - Fire potential areas - Fire fighting measures, equipments, training, requirements, regular drill.	* Understand the significance of Proper safety measures against fire hazards. - State the fire potential areas. - Describe the various fire fighting measures taken.	
9.13.- First aid.	* Describe the various aspects of first aid to be provided for different types of mishaps.	
9.14.- Safe working environment and safety consciousness.	* Explain the various steps taken by management to provide safe working environment in inculcating safety consciousness amongst the workers.	
9.15.- Industrial Housekeeping - Definition - Significance - Factors governing housekeeping to include : 1) Proper layout and equipment 2) Correct material handling and storage. 3) Cleanliness and Orderliness.	* Understand the significance of good industrial housekeeping. - Define industrial housekeeping. - Explain the factors governing housekeeping.	* Refer : Maintenance engineering handbook by Lindley R. Higgins page No.14-37 to 14-59.
9.16.- Basic requirements for good housekeeping. - General organisation - Competent supervision - Adequate manpower	* Explain the basic requirements of good housekeeping. - etc.	

32/278

-273-

- Proper equipment, tools and supplies
- Work schedules
- Assistance from other working groups.
- Housekeeping inspection.

32/279

MAINTENANCE AND SAFETY

LIST OF PRACTICALS

1. Demonstration and operation of protective equipments.

2. Demonstration of operation of Fire Extinguisher equipments.

3. Measurement of Wear on flate surfaces by -

   (a) Microscope and steel string method.
   (b) Optical method
   (c) Hydrostatic method

4. Measurement on Wear on cylindrical surfaces by -
   (a) Vernier Caliper
   (b) Micrometer
   (c) Dial indicator and V block.

5. Measurement of Wear of gears by thickness gauges and gear tooth vernier gauge.

6. Estimation of time in minutes for dismantling and removing piston of pump.

7. Demonstration and operation of grease gun in lubricating various components of any available machine or engine.

8. Study of various tools and gauges used in mechanical maintenance.

9. Visit of large/medium/small/ scale industries for collecting information regarding the safety measures taken during material handling, handling of electrical devices, fire, accidents, processes etc.

10. Visit of large/medium/small/ scale industries for collecting information in respect of (a) Keeping record for condition of equipment maintenance and replacement of parts, if any (b) lubrication plan etc.

MAINTENANCE AND SAFETY

LIST OF SUGGESTED TEXT BOOKS / REFERENCE BOOKS

1. Accident Prevention Manual for Industrial operations by Frank E. McElroy, P.E., C.S.P. Editor in chief National Safety Council, Chicage, U.S.A.

2. Accident Prevention Manual for administration and programmes by Frank E. McElroy, P.E., C.S.P. Editor in chief National Safety Council, Chicage, U.S.A.

3. Commentary on - Factories Act with M.P. - Rupees by Krishanlal Sethi The Lawyers Home, Indore-7 .....Rs. 120/-

4. Industrial accident Prevention
By H.W. Heinrich
MeGraw Hill Book Company, IWC.

5. An Introduction to Safety Engineering and Management
by N.V. Krishnan
CPS Publishers Pvt. Ltd. Culcutta- 700 001.

6. Maintenance of Industrial Equipment by B. Gelberg. G. Poklis.

7. A guide to efficient Maintenance Management By H.V. Mstwatt.

8. Modern Maintenance Management by Miller and Blood.

9. Maintainability-by Benjamin S. Blanshard, E. Edward Lowery.

10. Maintenance Engineering Hand Book by MoRROW.

11. Repair of industrial Equipment by B.G.glberg, G- Peklis.

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

PROGRAMME - ADVANCE DIPLOMA IN MANUFACTURING ENGG.

COURSE - 7.5 : ENVIRONMENTAL ENGINEERING.

SEMESTER - SEVENTH SEMESTER

RATIONALE

Engineers and Scientists from a number of related disciplines have been involved over years in the development of an academic basis for the understanding and management of the environment.

The purpose of keeping the Environment Engineering is to introduce a unique approach to the overall concept of environmental engineering an approach that emphasizes the relationship between the principales observed in natural purication processes and those employed in engineered processes.

9/07/97 Rajeev Gupta

9.7.97 (R.M.Khan)

9/7/97 (Shamim Mohd.)

09/7/97 (B.K. Saxena)

32|283 ~~58~~ -278-

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PROGRAMME - ADVANCE DIPLOMA IN MANUFACTURING ENGG.

COURSE - 7.5 : ENVIRONMENTAL ENGINEERING.

SEMESTER - SEVENTH SEMESTER

SCHEME OF STUDIES

S.No.	Topic	Theory Hrs.	Lab/Pra. Hrs.	Total Hrs.
1.	Introduction.	2	-	2
2.	Air quality, definition, characteristics and perspectives.	5	-	5
3.	Meteorology and natural purification processes	6	-	6
4.	Engineered systems for Air pollution control.	6	-	6
5.	Engineered systems for Resource and energy recovery	5	-	5
6.	Noise pollution and control	5	-	5
7.	Industrial waste	6	-	6
8.	Environment & pollution control laws.	6	-	6
9.	Global warming	1	-	1
10.	Air pollution from thermal power plants etc.	4	-	4
11.	Water contamination in ocean.	2	-	2
		48	-	48

i.e. 3 periods/week.

Note - This course 302 is common to DCTM/DME/DEE programmes based on MPECS.

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BHOPAL.

PROGRAMME - ADVANCE DIPLOMA IN MANUFACTURING ENGG.

COURSE - 7.5 : ENVIRONMENTAL ENGINEERING.
(common to Civil, Mechanical and Elect. programmes based on MBECS Code No.302

SEMESTER - SEVENTH SEMESTER

Topic 1 Introduction

The Environment, the impact of human beings upon the environment, the impact of the Environment upon human beings, Improvement of Environmental quality, the role of the Environmental engineer.

Topic 2 Air quality : Definitions/characteristic and perspectives

Air Pollution -

Historical overview, global implication of Air pollution, Units of measurement, sources of pollutants

Classification of pollutions -

Particulates, hydrocarbons, carbon monoxide, Oxides of sulphur, oxides of nitrogen, photochemical oxidants, Indoor air pollution, Measurements of above pollutants. Air quality management concepts.

METEOROLOGY

Topic 3 Meteorology and natural/purification processes -

Elemental properties of the atmosphere- Scales of motion, heat pressur, wind, moisture, relative humidity. Devices used for the measurement of above properties. Influence of meteorological phenomena on air quality- Iapse iatea and dispersion, pressure system and dispersion, winds and dispersion, moisture and dispersion, modeling.
Effects of air pollution on meterological conditions- Changes on the Macroscale and Microscale, changes on Macroscale.

9/7/97 Rajeev Gupta

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9.7.97 (Shambhu Vaishya)

09.7.97 (B.K.Saxena)

Contd..

Topic 4 Engineered systems for air pollution control -

Atmospheric cleansing processes. Approaches to contaminant control.

Central devices for particulate contaminants - Gravitational settling chambers, centrifugal collectors, wet collectors, fabric filters (baghouse filters) electrostatic precipitators (ESP)

control devices for gaseous contaminants - Addsorption, absorption, condensation, combustion. Automotive emission control.

Topic 5 Engineered systems for resource and energy recovery.

Processing techniques - Mechanical size alternation, Mechanical component separation, Megnetic and Electro-mechanical separation, Drying and Dewatering.
Materials recovery systems- Materials specifications, processing and recovery systems.
Recovery of biological conversion products - Composting (Aerobic conversion), Anaerobic digestation
Recovery of thermal conversion products- combustion of waste materials, incineration with heat recovery, use of refuse- Derived fuels (RDF), Gasification, pyrolysis.
Recovery of energy from conversion products- Energy recovery systems, Efficiency- Factors, Determination of energy output and efficiency.
Materials and energy-- Recovery systems.

Topic 6 Noise pollution and control -

Sources of noise pollution, control of noise pollution, unit of noise measurement, Noise control devices and their working principles, Noise intensity level- allowable limit for different situation, Noise measurement, the problem of noise pollution and legal measures for its control.

Topic 7 Industrial Waste -

Industrial waste treatment- Economics of waste-treatment, Benefits of pollution abatement (primary, secondary and intengible benefits), difficulties in achieving, pollution abatment through industrial waste treatment, theories of waste treatment volume reduction, strength reduction, neutralization and proportioning.

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32/286/131

treatment of specific, industrial waste such as textile, dairy, paper and pulp, and distillery wastes.

Topic 8 Environment & pollution control laws.

Air (prevention and control of pollution) Act.1981 and air (prevention and control of pollution) rules 1982- Short title, extent and commencement, definitions. The environment (protection) act.1986-short title, expent and commencement, definition- measures to protect and improve environment.

Topic 9 Global warming - Reasons, Concepts,

Topic 10. Air pollution from thermal power plants, nuclear power plants, fertilizer and chemical plants, acid rain. Methods of prevention

Topic 11. Water contamination in ocean-reasons, its effects, method of prevention.

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09.7.97 (B.K. Saxena)

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COURSE - 7.5 : ENVIRONMENTAL ENGINEERING.

SEMESTER - SEVENTH SEMESTER

REFERENCE BOOKS

1. Air pollution by Perkins.
2. Liquid waste of industry, theories, practices and treatment by Nelson L Vemerow
3. Management of solid waste in developing countries by Flint off.
4. Environmental Engineering (International Edition) by Peavy, Howard S.
5. Air pollution- its origin and control by- Kenneth work and Warmar. (W.H.O.publication)
6. Industrial waste by Mamit.
7. Thermal Engironment by Burgess H. Jennings.
8. Environment & Pollution Control Laws by Vijay Malik (EBC publishing (PVT) Ltd. Lucknow.
9. Environment protection-problems, policy administration, law edited by Paras Diwan Deep & Deep publications.

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Rajeev Gupta

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(R.M Khan)

9.7.92
(Shamim Uddin)

09.7.97
(B.K. Sapena)

ADVANCED DIPLOMA IN MANUFACTURING ENGINEERING
8 TH SEMESTER

Industrial Training (Duration 16 weeks)

	Component of Assessment	Marks Alloted
A.	In Industry	
	I. Attendange and General discipline	25
	II. Daily diary Maintenance	25
	III. Initiative & Purticipative attitude	50
	IV Assessment of Training by Industrial Supervisor	100
B.	In Institution	
	V. Training report	100
	VI. Seminar	50
	VII. VIVA –voce	50
TOTAL		400