Table of Content

Programme : **Diploma in Mechanical Engineering**											
Course Code : **SC 11120**						Course Title : **Applied mathematics**					
						C / O : **Compulsory**					
Credits				Duration of Written Examination		Examination Scheme					
TH	TU	PR	TOTAL	TH	TS	TH	TS	PR	OR	TW	TOTAL
3	1	-	4	3 hrs	2 Tests of 1 Hour each	80	20	-	-	-	100

Rationale

The subject intends to teach students basic facts, concepts, principle & procedure of mathematic as a tool to analyze Engineering problems & as such lays down foundation for understanding the engineering & core technology subjects

Objectives:

The Students will be able to,

1. Understand basic facts of mathematics about the field analysis of any Engineering Problem.
2. Know the standard ways in which the problem can be approached.
3. Apply basic concepts to engineering problem.

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Section I		
Contents:	**Hours**	**Marks**
1: Integration 1.1. Definition ,Standard formulae for integration (without proof) 1.2. Rules of integration simple integration, Actual division 1.3. Method of substitution 1.4. integration by parts 1.5. Integration by partial fraction. 1.6. Definite integral: Definition and properties of definite Integral, simple examples and examples based on the properties.	10	20
2.Applications of Definite integrals 2.1. Area under the curve and area enclosed between two curves 2.2. Mean value and R.M.S. values.	04	08
3 DIFFERENTIAL EQUATIONS 3.1 Definition ,order and degree of differential equation, formation of differential equation 3.2 Types of differential equations 3.3 Variable separable and reducible to variable separable. 3.4 Homogeneous differential equation. 3.5 Linear differential equation and Bernoulli's equation. 3.6 Partial derivatives first order only. 3.7 Exact differential equation.	10	12

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Section II		
Contents:	**Hours**	**Marks**
4 **PROBABILITY** 4.1 Basic definitions, trial, event, exhaustive, favorable events. 4.2 Mutually exclusive and independent events, addition and Multiplication theorem. 4.3 Binomial distribution, 4.4 Poisson's distribution 4.5 Normal distribution	**12**	**20**
5. Numerical Analysis 5.1 Salutation of algebraic equations using:- a) Bisection method, b) Regular-Falsi method, c) Newton-Raphson method	6	10
6. Solution of simultaneous equation 6.1Gauss elimination method 6.2 Jacobi"s method 6.3 Gauss-Seidal method 6.4 Gauss -Jorden method	6	10

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Sr.No.	Author	Title	Publication
1	S.P. Deshpande	Mathematics for polytechnic students	Pune Vidyarthi Graha Prakashan
2	H. K. Das	Mathematics for polytechnic students (Volume I)	S.Chand Prakashan
3	G. V. Kumbhojkar	Companian to basic maths	Phadke Prakashan
4	N. Raghvendra Bhatt Late Shri R Mohan Singh	Applied Maths	Tata McGraw Hill Publication

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Programme : **Diploma in Mechanical Engineering**											
Course Code : **ME11 211**				Course Title : **Manufacturing Processes**							
				C / O : **Compulsory**							
Credits				Duration of Written Examination		Examination Scheme					
TH	TU	PR	TOTAL	TH	TS	TH	TS	PR	OR	TW	TOTAL
02	-	04	6	3 Hours	2 Tests of 1 Hour each	80	20	-	-	50* Term End	150
(*) Examination by internal and external examiner.											

Rationale:

Manufacturing process is a core technology subject for Mechanical Engineering Course. Manufacturing is the basic area for any mechanical engineering technician. The technician should be introduced to the basic processes of manufacturing. This subject will help the student to be familiarized with working principles and operations like turning using lathe, milling, drilling, planing, casting, welding, and soldering etc which are the basic manufacturing processes. The basic knowledge of these processes will be helpful to select the most appropriate process for getting the desired results in terms of getting the raw material converted to finished product as per the requirements.

Objective:

The student will able to

1. Know and identify basic manufacturing processes for manufacturing different components.
2. Operate & control different machines and equipments.
3. Inspect the job for specified dimensions.
4. Produce jobs as per specified dimensions.
5. Select the specific manufacturing process for getting the desired type of output.
6. Adopt safety practices while working on various machines.

Section I (40 Marks)			
Topic No.	**Contents**	**Hours**	**Marks**
1	**PATTERN MAKING** Introduction, pattern materials, tools used, types of pattern, allowances, colour coding.	2	8
2	**MOULDING & FOUNDRY** Introduction ,Moulding tools and equipment, moulding sand ,types of molding sand, properties of moulding sand, sand preparation, machine moulding, permanent mould casting, melting furnace, defect in casting & remedies.	5	10
3	**SHEET METAL WORK** Introduction, material used in sheet metal, hand tools used and their functions, operations.	2	6
4	**PRESS AND PRESS WORK** Introduction, types, parts, driving mechanism, Specifications, Press tools (Punch & Die), Operations.	3	6
5	**WELDING AND BRAZING** i) **Welding -** Introduction, weldability, types - gas welding, Oxy-Acetylene welding, ARC welding- (e.g. Carbon arc, metal arc), Resistance welding (e.g. Butt, spot), Submerged arc welding, Eutectic welding. Introduction to TIG & MIG welding, Defects in welding and their causes. ii) **Brazing –** Need, Methodology & applications, Comparison with Soldering & welding	4	10

Section II (40 Marks)			
Topic No.	Contents	Hours	Marks
6	**TURNING** **Conventional Lathe:** Introduction, Basic parts and their functions, types, specifications & accessories , operations- Turning, parting off, Knurling, facing, Boring, drilling, threading, step turning, taper turning. taper turning methods, thread cutting mechanism. Geometry of single point cutting tool. Tool signature	4	10
7	**Milling** **Conventional Milling Machine:** Introduction, types, parts and the functions of Column and knee type milling machine, specifications, cutter holding devices, Standard milling cutters, up milling, down milling, Milling machine operations. Gear cutting, types of gear cutting, Indexing – simple & compound indexing.	4	10
8	**DRILLING** Introduction, types, Basic parts and their functions of Radial drilling machine, specifications, operations, twist drill nomenclature.	2	6
9	**BORING** Introduction, types, Basic parts and their functions of Horizontal Boring Machine, specifications, operations, boring bar, boring head, facing head.	2	6
10	**SHAPING and PLANING** **Shaping** - Introduction, types, parts and their functions, specifications, Mechanisms- Crank and slotted lever and hydraulic Shaper mechanism, Operations performed. **Planing** - Introduction, types, size, parts and their functions, Planner mechanisms, shaper verses planner.	4	8

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LIST OF PRACTICALS

Each candidate is required to complete and submit the term work as follows :

a) One composite job on plain turning, step turning and taper turning with 'V' threading. (Accuracy ± 0.5 mm) on traditional lathe machine. Measurement of taper.

b) One job on Gear Cutting in Machine Shop.

c) Journal / workbook based on above T. W.

d) Making of one simple job per batch on Welding.

e) Making of one simple job per batch on wooden Pattern.

f) Making of one simple job per batch on moulding.

Note:

1] The workshop instructors should prepare specimen job in each shop as demonstration practice before the student (as per the drawing given by subject teacher/ workshop superintendent).

2] Theory behind practical is to be covered by the concerned subject teacher/ workshop superintendent.

3] Workshop diary should be maintained by each student duly signed by respective shop instructors.

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Learning resources-

Author	Title	Publisher
S. K. Hajra Chaudary, Bose, Roy	Elements of workshop Technology – Volume I & II	Media Promoters and Publishers limited
D. L. Wakyl	Processes and design for manufacturing	Prentice Hall
O. P. Khanna and Lal	Production Technology - Volume I & II	--
W.A.J. Chapman	Workshop Technology - Volume I , II & III	---
Jhon A Schey	Introduction to Manufacturing Processes	McGraw Hills International
M. Adithan and A. B. Gupta	Manufacturing Technology	New Age International
Pabla B S M. Adithan	CNC Machines	New Age International

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Programme : **Diploma in Mechanical Engineering**											
Course Code : **ME 11 301**				Course Title : **Applied Thermodynamics**							
				C / O : **Compulsory**							
Credits				Duration of Written Examination		Examination Scheme					
TH	TU	PR	TOTAL	TH	TS	TH	TS	PR	OR	TW	TOTAL
4	-	2	6	3Hours	2 Tests of 1 Hour each	80	20	-	25*	25	150

Note: symbol (*) indicates combined evaluation by both internal and external examiner.

Rationale:

Diploma Engineers should know the basic concepts of Thermal power plant. They should know about the equipments used in Process plant Industries like Boilers, Steam Condensers, Air Compressors, Nozzles, etc. They should know the various principles of Gas Turbine and Jet Propulsion.

They should get a brief introduction to I.C. Engine and their systems and concepts related to them such as Supercharging and Turbocharging. They should also know the maintenance and supervision of the Process plants equipments.

Objectives:

After studying the course, students will be able to:

- Apply the knowledge of basic thermodynamics to analyze the performance of devices such as Steam Turbine, Condensers, Air Compressor, Internal Combustion Engine, etc.
- Understand working of different types of I.C. Engine and their sub systems.
- Design and conduct test on I.C. Engines.
- Appreciate principles of Gas Turbine cycles.
- Understand principle of Jet Propulsion Systems.
- Develop awareness about pollution and ecological imbalance due to thermal power plant

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Section –I (40 Marks)			
Topic No	**Contents**	**.Hrs.**	**Marks**
1	**Overview of Thermal power plant:** 1.1 Sources of energy : 1.2 Modern thermal power plant- Layout, Working and site selection.	03	04
2	**Steam Turbines:** 2.1 Steam Nozzle – Types & Applications (No derivations) 2.2 Steam Turbines – Types – Impulse, Reaction, Combined, their construction & working, velocity diagram, work done on turbine blades & efficiency of Impulse Turbine only 2.3 Compounding of Turbines – Need, Types, Pressure, Velocity, Pressure – Velocity Compounding 2.4 Regeneration Feed heating & Bleeding of Turbines 2.5 Governing of Steam Turbines (No analytical treatment)	10	12
3	**Steam Condensers & Cooling Towers:** 3.1 Introduction, Function of Condenser, Advantages of Condensers 3.2 Elements of Steam Condensing plants 3.3 Types of condensersJet Condensers, Low level condenser ,High level condenser ,Ejection Condenser. Surface condenser – construction & working Comparison between Jet & Surface condenser 3.4 Cooling Towers – need, types & their merits demerits (No analytical treatment)	08	10
4	**Air Compressors:** **Reciprocating Air Compressors:** 4.1 Industrial use of compressed air 4.2 Classification, Construction & working of single & two stage reciprocating compressor **4.3** Efficiencies – Volumetric, Isothermal, Mechanical (Simple Numerical. **Screw Air Compressors** Construction , working and application. Multistage, Advantages of multistage of air compressors	08	10

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5	**Introduction to Refrigeration** 5.1 Definition, unit of refrigeration 5.2 Applications of Refrigeration 5.3 Vapour compression and Vapour absorption cycles (No numerical),T-S and P-H diagrams and COP	03	04

Section –II

(40 Marks)

Topic No	Contents	Hrs.	Marks
6	**Introduction to I.C. Engine:** 6.1 Air standard cycles-Otto, Diesel and Dual cycles, P-V and T-S diagrams (No numerical) 6.2 Classification of I.C. Engine, Nomenclature of I.C. Engine Construction & working of two stroke/4 stroke petrol/diesel engine P – V diagram & Valve timing diagram Comparison of different engines 6.4 Application of I.C. Engine 6.5 Supercharging and Turbo charging	08	10
7	**Systems of I.C. Engine** 7.1 Fuel supply system in S. I. Engine Simple Carburetor – construction, working, limitations Air Fuel ratio 7.2 Fuel supply system in C. I. Engine Fuel supply system components Description & working of Fuel Pump, Injector	06	06
8	**8. Testing of I. C. Engine:** Introduction 8.1 Measurement of I.P.& B.P. 8.2 Morse Test 8.3 Measurement of speed 8.4 Measurement of air consumption, fuel consumption 8.5 Measurement of heat carried away by cooling water & exhaust gases 8.6 Heat Balance sheet 8.7 Various efficiencies of I. C. Engine : Mechanical Efficiency ,Relative Efficiency ,Volumetric Efficiency 8.8 Specific Fuel consumption (Simple numerical based on above)	08	10

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9	**9 Gas Turbine & Jet Propulsion:** Classification of Gas Turbine 9.1 Working cycle of Gas Turbine 9.2 Elements of Gas Turbine 9.3 Open cycle, closed cycle Gas Turbine 9.4 Their comparison & application of Gas Turbine 9.5 Principles of Turbojet, Turboprop, Ramjet (Construction & working) 9.6 Rocket, Rocket fuels, their uses, applications	07	10
10	**Environmental Concerns of power plant:** 10.1 air and land Pollution caused by power plant 10.2 CO_2 & its role in the biological life 10.3 Role of SOX, NOX on environment. 10.4 Ecological imbalance due to thermal power plant. 10.5 Concept of carbon credit on global scenario.	03	04

List of Experiments:

1. Collect the data of three reputed car and heavy vehicle manufacturers Compare their engine specifications, fuel supply system, valve operating system etc
2. Study of different parts of 4-stroke diesel engine. Students shall dismantle and reassemble the engine to get the better insight
3. Study of different parts of 4-stroke petrol engine. Students shall dismantle and reassemble the engine to get the better insight
4. Draw a labeled diagram of cooling and lubrication system of I.C.Engine available in laboratory.
5. Trial on Reciprocating Air compressor.
6. Trial on 4 stroke diesel or petrol engine with Heat Balance sheet and also measure the pollutants.
7. Visit PUC testing centre and collect data related to percentage of pollutants detected in different types of vehicles.
8. Study the maintenance and repair of automobile vehicles by visiting company authorized repairing workshop and prepare the detailed report on maintenance and repairs

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Reference Books:

Sr.No	Author	Title	Publication
01	Patel &Karamchandani.	Heat engine Vol. I & II	Acharya Publishers
02	V.M. Domkundwar.	Heat engine	Dhanpath Rai & Company
03	R. K. Kapoor.	Thermal engineering Vol. I & II	TATA Macro Hill (New Delhi)
04	Arora Domkundwar	Power plant Engineering	Dhanpath Rai & Company
05	R. S. Khurmi.	Thermal engineering	S. Chand Company
06	P. L.Ballaney	Thermal engineering	Khanna Publishers Delhi

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Principal
Government Polytechnic, Mumbai-51

Programme : **Diploma in Mechanical Engineering / Rubber Technology**											
Course Code : **MG 11 537**				Course Title : **Entrepreneurship Development**							
				C / O : **Compulsory**							
Credits				Duration of Written Examination		Examination Scheme					
TH	TU	PR	TOTAL	TH	TS	TH	TS	PR	OR	TW	TOTAL
1	2	-	3	-	-	-		-	25*	25	50
(*) indicates assessment by Internal and External examiners.											

Rationale:

Globalization, liberalization & privatization along with revolution in Information Technology, have thrown up new opportunities that are transforming lives of the masses. Talented and enterprising personalities are exploring such opportunities & translating opportunities into business ventures such as- BPO, Contract Manufacturing, Trading, Service sectors etc. The student community also needs to explore the emerging opportunities. It is therefore necessary to inculcate the entrepreneurial values during their educational tenure. This will help the younger generation in changing their attitude and take the challenging growth oriented tasks instead of waiting for white- collar jobs. The educational institutions should also demonstrate their uniqueness in the creation of enterprising personalities in their colleges. This subject will help in developing the awareness and interest in entrepreneurship and create employment for others.

General Objectives:

The students will be able to

1) Appreciate the concept of Entrepreneurship
2) Identify entrepreneurship opportunity.
3) Develop entrepreneurial values and attitude.
4) Collect and use the information to prepare project report for business venture.
5) Develop awareness about enterprise management.

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Sr. No.	Contents	Hours
1.	**INTRODUCTION** • Definition of Entrepreneur. • Characteristics of Entrepreneur. • Functions of an Entrepreneur. • Barriers to Entrepreneur. • Distinction between Entrepreneur, Manager and Intrapreneur • Women Entrepreneur-problems and developing trends. • Entrepreneurship-definition, need.	3
2.	**FROM BUSINESS IDEA TO OPPORTUNITY** • Identifying trends, opportunities and ideas. • Creativity techniques for idea generation. • Evaluate business opportunities • Use of SWOT analysis.	2
3.	**MARKET ASSESSMENT AND PRODUCT FEASIBILITY** • Marketing -Concept and Importance • Market Identification, • Customer need assessment, • Market Survey • Meaning and definition of product feasibility • Technical, Market, Financial feasibility including break even analysis.	2
4.	**SUPPORT SYSTEMS** • **Information Sources** Information related to project, procedures and formalities • **Support Systems** • Business Planning & Requirements for setting up an SSI • Govt. & Institutional Agencies (Like MSFC, DIC, MSME, MCED, MSSIDC, MIDC, LEAD BANKS), Statutory requirements and agencies.	3
5.	**PROJECT/BUSINESS PLAN** • Meaning and Importance • Concept of vision and mission • Components of project report/profile	3

6.	**ENTERPRISE MANAGEMENT AND MODERN TRENDS** • Essential roles of Entrepreneur in managing enterprise • E-Commerce: Concept and process • Global trends and opportunities. • Steps in starting small scale industry • Causes Of Sickness	**3**

Term Work

Term work consists of following interactive type assignments. Faculty acts as a facilitator in providing conducive, dynamic environment, exposing students to various aspects of entrepreneurship. Assignments are aimed at compelling the students to critically think and apply the concepts learnt, leading to better insight development.

Sr. No	Assignments
1	**Assimilation Of Profile Of A Successful Entrepreneurs** Every student will study the biography of a successful entrepreneur and make a write up of two pages, indicating milestone achievements. Summarize the important traits and share their understanding in the peer group.
2	**Assess yourself as an entrepreneur?** Several skills and traits are essential in an entrepreneur, to achieve success. What is your potential in this regard?..Assess yourself and reflect upon the findings. Faculty will provide you a suitable instrument.
3	**Brain Storm To Generate Business Ideas.** Brain storming is a group creativity exercise designed to come out with a number of solutions to a problem. Follow the steps. ✓ State the problem (Ex. What business would you start if you are given Rs Lacs?) ✓ Select the participants ✓ Select a leader ✓ Set the stage Rules to be followed are, • Focus on quantity • Postpone criticism • Build on others ideas • Encourage crazy ideas • Work with a dead line
4	**Identify A Business Opportunity Suitable For You** ✓ This activity will help you to identify opportunity that may be right for you. Once identified you will use this business idea to carry out the mini project, throughout the session. ✓ List your interests and hobbies. List the business ideas that relate to each interest. Use the following steps to end up with the opportunity.

	✓ Make SWOT analysis of self, cross out those ideas that no longer seem suitable for you. ✓ Assess your aptitude and identify those ideas that match with your aptitude ✓ Make a matrix of advantages and disadvantages of remaining ideas, find which one is of maximum advantage ✓ Use internet or library and find out at least one source of information for each idea. ✓ Choose one of the business opportunities that suit your life style requirements. ✓ Write vision and mission statement. Set personal financial and non financial goals you hope to achieve in five years perspective. Be realistic and be sure to include specific activities for each plan.
5	**Begin To Develop Your Business Plan** ✓ Write a vision and mission statement for the business enterprise ✓ Describe one page report that fully describes your product or service and how it differs from what is currently available. ✓ List your short, medium and long term goals. What steps do you need to achieve each of these goals? Do you foresee any obstacles in attaining them? What are they? ✓ What are the economic, technological or growth trends in this industry? Is the location of your business is a critical factor in its success? Why or why not?
6	**Design A Market Strategy** ✓ Identify the market for your business. Use the secondary data source that could help you assess demand for your product or service. ✓ Based on secondary data, develop a customer profile. Figure out which market segment of your industry you are targeting. be specific. ✓ Develop a questionnaire to conduct primary data research.Coduct a mock survey and analyze the results. Determine what course of action you will take? ✓ Determine who your competitor are, both direct and indirect. Analyse each competitor in terms of price, location, facility, strength and weakness. Determine strategy to deal with each competitor. ✓ Write down your strategies for maintaining customer loyalty, and describe why you think each one will work.
7	**Find Out Break Even Point For Your Business** Perform a break even analysis for your business. How many units you are required to sell to break even? Is this a feasible number? Why or Why not? Can you think of ways to lower the breakeven point?
8	**Feasibility Study Reports** Make a feasibility study analysis of sample reports provided and discuss your observations in the class.(Group work each consisting 4 students)

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08

9	**Interactive Session With An Entrepreneur** In live conversation with an entrepreneur raise the issues of your interest pertaining to various aspects of entrepreneurship and make a report on it.
10	**Mini Project** Develop a mini project on a business opportunity incorporating various aspects as per the standard format provided. This activity should be carried out on continual basis, under the guidance of the concerned faculty. Components of Project Report: 1. Project Summary (One page summary of entire project) 2. Introduction (Promoters, Market Scope/ requirement) 3. Project Concept & Product (Details of product) 4. Promoters (Details of all Promoters- Qualifications, Experience, Financial strength) 5. Manufacturing Process & Technology 6. Plant & Machinery Required 7. Location & Infrastructure required 8. Manpower (Skilled, unskilled) 9. Raw materials, Consumables & Utilities 10. Working Capital Requirement (Assumptions, requirements) 11. Market (Survey, Demand & Supply) 12. Cost of Project, Source of Finance 13. Projected Profitability & Break Even Analysis 14. Conclusion.

Learning Resources:

1) Reference Books:

Sr.No.	Name of Book	Author	Publisher
1	Entrepreneurship Development	Preferred by Colombo plan staff college for Technical education.	Tata Mc Graw Hill Publishing co. ltd. New Delhi.
2	A Manual on How to Prepare a Project Report	J.B.Patel D.G.Allampally	EDI STUDY MATERIAL Ahmadabad (Near Village Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat,India P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in/olpe@
3	A Manual on Business Opportunity Identification & Selection	J.B.Patel S.S.Modi	
4	National Directory of Entrepreneur Motivator & Resource Persons.	S.B.Sareen H. Anil Kumar	
5	New Initiatives in Entrepreneurship Education & Training	Gautam Jain Debmuni Gupta	

6	A Handbook of New Entrepreneurs	P.C.Jain	ediindia.org Website : http://www.ediindia.org
7	Evaluation of Entrepreneurship Development Programmes	D.N.Awasthi , Jose Sebeastian	
8	The Seven Business Crisis & How to Beat Them.	V.G.Patel	
9	Entrepreneurship Development	Special Edition for MSBTE	McGraw Hill Publication
10	Entrepreneurship Development	-	TTTI, Bhopal / Chandigarh

2) VIDEO CASSETTES

NO	SUBJECT	SOURCE
1	Five success Stories of First Generation Entrepreneurs	EDI STUDY MATERIAL Ahmedabad (Near Village Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat,India P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in/olpe@ediindia.org Website : http://www.ediindia.org
2	Assessing Entrepreneurial Competencies	
3	Business Opportunity Selection and Guidance	
4	Planning for completion & Growth	
5	Problem solving-An Entreprencur skill	

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Principal
Government Polytechnic, Mumbai-51

Programme : **Diploma in Mechanical Engineering**											
Course Code : **CO 11 302**						Course Title : **Programming Language 'C'**					
						C / O : **Compulsory**					
Credits				Duration of Written Examination		Examination Scheme					
TH	TU	PR	TOTAL	TH	TS	TH	TS	PR	OR	TW	TOTAL
2	-	2	4	-	-	-	-	50 *	-	=	50

Note: symbol (*) indicates combined evaluation by both internal and external examiner.

Rationale:

Nowadays in every field of science and engineering, Software's are widely used. Therefore basic knowledge of software building is must for student. The syllabus is intended to create a general awareness of programming language and its operations for students.

Objectives:

The student will be able to

- Draw flow-charts.
- Write computer programs in C language.
- Handle computer files with C language.
- Write Program based on input output statement.
- Write Program based on loops and control statements.
- Write Programs using arrays and strings.
- Handle Files with C program.
- Run programs and make executable files.
- Solve simple engineering problems using C.

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Topic No	Contents	Hrs.	Marks
1	**1. Introduction and Basic Concepts:** 1.1 Introduction. 1.2 Programming styles. 1.3 Flow charts. 1.4 Features of C. 1.5 Structured Programming concept. 1.6 Character Set in C. 1.7 Keywords. 1.8 Program structure. 1.9 Input and output. (Printf & Scanf) 1.10 Variable & data types. 1.11 Initialization of variables. 1.12 Primary & Secondary data types. 1.13 Arithmetic, Relational & Logical Operators and expressions. 1.14 Hierarchy of operators. 1.15 Constants. • Data type conversion in C.	6	
2	**Control Statements and Control Loop Statements:** 2.1 Decision making & branching. 2.2 goto statement. 2.3 if statement. 2.4 Nesting of if - else statement. 2.5 switch statement. 2.6 Ternary Operator. 2.7 while loop. 2.8 do while loop. 2.9 for loop. 2.10 Use of break and continue statements.	08	

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3	**Arrays, Strings, Functions, Pointers and Structures:** 3.1 Array declaration. 3.2 One dimension, two dimension and multidimensional arrays. 3.3 String input /output. 3.4 String manipulation. 3.5 Array of strings. 3.6 Basic concept of function. 3.7 Concept of library functions. 3.8 User-defined functions. 3.9 Local & global variables. 3.10 Parameter passing. 3.11 Storage classes. 3.12 Structure declaration, initialization. 3.13 Array of structure. 3.14 Basic concept of pointer. 3.15 Pointer arithmetic. 3.16 Pointers and Functions. 3.17 Pointers and Arrays.	10	
4	**File Management:** 4.1 Basic concept. 4.2 Types of files: Text and Binary files. 4.3 Operations on file. File functions.	4	
5	**Introduction to OOPS:** 5.1 Its need and requirements. 5.2 Procedure oriented programming V/s object –oriented programming. 5.3 Programming concepts. 5.4 Features of OOPS. 5.5 Structure of C++ programming. C++ I/O statements, manipulators.	4	

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Laboratory work and Term work:

1. Program based on input output statement.
2. Program based on arithmetic expression. (4 programs)
3. Programs based on if, if-else, nested-if (3 programs)
4. Program based on switch statement.
5. Program based on loops. (for, do... while, while). (3 programs)
6. Program based on function. (2 programs)
7. Program based on strings. (2 programs)
8. Program based on arrays and pointers. (2 programs)
9. Program based on structures.
10. Program based on File Management.
11. Write simple OOPS program.

Reference Books:

1. Programming in C by Balguruswamy, Publisher: Tata Mcgraw Hills, New Delhi
2. Let us C by Yashwant Kanetkar, Publisher: BPB Publication, New Delhi

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Government Polytechnic, Mumbai-51

Programme: **Diploma in Mechanical Engineering**											
Course Code : **ME 11 303**				Course Title : **Hydraulic Machines**							
				C / O : **Compulsory**							
Credits				Duration of Written Examination		Examination Scheme					
TH	TU	PR	TOTAL	TH	TS	TH	TS	PR	OR	TW	TOTAL
3	-	2	5	3Hours	2 Tests of 1 Hour each	80	20	-	25*	25	150

Note: symbol (*) indicates combined evaluation by both internal and external examiner.

Rationale:

Fluid is present all around us. Every conceivable object is in some way or other is associated with fluid, either in liquid or gaseous form. A good understanding of the mechanics of fluid in particular is crucial for every sphere of activity, be it flying of aeroplanes or the designing of ships or launching of satellite.

Subject has lot of significance and practical importance in daily life. It is an important component of almost all branches of engineering disciplines. In many modern machines the concepts of hydraulics are widely used. Knowledge of fluid flow, its measurement and principles of working of hydraulic machinery is essential in many areas of application of mechanical engineering. Hydraulic machinery includes the theory surrounding fundamental principles of turbines, pumps.

Hydraulic machines have important role in power generation, water supply and irrigation and also in most of engineering segments.

Objectives: The student will be able to

1. Understand properties of fluid and their significance
2. Understand fluid Pressure and its measurement with different gauges
3. Measure various properties such as pressure, velocity, flow rate using various instruments such as venturimeter, orifice meter etc.
4. Understand principles of flow through pipes and their calculations
5. Understand principle of force generation by the jet of water comes out from nozzles and striking different types of plates or vanes and able to calculate work done by the force of jet in those situations
6. Understand principle, construction and working of different water turbines and able to

calculate work done and various efficiencies.

7. Test the performance of turbines and pumps and Plot characteristics curves of turbines and pumps
8. Understand principle, construction, and working of centrifugal pump and reciprocating pump and able to calculate work done, efficiencies and power requirements for the pumps.

SECTION –I (40 Marks)			
Topic No	**Contents**	**Hrs**	**Marks**
1	**FLUID PRESSURE & ITS MEASURMENT** 1.1 Fluid pressure, Pressure head, Pressure intensity. 1.2 Concept of vacuum, Gauge pressure, Atmospheric pressure, Absolute pressure. 1.3 Gauges for fluid pressure measurement, Piezometer tube, Manometers (Simple manometer, micro manometer, Differential manometer, Inverted differential manometer), Bourdon's tube pressure gauge, Diaphragm pressure gauge. **1.4** Concept of Total pressure on immersed bodies, Center of pressure (Horizontal, Vertical, Inclined surfaces). **Note - Numerical on Manometer, Total pressure & Centre of pressure.**	06	12
2	**FLUID FLOW.** 2.1 Types of fluid flow, 2.2 Continuity equation, 2.3 Energy possessed by flowing fluid, Bernoulli's Theorem, Applications of Bernoulli's Theorem 2.4 Venturi meter – Construction, Principle of working, Coefficient of discharge, Derivation of discharge through venturimeter. 2.5 Orifice meter - Construction, Principle of working, Hydraulic coefficients for orifice (coefficient of contraction, coefficient of velocity, coefficient of discharge), Derivation for discharge through orifice meter. 2.6 Pitot tube- Construction, Principle of working & applications. **Note - Numerical on venturimeter, orifice meter, Pitot tube.**	06	12
3	**FLOWS THROUGH PIPES.** 3.1 Laws of fluid friction. 3.2 Darcy's equation & Chezy's equation for loss of head due to friction.	06	08

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	3.3 Minor losses in pipes loss of head due to • Entrance in to pipe, • Sudden enlargement, • Sudden contraction • Exit from pipe. 3.3 Water hammer effect. 3.4 Flow through long pipe, Pipe in series & parallel. **Note - Numerical to estimate major & minor losses and flow through long pipes.**		
4	**IMPACT OF JETS** 4.1 Impulse momentum equation, 4.2 Generation of force due to impact of jet; • On fixed flat plate (Vertical, inclined). • On moving flat plates (Vertical, inclined). • Impact of jet on curved fixed & moving Vanes **Note - Numerical on calculations of force, work done & efficiency.**	06	08
	Section –II **(40 Marks)**		
5	**WATER TURBINES** 5.1 Layout & features of hydroelectric power plant. 5.2 Classification & selection of hydraulic turbines. 5.3 Principle, Construction & working of • Pelton wheel Turbine, • Francis Turbine • Kaplan Turbine. 5.4 Concept of cavitations in turbine, 5.5 Velocity diagrams, 5.6 Calculation of work done & efficiencies	10	16
6	**CENTRIFUGAL PUMP** 6.1 Construction, Principal of working & applications 6.2 Types of casing & impellers. 6.3 Manometric head, Velocity diagrams, Work done, manometric efficiency, mechanical efficiency, Overall efficiency. 6.4 Discharge of centrifugal pump. NPSH. Performance characteristics of centrifugal pump. Priming and its importance. Methods of priming **Note - Numerical on calculation of overall efficiency, manometric efficiency & power required for driving pump.**	08	14
7	**RECIPROCATING PUMP** 7.1 Construction, working & principles & applications of single &	06	10

	double acting reciprocating pumps. 7.2 Concept of slip, negative slip 7.3 Use of air vessel. Indicator diagram. With effect of acceleration head & frictional head.(no derivations) 7.4 Discharge of reciprocating pump. 7.5 Power required driving reciprocating pump. 7.6 Separation & maximum speed of operation. **Note - Numerical on power required, pressure head calculation considering effect of acceleration in reciprocating pump.**		

LABORTORY WORK & TERM WORK:

1 Determination of coefficient of friction in flow through different types of pipes.

2 Determination of coefficient of discharge for flow through orifice.

3 Trial on Pelton turbine to determine overall efficiency.

4 Trial on Francis turbine to determine overall efficiency.

5 Study of Kaplan Turbine.

6 Trial on reciprocating pumps.

7 Organize visit to hydro electric power station. Student shall submit a brief technical report of the visit as a part of term work.

Reference Books:

Sr.No	Author	Title	Publication
1	Dr. R.K.Bansal	A textbook Of Fluid mechanics & Hydraulic Machines	Laxmi Pub (P) Ltd.
2	R.S.Khurmi	Hydraulic Fluid mechanics & Hydraulic Machines	S. Chand
3	P.N.Modi, S.M.Seth	Hydraulic & Fluid Mechanics	Standard Book House
4	Ojha	Fluid mechanics & Machines	Oxford

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Principal
Government Polytechnic, Mumbai-51

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Programme : **Diploma in Mechanical Engineering**											
Course Code: **ME 11 308**				Course Title: **Production and Industrial Engineering**							
Credits				C/O: **Compulsory**							
				Duration of written Examination		Examination Scheme					
TH	TU	PR	TOTAL	TH	TS	TH	TS	PR	OR	TW	TOTAL
3	-	2	5	3Hours	Two tests of 1 Hour each	80	20	-	-	50	150

Rationale:

The technicians (Mechanical) are likely to perform supervisory role on shop floor of the manufacturing units. In addition to this they are also expected to improve the working environment/methods and productivity. Principles of Production Engineering help them to understand the measures of productivity, plant layout, process planning, and project management. While Industrial Engineering helps them to carry out work-study and motion study. They should be aware of modern manufacturing techniques in production Engineering.

Objectives:

The student will be able to:

1. Understand the production systems and productivity.
2. Understand and prepare a process planning for product.
3. Understand the functions of PPC.
4. Design Jig and Fixture.
5. Carry out method study, motion study for given product or process considering ergonomics and aesthetic aspects.
6. Understand the different modern production systems which connect them with present era of industries.

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Sr. No	Section-I (40 Mark) Contents	Hours	Marks
01	**Production systems** Definition, types of production systems (Intermittent/continuous) their types and comparison. Productivity: Importance, measurement of productivity and techniques of improving productivity.	05	08
02	**Plant Layout** Objective, Types of plant layout, design principles, Factor affecting plant layout.	04	06
03	**Process Planning** Planning of process from raw material to finish product, Deciding sequence of operation, operation sheet, combine operations and determination of inspection stage.	05	08
04	**Production planning and control** Definitions, function and importance of PPC, Meaning of control, progressive control, Routing, sequencing (n job 2 machine), scheduling, dispatching, Gantt chart, flow process sheet, Line balancing.	05	10
05	**Jigs and fixtures** Introduction. Difference between jig and fixture, Different components of Jig/ fixture, Types of jigs and fixtures, Types of locators and clamping devices, 3-2-1 principle of location, Fool proofing of jigs and fixture, General principles of jig and fixture design.	05	08

Sr. No	Section-II (40 Mark) Contents	Hours	Marks
06	**Method Study** Definition and objectives, Procedure, Selection of work Charting Techniques: Flow process charts, outline process chart, flow diagram, travel chart, Critical examination and analysis.	05	08
07	**Principle of motion economy** General consideration, Tool and equipments, Two handed process, multiple activity chart, Therblings, Cycle and Chronocycle graph, SIMO chart.	05	08

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08	**Time Study** Definition, Procedure, Factor affecting the rate of working, Equipments for time study, Types of elements, Rating and allowances, Normal time, Standard Time, Work sampling, MOST.	05	08
09	**Ergonomics and Aesthetics consideration** Introduction and definition, objective, Man-Machine system and its three aspects, Display and Controls design, Environmental factor, Layout of Panels, Design of workplace.	04	08
10	**Modern Production Systems** Kaizen, Just in Time system, Kanban, Group Technology Flexible Manufacturing System, Lean Manufacturing system.	05	08

Assignments/ Activities to be performed:

1 Study of production system and productivity.
2 Design of the plant layout for manufacturing of a simple product.
3 Preparation of process planning and operation sheet for a simple component.
4 Production Planning and Control of simple product.
5 Assignment based on design of simple Jig and Fixture.
6 Method study for a component of a selected product in assignment 2, 3 and 4.
7 Motion economy for a simple component or process.
8 Calculation of standard time for selected simple product or process.
9 Design of work place layout for manufacturing a product or single process using ergonomics and aesthetic principles.
10 Assignment based on any one modern production system.

Recommended books:

Sr. No	Title	Author/s	Publication/s
01	Work Study	-	ILO, Geneva
02	Production Planning and Control	L. C. Jhamb	Everest
03	Production system, Planning, Analysis and Control	James C. Rigs	Wiley and Sons
04	Industrial Engineering and Management	O. P. Khanna	Dhanpat Rai and Sons
05	Industrial Engineering and Production Management	Martand Telsang	S. Chand Publication

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