



Integral University, Lucknow  
Department of Mechanical Engineering  
Study and Evaluation Scheme

Program: Diploma in Engineering

**Semester IV**

S. No.	Course code	Course Title	Type of Paper	Period Per hr/week/sem			Evaluation Scheme				Max. Marks	Credit	Total Credits	Attributes						
				L	T	P	CT	TA	Total	ESE				Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics
<b>THEORIES</b>																				
1	DMA - 401	Applied Mathematics-II (B)	Core	03	01	00	40	20	60	40	100	3:1:0	4	√		√				
2	DME - 401	Hydraulics & Hydraulic Machines	Core	03	01	00	40	20	60	40	100	3:1:0	4		√	√			√	
3	DME - 402	Material Science –II	Core	03	01	00	40	20	60	40	100	3:1:0	4		√	√			√	
4	DME - 403	Thermal Engineering - II	Core	03	01	00	40	20	60	40	100	3:1:0	4	√	√	√			√	
5	DME - 404	Manufacturing Process	Core	03	01	00	40	20	60	40	100	3:1:0	4	√	√	√			√	
6	DME - 405	Basic Electronics Engg.	Core	03	01	00	40	20	60	40	100	3:1:0	4	√		√				
<b>PRACTICAL</b>																				
1.	DME - 451	Hydraulics Lab.	Core	00	00	03	40	20	60	40	100	0:0:1.5	1.5		√	√			√	
2.	DME - 452	Workshop ( Manufacturing Process)	Core	00	00	03	40	20	60	40	100	0:0:1.5	1.5	√	√	√			√	
3.	DME - 455	Basic Electronics Engg.. Lab	Core	00	00	03	40	20	60	40	100	0:0:1.5	1.5	√		√				
4.	GP- 451	General Proficiency		-	-	-	-	-	60	-	60								√	√
<b>Total</b>				<b>18</b>	<b>06</b>	<b>09</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>960</b>		<b>28.5</b>							

# **APPLIED MATHEMATICS-II (B)**

## **(DMA-401)**

**(Common to All Diploma Engineering Courses)**

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### **UNIT-1**

#### **Differential Calculus-II**

**[8]**

Function of two variables, identification of surfaces in space, partial derivatives, chain rule, higher order partial derivatives, Euler's theorem (without proof) for homogeneous functions, Jacobians.

### **UNIT-2**

#### **Vectors Calculus**

Scalar and Vector function. Derivative, Gradient, Divergence & Curl of functions. Directional derivatives. Line, Surface & Volume integrals.

### **UNIT-3**

#### **Laplace Transformation**

Definition & properties of Laplace & Inverse Laplace transformation. Unit step function, periodic function. Solution of ordinary differential equations by Laplace transformation.

### **UNIT-4**

#### **Beta and Gamma Functions**

Definition of Beta and Gamma functions, relation between Beta and Gamma functions, their use in evaluating integrals.

#### **Fourier Series**

Fourier series of odd and even functions.

## **UNIT-5**

### **Probability and Statistics**

Definition of probability, laws and conditional distribution, discrete and continuous distribution. Binomial, Normal and Poisson distribution.

**Method of Least-Square and Curve Fitting:** Straight line, parabola.

### **References:**

1. Applied Mathematics: Kailash Sinha, Meerut publication.
2. Applied Mathematics: H.R Luthra, Bharat Bharti Prakashan.
3. Applied Mathematics: H.K Das, C.B.S Publication.
4. Mathematics for Polytechnic: S.P Deshpande, Pune Vidyarthi Griha.

# HYDRAULICS & HYDRAULIC MACHINES:

(DME-401)

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## UNIT-I

### INTRODUCTION:

Fluid, Fluid Mechanics, Hydraulics, Hydro-statics, Hydrodynamics, Ideal fluid.

### HYDROSTATICS:

Properties of fluids, Pressure and depth relationship,

Hydrostatic pressure, Pascal's law, total pressure on flat surfaces, Centre of pressure on flat surfaces.  
(Simple Numerical Problems)

8

## UNIT-II

### BUOYANCY:

Buoyancy, Condition of equilibrium of a floating body, Meta centre and Meta centric height. (Simple Numerical Problems)

### FLUID FLOW:

Different types of flow, Reynold's number, Equation of continuity and its applications. (Simple Numerical Problems)

### ENERGY AND MOMENTUM EQUATION:

Types of energies, Energy equation and its application. Bernoulli's theorem flow measurement instruments where energy equation is used e.g. Venturimeter, Orifice meter, Flow nozzle, pitot tube, Prandtl tube. (Simple Numerical Problems)

8

## UNIT-III

### ORIFICES:

Flow through orifices, Co-efficient of contraction, Coefficient of velocity, Co-efficient of discharge, Large

Vertical orifices, Drowned orifice, time of emptying a rectangular and circular tanks with flat bottoms.  
(Simple Numerical Problems)

### **NOTCHES & WEIRS:**

Different types of notches, Measurement of discharge over rectangular notch, V-notch, Francis and Brazin's formula for rectangular weirs. Submerged weirs, Broad crested weirs. (Simple Numerical Problems) 8

### **UNIT-IV**

#### **FLOW THROUGH PIPES:**

Losses in pipe flow due to friction, sudden enlargement, contraction and bends, Elbow & Tee. (Simple Numerical Problems)

#### **CHANNELS:**

Characteristics of flow, Uniform flow through channels. Rectangular and Trapezoidal channels, Application of Chezy's, Manning and Kutter's formula. Most economical channel sections of rectangular and trapezoidal shapes. (Simple Numerical Problems) 8

### **UNIT-V**

#### **HYDRAULIC MACHINES:**

Impulse and reaction turbines, Principle of working of Pelton wheel, Francis and Kaplan turbines with simple line diagrams, their classification, construction, working, operational problems. Centrifugal and reciprocating pumps, Hydraulic press and Hydraulic Jack.

#### **Ref. Books:**

R.S. Khurmi – Fluid Mechanics & Machinery – S. Chand Publications

# MATERIAL SCIENCE-II

(DME-402)

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## UNIT-I

### NON-METALIC MATERIALS:

#### Timber:

Conversion of Timber: Its meaning necessity, Seasoning of timber, Preservation of Timber : Types of Preservation, Methods of application, Defects in timber, Surface treatment, Soaking treatment, Hot and Cold treatment; Common Indian timber specific uses, properties identification, units of purchase. Brief study of produces of Timber, Plywood, Hard board, Batten Board, Veneer board. 8

## UNIT-II

### Plastic and Other Synthetic Materials:

Plastics-Important sources-Natural and Synthetic, Classification, thermoset and thermoplastic, Various trade names, Important Properties and engineering use of plastics. Market forms-Pallets, Granules, Powder and Liquid forms; Uses of Sungloss rexin, Linoleum, Plastic coated paper, Fibres-Important sources. Inorganic fibres, Natural Organic Fibres and Synthetic organic fibre and their use.

## UNIT-III

### Hardwares:

General specification, uses and methods of storage of G.I. and C.I. steel, Copper, A.C. pressure conduits, R.C.C. spun, P.V.C. pipes and their uses. General sheets specification (I.S.) and uses. Method of storage

of G.I. sheets, M.S. sheets, General specification of pipe fittings viz. Elbow, Tee, Bend, Crosses and Sockets. General specification and use of wire nails, wood screws and door hinges, toggle bolts, sliding bolts.

#### **IDENTIFICATION AND TESTING OF METAL ALLOYS:**

Selection, specification forms and availability of materials. Testing of materials (Destructive and nondestructive), Identification of metal by giving mini project. 8

#### **UNIT-IV**

##### **HEAT TREATMENT OF METALS:**

Elementary concept, purpose, Iron-carbon equilibrium diagram. T.T.T. or 'S' curve in steels and its significance, micro structure of steels and martensitic transformation (elementary idea). Hardening, Tempering, Annealing, Normalising and case hardening. Ageing, Various temperature ranges for different metals and alloy (From heat treatment hand book) 6

#### **UNIT-V**

##### **MISCELLANEOUS MATERIALS:**

Important properties, characteristics and use of the following materials.

(a) Abrasives-Natural and Manufactured, sand stone, emery and corundum, diamond, garnet, silicon carbide, Boron carbide, aluminum oxide, any other abrasives qualities of good abrasive.

(b) Celluloid or Xylomite

(c) Felt

(d) Magnetic Materials

(e) Mica

(f) Refractory Materials-Fire clay, Dolomite, Magnesite, Porcelain, Fire bricks and their uses

(g) Jointing Materials-Glues and Adhesives, Cements Pyroxylene cement, Rubber cement, Magnestic cement.

(h) Composite Materials : Introduction to polymers of metal matrix composite, Carbon fibre, Glass fibre

(i) Germerium alloys (metal glasses)

(j) Source of procurement of various Ferrous and nonferrous and composite materials

**Ref. Books :**

Manufacturing Process – Kalpak Jain

Material Science – K. M. Gupta



# **THERMAL ENGINEERING-II**

**(DME-403)**

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## **UNIT-I**

### **GAS TURBINE :**

Elements of gas turbine, working principle, fuel and fuel system, open and close cycle, methods of testing, operating characteristics, Atkinson cycle, Brayton cycle, Heat exchanger, Inter cooler, Reheater, Applications, Performance. Brief concept of heat exchanger. 8

## **UNIT-II**

### **AIR COMPRESSOR :**

Definition and their use, Difference between reciprocating and rotary compressor, their types and working workdone during compression in single stage and two stage, Heat rejected and inter cooling in tow stage compression, volumetric efficiency, compressor lubrication. 8

## **UNIT-III**

### **THERMAL POWER PLANT :**

Main parts and working of plant, Thermodynamics cycle, Fuel handling, Combustion and combustion equipments, Problem of ash disposal, Circulating of water schemes and supply of make up water, Selection of economiser, Super heater, Preheater, Feed water heater and dust collector, Steam power plant, Heat balance and efficiency. 8

## **UNIT-IV**

### **NUCLEAR POWER PLANT :**

Elements of nuclear power plant, Types of nuclear reactor, Fuel moderators, Coolants, Controls, Disposal of nuclear wastes, Classification of nuclear power plant, Cost of nuclear power, Nuclear fuels. 8

## **UNIT-V**

### **INTEGRAL COMBUSTION PLANT :**

Engine classification, Engine cycle, C.I. engine combustion, S.I. engine combustion, Engine structure, Fuel admission system, Air intake system, Engine cooling system, Lubrication system, Engine starting system, I.C. engine in steam plant-Features and working. 8

### **Ref. Book:**

R.S. Khurmi – Thermal Engineering

# MANUFACTURING PROCESS

(DME-404)

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## UNIT-I

### GENERAL FORMING PROCESSES:

Classification and elementary idea of metal forming processes on the basis of the properties of deformability

(Plasticity), fusibility and divisibility Viz Rolling, Forging, Drawing, Extruding, Spining, Pressing, Punching, Blanking.

6

### WELDING:

Weldedge preparation, Introduction to various welding processes with procedure equipments and applications

such as

(i) Electric arc welding.

(ii) Resistance welding-Spot welding, Flash butt, Percussion welding.

(iii) Thermit welding.

(iv) Carbon arc welding

(v) Metal-Inert-Gas welding (MIG).

(vi) Tungsten arc welding (TIG).

(vii) Atomic Hydrogen arc welding.

(viii) Stud welding.

(ix) Laser Beam, Electrom Beam Welding, Exploison Welding, Ultrasonic Welding.

(x) Under water welding

(xi) Submerged Arc welding

10

## **UNIT-II**

### **WELDING:**

Definition, arc initiation, arc structures, types of arc, metal transfer characteristics and influencing parameters, weld bead geometry, various types of electrodes used in various processes. Selection of electrode from catalogue, current and voltage setting from welder's hand book.

### **WELDING OF SPECIAL MATERIALS:**

- (i) Welding of plastics, equipment, filler, rods, weldability, procedures and precautions.
  - (ii) Welding of Grey Cast Iron, shielded metal arc gas welding procedures.
  - (iii) Welding of Aluminum, Argon arc and gas welding procedures.
  - (iv) Welding of copper, Brass and Bronze, Gas shielded metallic arc welding, TIG. Oxyacetylene method.
  - (v) Welding of Alloy steels welding, Stainless steel, welding by oxyacetylene process, MIG, TIG.
- Specification of electrode as per latest I.S. code. 10

### **TESTING OF WELDS & RELEVANT WELDING CODES:**

- (a) Destructive methods.
- (b) Non destructive methods-visual, X-ray, Gamma-ray, Magnetic particles, flaw detection, fluorescent, Dye penetrant and ultrasonic testing. 6

## **UNIT-III**

### **COST ESTIMATION OF WELDING:**

Material cost, Fabrication cost, Preparation cost, Welding cost and Finishing cost, Over head cost, Cumulative effect of poor practices on cost, Calculation of cost of welding gas consumption and Welding electrodes. 8

### **FOUNDRY PRACTICE:**

#### **PATTERN AND MOULDING:**

The pattern materials used, Types of patterns, Allowances and pattern layout, Colour scheme pattern defects, Types of cores and their utility. 8

## **UNIT-IV**

### **MOULDING PROCESS**

Classification of mould materials according to characteristics, Types of sands and their important test, parting powders and liquids. Sand mixing and preparation, Moulding defects. 8

### **MELTING AND POURING:**

Fuels and metallic materials used in foundry. Melting furnaces used in foundry such as pit furnace, Tilting

and cupola furnaces, metals and alloys. Additions to molten metal, Closing and pouring of the moulds.

Coring-up, venting and closing, use of ladles, spur and risers, Defects due to closing and spuring. Basic idea

of fettling operations. Surface treatment, Salvaging of castings, Factors determining soundness of casting.

Handling of molten metal from furnace to mould. 8

## **UNIT-V**

### **SPECIAL CASTING:**

Elementary idea of special casting processes-Shell mould casting, die casting, investment mould casting, Centrifugal and continuous casting full mould casting. Elementary idea of mechanisation of foundries.

### **ESTIMATING AND COSTING:**

Calculation of material cost for casting and Forging.

8

### **POWDER METALLURGY:**

Introduction, principle, scope and names of processes. Production of metal powders, compaction, sintering and sizing. Self lubricated bearings. Advantages of the process and its limitations. (Elementary concept only).

### **Ref. Books :**

Advanced Welding Technology – M.I. Khan

Manufacturing Processes – Kalpak Jian

Manufacturing Science – K.M. Moeed.

# BASIC ELECTRONICS ENGINEERING

(DME-405)

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## UNIT-I

### Semiconductor Diode

**Mechanism of Conduction in Semiconductors:** Mobility and Conductivity, Electron and holes in an intrinsic semiconductors, Donor and Acceptors impurities, Fermi level, Carrier densities in semiconductor, drift of carrier in electric and magnetic field, Diffusion and Recombination.

### Junction diode

PN Junction characteristic, Depletion layer, Diode resistance, Capacitance, Switch time Breakdown mechanism, Zener and Avalanche breakdown Characteristics.

### Diode as circuit Element

Half wave and full wave rectifies, Filters, Zener Diode regulated power supplies The diode clamper, clipper and multiplier circuits special diode I.E.D. Schottkydiode.

## UNIT-II

### BJT characteristics and circuits

Basic characteristic of NPN, PNP transistor, CE, CB,CC configurations, transistor biasing, biasing analysis and stability. Transistor hybrid equivalent circuits, transistor amplifier and its small signal low frequency analysis using hybrid equivalent circuits, Feed back amplifiers.

## UNIT-III

### Field Effect Transistor

**JEET:** Characteristic, equivalent circuit, basic amplifier circuits.

**MOSFET :** Enhancement & depletion types, N-Channel, P-Channel.

DC Characteristic, use of MOSEFT as a switch and as an amplifier.

## **UNIT-IV**

### **Switching Theory & Logic gates**

Number system, Boolean algebra, Logic gates, Canonical forms, Minimization  
Of logical function using Karnaugh map.

## **UNIT-V**

### **Operational Amplifiers**

Concept of ideal operational amplifier (inverting and non-inverting) and its  
Applications, inverter, integrator, differentiator, voltage follower, summing  
And differential amplifier.

### **Electronic Instrument**

Multimeter, CRO and its applications.

### **Books Recommended :**

1. L. Millman & A. Grabel : Microelectronics, TMII 1999
2. R.L. Boylestad & I. Nashelesy: Electronic Devices & Circuit  
Theory, PIII 1998
3. B.G. Bueetman & Banerjee: Solid State Electronics devices PIII 2001
4. Milliman & Halkias: Integrated Electronics TMII 1996.



## HYDRAULICS LAB

(DME-451)

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Any Ten

### **A. Demonstration of the following for study & sketch.**

1. Piezometer tube, Mechanical flow meter, Manometers, Pressure gauge.
2. Hydraulic ram, press and jack.
3. Pelton wheel and Francis turbine or their model.
4. Centrifugal and Reciprocating pumps.

### **B. Performance Experiments:-**

5. Measurement of discharge over notches and its verification.
6. To determine coefficient of discharge of a Venturimeter.
7. To determine coefficient of contraction, coefficient of velocity and coefficient of discharge for a given orifice.
8. To determine the loss of head of water due to friction in a water pipe line.
9. To study performance
  - i. Pelton Wheel
  - ii. Francis Turbine.
10. To study the performance of a
  - i. Centrifugal Pump
  - ii. Reciprocating Pump.
  - iii. Gear Pump
11. To measure the velocity of water flow in a open channel by a current meter
12. To verify Bernoulli's theorem.

## **WORKSHOP (MANUFACTURING PROCESSES)**

**(DME-452)**

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### **I. FOUNDRY PRACTICE (WORKSHOP):**

Minimum work in each section is indicated against that

#### **1. PATTERN MAKING:**

(a) Making Patterns (At least two).

(i) Solid one piece pattern.

(ii) Split two piece pattern.

(iii) Split three piece pattern.

(iv) Gated pattern.

(v) Four Piece pattern.

(vi) Sweep pattern.

(vii) Skeleton pattern.

(viii) Segmental pattern.

(b) MAKING CORE BOXES (At Least 2 ) For:

(i) Straight Core Box.

(ii) Bent Core Box.

(iii) Unbalanced Cores.

#### **2. SAND PREPARATION AND TESTING:**

(a) Sand Testing (At Least 2 Experiments).

(i) Grading (Grain Size).

(ii) Determination of Moisture content

- (iii) Determination of Clay content.
- (iv) Determination of Permeability for gases.

(b) Preparation of :

- (i) Green Sand Composition.
- (ii) Dry Sand Composition.
- (iii) Loam Sand Composition.
- (iv) Oil Sand For Cores.

### **3. MOULDING:**

(a) Making at least 8 sands moulds of different forms with different types of pattern using.

- (i) Floor Moulding.
- (ii) Two Box Moulding.
- (iii) Three Box (or more) Moulding.

(b) At least one of the following :

- (i) Making and setting of cores of different types.
- (ii) Making one shell mould apparatus.

### **4. MELTING AND POURING:**

(Each to be Demonstrated at least once in the session).

(a) Demonstration of Melting of cast iron in

- (i) Pit Furnace.
- (ii) Cupola.

(b) Demonstration of melting a Non-Ferrous metal in:

- (i) Pit Furnace.
- (ii) Tilting Furnace.

(c) Pouring of Metals in Moulds (Ferrous and Non Ferrous).

## **5. CLEANING, INSPECTION AND NON DESTRUCTIVE TESTING:**

- (a) Shaking, cleaning and fettling of casting (At least 2 casting).
- (b) (i) Inspection of cast component (visual) and preparing inspection report (At least one report).
- (ii) Establishing cause of Defects seen (At least one cause).
- (iii) Dye penetration test for casting
- (iv) Magnetic flw detection test/Ultra sound flaw detection test for castings.

## **6. CASE STUDY OF:**

At least 2 sand casting products from sand preparation, pattern layout to final finished casting by shell moulding, centrifugal casting, investment casting and continuous casting.

## **7. ADVANCE WELDING SHOP :**

(a) Study of various Gas cutting and welding equipments: - Welding transformer, Generator/rectifier, Gas cylinder, Gas cutting machines, Cutting torches etc., various electrodes and filler metals and fluxes.

Practice of welding and cutting of different metals by making suitable jobs by different methods:-

1. Arc Welding practice of mild steel (M.S.) and Spot welding on stainless steel jobs.
2. Tig Welding practice of Non-Ferrous metals, like Copper, Brass and Aluminum.
3. Practice of Gas cutting manually.
4. Practice of Gas cutting by cutting machine.
5. Practice of Arc cutting.
6. Study of Welding defects.
7. Inspection and Tests of welded joints.
8. Practice of Spot and Seam welding.
9. Practice of Welding pipe joints, Pipes and Pressure vessels.

# BASIC ELECTRONICS LAB

(DME-455)

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## Perform any 10 experiments:-

1. Semiconductor diode: identification of types of packages, terminals and noting different ratings using data books for various types of semiconductor diodes (germanium, point contact, silicon low power and high power and switching diode).

2. Rectifier circuits using semiconductor diode measurement of input and output voltage and plotting of input and output wave shapes:

i) Half wave rectifier

ii) Full wave rectifier (centre tapped and bridge rectifier circuits).

3. Plot the wave shapes of a full wave rectifier with shunt capacitor, series inductor, and filter circuit

4. Transistor Biasing Circuits Measurement of operating point ( $I_C$  and  $V_{CE}$ ) for a

i) Fixed bias circuit

ii) Potential divider biasing circuit.

(Measurement can be made by changing the transistor in the circuit(s) by another of same type number.

5. Single stage common emitter amplifier circuit

i) Measurement of voltage gain at 1 KHZ for different load resistances.

ii) Plotting of frequency response of a single stage amplifier circuit.

iii) Measurement of input and output impedance of the amplifier circuit.

6. To measure the overall gain of two stage R.C coupled amplifier at 1 KHZ and note the effect of loading of second stage on the first stage.

7.(a) To plot the load Vs output power. Characteristic to determine the maximum signal input for undistorted signal output.

(b) The above experiment is to be performed with single ended power amplifier, transistorized push pull amplifier. Complementary symmetry power amplifier.

8. To observe the effect of a by-pass capacitor by measuring voltage gain and plotting frequency response for a single stage amplifier.

9. To measure input and output impedance of a feedback amplifier with and without by-pass capacitor.

10. Measurement of voltage gain, input and output impedance and plotting of frequency response of an emitter follower circuit.

11 Plot the FET characteristics and determination of its parameters from these characteristics.

12. To determine the range of frequency variation of a RC phase shift oscillator.

13. To test adjustable IC regulator and current regulator.

14. Identification of Some Popular IC of 74 and 40 series with Pin Number and other details.

15. Application and use of Multimeter, CRO, Audio Oscillator and Power Supply (D.C.)