



SCHEME FOR FIFTH SEMESTER-MECHANICAL ENGINEERING (TOOL AND DIE)

Sr. No.	Subject	Study Scheme			EVALUATION SCHEME						Total Marks
					INTERNAL ASSESSMENT		EXTERNAL ASSESMENT (EXAMINATION)				
					Theory	Practical	Written Paper		Practical		
					Max. Marks	Max. Marks	Max. Marks	Hrs.	Max. Marks	Hrs.	
	Industrial Training	-	-	-	-	50	-	-	50	3	100
5.1*	Heat Treatment	2	-	2	25	25	100	3	50	2	200
5.2*	+Plastic Mould-Design and Drawing	2	-	4	-	50	100	3	-	-	150
5.3*	*Employability Skills – I	-	-	2	-	25	-	-	50	3	75
5.4*	*Environment Education	3	-	-	25	-	100	3	-	-	125
5.5*	**CNC Machines and Automation	3	-	2	25	25	100	3	50	3	200
5.6*	**Workshop Technology- III	3	-	-	25	-	100	3	-	-	125
5.7*	**Workshop Practice- III	-	-	4	-	100	-	-	100	3	200
5.8*	Estimating and Costing	3	-	-	25	-	100	-	-	-	125
# Student Centered Activities		-	-	5	-	25	-	-	-	-	25
Total		16	-	24	125	300	600	-	300	-	1325

* Common with other diploma programmes

** Common with diploma in Mechanical Engineering and Production Engineering.

+ The Question paper will consist of 2 parts: Section A and Section B. Section A will contain theory contents to the extent of 50%. Section B will contain design and Drawing to the extent of 50%.

Student Centered Activities will comprise of co-curricular activities like extension lectures, library studies, games, Hobby clubs e.g. photography, painting, singing, seminars, declamation contests, educational field visits, N.C.C.,NSS, Cultural Activities, Civil Defence/Disaster Management activities etc.



SYLLABUS: Polytechnic (T&D)

Department: Mechanical Engineering – 5th Semester

Subject: Heat Treatment (Theory)

Subject Code: 31851

Detailed Contents

Unit No.1 Introduction

Topic No.1: Heat treatment and its applications

Topic No.2: principles of heat treatment such as heating, soaking & quenching

Unit No.2 Iron carbon diagram

Topic No.3: Heating and cooling

Topic No.4: Allotropic forms of iron

Topic No.5: Various phases and there constitutes

Topic No.6: Phase transformation

Topic No.7: Eutectic and eutectoid points of curves

Topic No.8: Classification of iron

Topic No.9: Steel and cast iron group

Topic No.10: Iron carbon diagram

Unit No.3 Heat treatment processes

Topic No.11: Common heat treatment processes for steel such as annealing, normalizing.

Topic No.12: Hardening and tempering.

Topic No.13: Tempering colour and temperatures

Topic No.14: Temperature range of heat treatment processes and rate of cooling.

Unit No.4 Quenching and quenching media.

Topic No.15: Concept of quenching, various quenching media used in heat treatment.

Topic No.16: Applications and suitability of various quenching media.

Unit No.5 Harding of steel

Topic No.17: Concept of chemical hardening such as solid carburising (pack).

Topic No.18: Liquid carburising and gas carburising.

Topic No.19: Advantages and disadvantages of Liquid carburising and gas carburising.

Topic No.20: flame and induction hardening.

Topic No.21: Concept and procedure of performing the operation.

Topic No.22: Nitrating

Unit No.6 TTT Curve (Isothermal transformation)

Topic No.23: Concept of TTT curve in heat treatment

Topic No.24: Transformation of various phases at constant temperature.

Topic No.25: Procedure to describe transformation into various phases of steel with the help of TTT curve.

Topic No.26: TTT Curve.

Unit No.7 Furnaces and Equipment

Topic No.27: Common furnaces used in heat treatment shop.

Topic No.28: Working principles and selection of furnaces for heat treatment operations.

Unit No.8 Defects during heat treatment, and there causes and prevention

Topic No.29: Concept of defects such as decarburising.

Topic No.30: Quenching cracks.

Topic No.31: Excessive hardness.

Topic No.32: Less hardness, soft spots

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
3	-	-	25	-	100	3	-	-	



PM POLYTECHNIC

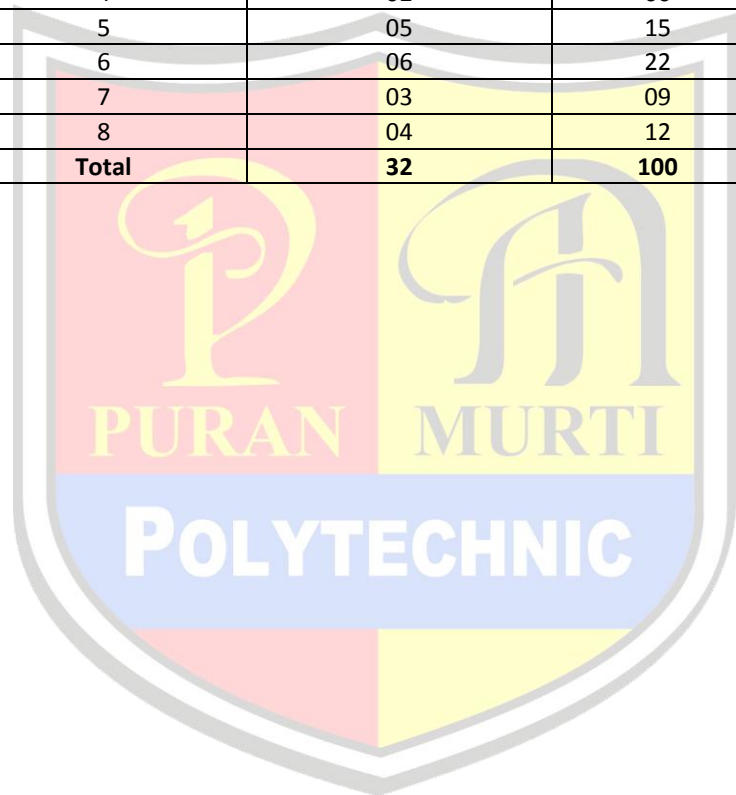
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REFERENCE BOOKS:

1. GBS Narang "Material Science" Khanna Publishers Delhi-6.
2. B.K. Agarwal "Introduction To Engg. Material" Tata Mc Graw Hill, Publishers Co.Ltd. New Delhi.
3. G.K. Narula., K.S. Narula., V.K. Gupta., "Material Science" Tata Mc Graw Hill Publishers Ltd. Co. New Delhi.
4. O.P. Khanna "A text book of Materials and Metallurgy, Dhanpat Rai Publishers Pvt.Ltd. New Delhi

.SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted
1	02	06
2	06	18
3	04	12
4	02	06
5	05	15
6	06	22
7	03	09
8	04	12
Total	32	100





Detailed Contents

Section - A

Unit No.1 Introduction to Moulding Process

- Topic No.1: Injection Moulding
- Topic No.2: Compression Moulding
- Topic No.3: Blow Moulding
- Topic No.4: Transfer Moulding
- Topic No.5: Rotational Moulding
- Topic No.6: Thermoforming

Unit No.2 Moulding Machines

- Topic No.7: Injection Moulding Machine
- Topic No.8: Compression Moulding Machine

Unit No. 3 Injection Moulds

- Topic No.9: Main Parts of Injection Mould and Their Function

Unit No. 4 Compression/Transfer Moulds

- Topic No.10: Main Parts of Compression Moulds and Their Function

Unit No. 5 Material for Mould Parts

- Topic No.11: Materials Used For Various Mould Parts
- Topic No.12: Heat Treatment of Mould Parts

Unit No. 6 Mould Maintenance

- Topic No.13: Maintenance
- Topic No.14: Storage and Safety of Moulds
- Topic No.15: Transportation/Handling

Section - B

- Topic No.16: Making drawings of the relevant topics learned, design and drawing of multi cavity, mould for simple Components, injection and compression.

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment			External Assessment (Examination)			
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks		Hrs
3	-	4	-	50	100	3	-		-

REFERENCE BOOKS:

1. Injection Mould design fundamentals by A.B. Glanvill, E.N. Denton, Industrial Press Inc.
2. Plastic Material handbook Vol. I and II. by A.S. Athalye, Multitech Publishers Co. Mumbai.
3. Injection Moulding by A.S. Athalye, Multitech Publishers Co. Mumbai.
4. Rubber and Plastic technology by Chandra and Mishra, CBS Publishers and Distributor, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted
1	03	09
2	03	09
3	12	40
4	08	24
5	04	12
6	02	06
Total	32	100



PM

POLYTECHNIC

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Subject: Environmental Education (Theory)

Subject Code: 120151

Detailed Contents

Unit No. 1: Introduction

- Topic No.1: Definition
- Topic No.2: Scope
- Topic No.3: Importance of Environmental Education

Unit No. 2:

- Topic No.4: Basics of ecology, Biodiversity
- Topic No.5: Eco system and Sustainable development

Unit No. 3:

- Topic No.6: Sources of pollution - natural and manmade, Causes
- Topic No.7: Effects and control measures of air pollution and their units of measurement
- Topic No.8: Effects and control measures of water pollution and their units of measurement
- Topic No.9: Effects and control measures of noise pollution and their units of measurement
- Topic No.10: Effects and control measures of soil pollution and their units of measurement
- Topic No.11: Effects and control measures of radioactive pollution and their units of measurement
- Topic No.12: Effects and control measures of nuclear pollution and their units of measurement

Unit No. 4:

- Topic No.13: Solid waste management, Causes, Effects
- Topic No.14: Control measures of urban and industrial waste

Unit No. 5:

- Topic No.15: Mining - Causes, effects and control measures
- Topic No.16: Deforestation – Causes, effects and control measures

Unit No. 6:

- Topic No.17: Environmental Legislation - Water (prevention and control of Pollution) Act 1974
- Topic No.18: Air (Prevention and Control of Pollution) Act 1981
- Topic No.19: Environmental Protection Act 1986
- Topic No.20: Role and Function of State Pollution Control Board,
- Topic No.21: Environmental Impact Assessment (EIA)

Unit No. 7:

- Topic No.22: Role of Non-conventional Energy Resources-Solar Energy
- Topic No.23: Wind Energy, Bio Energy, Hydro Energy

Unit No. 8:

- Topic No.24: Current Issues in Environmental Pollution – Global Warming
- Topic No.25: Green House Effect, Depletion of Ozone Layer
- Topic No.26: Recycling of Material, Environmental Ethics
- Topic No.27: Rain Water Harvesting, Maintenance of Groundwater
- Topic No.28: Acid Rain, Carbon Credits

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
3	-	-	25	-	100	3	-	-	125



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RECOMMENDED BOOKS

1. Environmental Engineering and Management by Suresh K Dhameja; SK Kataria and Sons, New Delhi.
2. Environmental Science by Dr. Suresh K Dhameja; SK Kataria and Sons, New Delhi.
3. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
4. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
5. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.
6. Engineering Chemistry by Jain and Jain; Dhanpat Rai and Co. (P) Ltd. Delhi.
7. Environmental Studies by Erach Bharucha; UGC University Press

INSTRUCTIONAL STRATEGY

In addition, different activities pertaining to Environmental Education like expert lectures, seminar and awareness camps etc. may also be organized.

SUGGESTED DISTRIBUTION OF MARKS

Unit No.	Time Allotted for Lectures (Periods)	Marks Allotted (%)
1	02	04
2	03	06
3	12	24
4	06	12
5	04	10
6	10	20
7	04	10
8	07	14
Total	48	100



Detailed Contents

Unit No. 1 Introduction

- Topic No.1: Introduction to NC, CNC & DNC, their advantages, disadvantages and applications;
- Topic No.2: Basic components of CNC machines, Machine Control Unit, input devices,,
- Topic No.3: selection of components to be machined on CNC machines, Axis identification.

Unit No 2: Construction and Tooling

- Topic No.4: Design features, specification of CNC machines, use of sideways, balls, rollers and coatings,
- Topic No.5: motor and lead screw, sward removal, safety and guarding devices
- Topic No.6: various cutting tools for CNC machines, Concept of CNC tool holder
- Topic No.7: different pallet systems and automatic tool changer system, management of a tool room.

Unit No. 3: System Devices

- Topic No.8: Control System; Open Loop and Closed Loop System,
- Topic No.9: Concept of Actuators, Transducers and Sensors,
- Topic No.10: Tachometer, LVDT, opto-interrupters
- Topic No.11: potentiometers for linear and angular position, encoder and decoder and axis drives.

Unit No. 4: Part programming

- Topic No.12: Introduction to Part programming, Basic concepts of part programming, NCwords, part programming for equation of head loss (without proof),
- Topic No.13: simple programming for rational components, part programming using conned cycles,
- Topic No.14: subroutines and do loops, tool off sets, cutter radius compensation and tool wear compensation

Unit No. 5: Problems in cnc machines

- Topic No.15: Common problems in CNC machines related to mechanical, electrical and pneumatic, electronic components
- Topic No.16: Study of common problems and remedies, use of on-time fault finding diagnosis tools in CNC machine.

Unit No. 6: Automation and NC System

- Topic No.17: Concept of automation, emerging trends in automation, automatic assembly
- Topic No.18: Overview of FMS, Group technology, CAD/CAM and CIM.

Unit No 7: Robot technology

- Topic No.19: Introduction to robot technology, basic robot motion and its applications

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment			External Assessment (Examination)			
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
5	-	-	25	-	100	3	-	-	125

RECOMMENDED BOOKS

1. CNC Machines – Programming and Applications by M Adithan and BS Pabla; New Age International (P) Ltd.
2. CNC Machines by M.S. Sehrawat and J.S. Narang; Dhanpat Rai and Co., New Delhi.
3. Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata Mc Graw Hill New Delhi.
4. CNC Machine by Bharaj; Satya Publications, New Delhi.

INSTRUCTIONAL STRATEGY

This is highly practice-based course. Efforts should be made to develop programming skills amongst the students. During practice work, it should be ensured that students get opportunity to individually perform practical tasks



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SUGGESTED DISTRIBUTION OF MARKS

Unit No.	Time Allotted for Lectures (Periods)	Marks Allotted (%)
1	06	12
2	06	12
3	12	26
4	08	18
5	04	08
6	06	12
7	06	12
Total	48	100





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Subject: CNC Machines and Automation_(Practical)

Subject Code: 121755(P)

List of practical

1. Study of constructional detail of CNC lathe.
2. Study of constructional detail of CNC milling machine.
3. Study the constructional details and working of Automatic tool changer and multiple pallets
4. Develop a part programme for following lathe operations and make the job on CNC lathe.
 - Plain turning and facing operation
 - Taper turning operation
 - Circular interpolation
5. Develop a part programme for the following milling operation and make the job on CNC milling
 - Plain milling
 - Slot milling
 - Contouring
 - Pocket milling
6. Preparation of work instructions for machine operator
7. Preparation of preventive maintenance schedule for CNC machine
8. Demonstration through industrial visit for awareness of actual working of FMS in production

STUDY SCHEME		EVALUATION SCHEME							Total Marks
		Internal Assessment			External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
-	-	4	-	25	-	-	50	2	75



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Subject: Workshop Technology-III (Theory)

Subject Code: 31753

Detailed Contents

Unit No.1 Milling

- Topic No.1: Principle of milling machine
- Topic No.2: classification of milling machine
- Topic No.3: construction of column and knee type milling machine
- Topic No.4: milling accessories and attachment
- Topic No.5: milling method
- Topic No.6: classification of milling cutter and work mandrels
- Topic No.7: types of milling operation
- Topic No.8: cutting parameter
- Topic No.9: indexing and its basic types

Unit No.2 Grinding

- Topic No.10: Grinding mechanism and grinding types
- Topic No.11: Types of grinding wheels and its specification
- Topic No.12: Mounting of wheel (turning and dressing)
- Topic No.13: Grinding method
- Topic No.14: Grinding machine

Unit No.3 Gear Manufacturing and Finishing Process

- Topic No.15: Gear hobbling
- Topic No.16: Gear shaping

Unit No.4 Modern Machining Process

- Topic No.17: Ultrasonic Machining (USM)
- Topic No.18: Electro chemical Machining (ECM)
- Topic No.19: Electro chemical Grinding (ECG)
- Topic No.20: Electrical discharge machining (EDM)
- Topic No.21: Laser beam machining (LBM) ,(EBM)

Unit No.5 Metallic Coating Process

- Topic No.22: Metal spraying process
- Topic No.23: Powder coating process

Unit No.6 Metal Finishing Process

- Topic No.24: Surface roughness and purpose of finishing process
- Topic No.25: Honing Process and their description
- Topic No.26: Lapping process and its description
- Topic No.27: Brief idea lapping machine
- Topic No.28: Polishing and buffing

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
4	-	-	25	-	100	3	-	-	125

TEXT BOOKS:

1. Workshop Technology by Dr. R. K. Singhal
2. Workshop Technology by Eshaan publication

RECOMMENDED BOOKS

1. Manufacturing Technology by Rao; Tata McGraw Hill Publishers, New Delhi.
2. Workshop Technology Vol. I, II, III by Chapman; Standard Publishers Distributors, New Delhi.
3. Production Technology by HMT; Tata McGraw Publishers, New Delhi.
4. Production Engineering and Science by Pandey and Singh; Standard Publishers Distributors, New Delhi.



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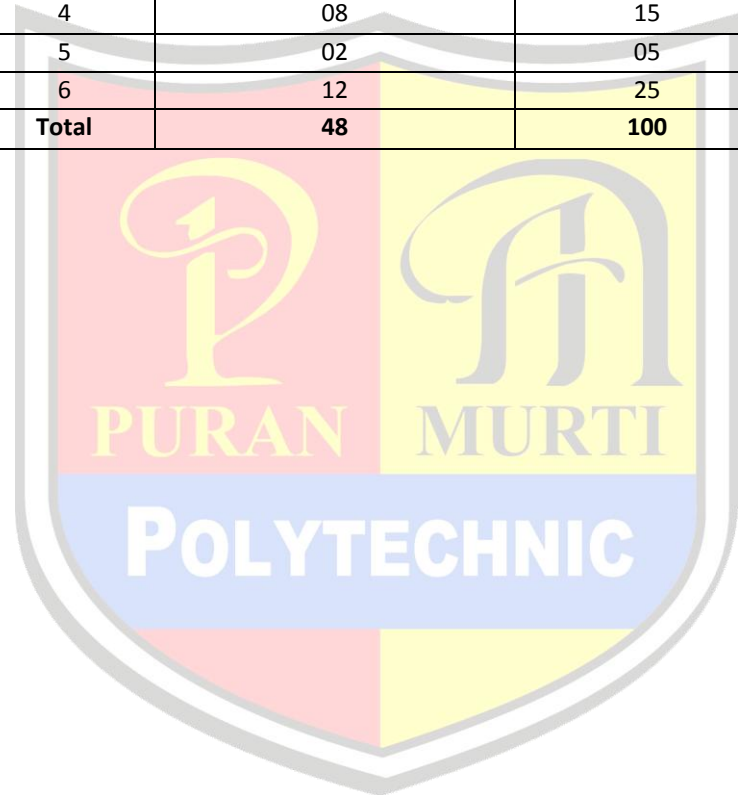
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INSTRUCTIONAL STRATEGY

1. Teachers should lay special emphasis in making the students conversant with concepts, principles, procedures and practices related to various manufacturing processes.
2. Focus should be laid in preparing jobs using various machines/equipment in the workshop.
3. Use of audio-visual aids/video films should be made to show specialized operations.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	12	25
2	12	25
3	02	05
4	08	15
5	02	05
6	12	25
Total	48	100





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Subject: Workshop Practice - III (Practical)

Subject Code: WP III (P)

List of practical

Advance Turning Shop

1. Exercise of boring with the help of boring bar
2. Exercises on internal turning on lathe machine
3. Exercises on internal threading on lathe machine
4. Exercises on external turning on lathe machine
5. Resharpener of single point cutting tool with given geometry

Machine Shop

1. Produce a rectangular slot on one face with a sharper
2. Produce a rectangular block using a milling machine with a side and face cutter
3. Prepare a slot on one face using milling machine
4. Job on grinding machine using a surface grinder
5. Prepare a job on cylindrical grinding machine
6. Exercise on milling machine with the help of a form cutter
7. Exercise on milling machine to produce a spur gear
8. Grinding a drill-bit on tool and cutter grinder
9. Exercise on dressing a grinding wheel

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
-	-	9	-	100	-	-	100	3	200



Detailed Contents

Unit No. 1: Introduction

- Topic No.1: Meaning and definition of estimation
- Topic No.2: cost accounting, purpose of estimating
- Topic No.3: difference between estimating and costing. qualities of estimator.

Unit No. 2: Cost Accounting

- Topic No.4: difference between financial accounting and cost accounting
- Topic No.5: Advantages of cost accounting. Methods of costing
- Topic No.6: unit costing, batch costing, Multiples of composite costing

Unit No. 3: Elements of Cost

- Topic No.7: Material, labor, expenses or overheads (factory, administrative, selling),
- Topic No.8: direct indirect labour, material
- Topic No.9: prime cost, factory cost, production cost,
- Topic No.10: total cost, selling price
- Topic No.11: factors effecting selling price in determining profit,
- Topic No.12: break even analysis,

Unit No. 4: OverheadS

- Topic No.13: Different types of overheads, depreciation, obsolescence
- Topic No.14: interest on capital, idleness costs, repairs and maintenance cost
- Topic No.15: Method of calculating depreciation/ methods of distributing overhead charges.:

Unit No. 5: Estimates of Material Costs

- Topic No.16: Estimation of volumes, weights
- Topic No.17: cost of material for item like pulley, spindle, lathe center
- Topic No.18: flywheel casting, wall bracket, crank shaft and similar items

Unit No. 6: Estimation in Machine Shop

- Topic No.19: Set up time, operation time, handling time, aligning time, tear down time.
- Topic No.20: Allowance, personal fatigues, tool sharpening or changing, checking and other miscellaneous allowances
- Topic No.21: Unit operation of different tool materials and product materials
- Topic No.22: Estimation of time for various machining operations:

Unit No. 7: Estimation in Forging Shop

- Topic No.23: Losses in forging shop. Estimation of materials
- Topic No.24: Procedure for estimation in forging shop

Unit No. 8: Estimation in Welding Shop

- Topic No.25: Welding cost, gas welding, arc welding,
- Topic No.26: cutting cost. Factors affecting welding costs.

Unit No. 9: Estimation in Foundry Shop

- Topic No.27: Estimation of pattern cost, foundry losses, processes for finding foundry cost

Unit No. 10: Estimation in Sheet Metal Shop

- Topic No.28: Calculation of blank size, Estimation of time for sheet metal operations
- Topic No.29: Estimation of products like funnel, bucket, mug tray

Unit No. 11: Costing of a Product

- Topic No.30: Costing of a Product

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
3	-	-	25	-	100	3	-	-	
125									



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RECOMMENDED BOOKS

1. Production Estimating and Costing by M. Adithan and B.S. Pabla; Konark Publishers, Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Allotted Time	Allotted Marks
1	2	4
2	4	8
3	6	12
4	6	12
5	4	8
6	6	16
7	4	8
8	4	8
9	4	8
10	6	12
11	2	4
Total	48	100

