

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM**PROGRAMME : DIPLOMA IN CE/ME/EE/EC/IT/CM /MT/PK/AU****LEVEL NAME : BASIC SCIENCE COURSES****COURSE CODE : PH 1201****COURSE TITLE : ENGINEERING PHYSICS****PREREQUISITE : NIL****TEACHING SCHEME: TH :04; TU :00; PR :02; TOTAL CREDITS: 06 (Hrs/Week)****(1 CREDIT = 1 CLOCK HR.)****EVALUATION SCHEME:**

MARKS	THEORY			TUTORIAL/PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	80	20	100	---	25@	NIL	125
MIN.	32	--	40	---	10	---	---

(# - External & Internal Assessment ; @ - Internal Assessment only)**TIME ALLOTTED FOR TERM EXAM : 03 HRS.****TIME ALLOTTED FOR PROGRESSIVE TEST : 01 HR.****❖ RATIONALE :**

Engineering Physics is one of the basic science subject is required for engineering courses. Engineering is the entirely meant for comfort of human beings. The different streams of physics provides fundamental facts, principals and laws are very helpful in having better understanding of the other technology courses.

❖ OBJECTIVES :**Students will be able to –**

- Measure given dimensions by using appropriate instruments accurately.
- Analyze relation among pressure, volume and temperature of gas and interpret the results.
- Identify good and bad conductors of heat.
- Properties light energy, sound energy and types of waves.
- Identify the properties of LASER and photoelectric effects and application.
- Characteristics of X-ray spectrum and application of X-ray.
- Properties of Nanomaterials and application of Nanotechnology.

❖ SKILLS :**The students will be able to**

- Select proper measuring instruments on the basis of range and its least count.
- Calibrate different measuring instrument.
- Transform one unit from one system to another system of unit.
- Test physical properties for practical application.
- Verify the principal and laws.

CONTENTS :**A. THEORY :**

SR. NO.	CHAPTER		MARKS	HOURS
1	UNITS AND MEASUREMENTS		06	04
	1.1	Need of measurement		
	1.2	Requirements of standard units		
	1.3	System of units		
	1.4	Least count and range of instruments: Vernier caliper, micrometer screw gauge and spherometer		
	1.5	Accuracy, precision, error and estimation of error		
	1.6	Rules and identification of significant figures		
2	GENERAL PROPERTIES OF MATTER		06	06
	2	ELASTICITY		
	2.1	Elasticity, Plasticity, Rigidity		
	2.2	Molecular theory of elasticity		
	2.3	Elastic limit and Hook's law, types of stress and strain		
	2.4	Types of modulus of elasticity		
	2.5	Behavior of wire under continuous increasing load		
3	3	SURFACE TENSION	06	06
	3.1	Molecular force, cohesive and adhesive force,		
	3.2	Laplace's molecular theory, definition of surface tension.		
	3.3	Angle of contact and capillary action(no derivation)		
4	3.4	Effect of impurity and temperature on surface tension	06	05
	4	VISCOSITY		
	4.1	Viscous force, Definition of viscosity, Newton's law of viscosity		
	4.2	Velocity gradient, streamline flow, turbulent flow, critical velocity		
	4.3	Reynolds's number and its significance		
	4.4	Stoke's law, statement and formula (no derivation)		
5	4.5	Coefficient of viscosity and S.I. unit	06	04
		HEAT		
	5	TRANSMISSION OF HEAT AND EXPANSION OF SOLIDS		
	5.1	Three modes of transmission of heat- conduction, convention, radiation		
	5.2	Good and bad conductor of heat with examples, Law of thermal conductivity and S.I. units		
6	5.3	Definition of linear, aerial and cubical expansion, relation between them (no derivation)	06	04
	6	GAS LAWS AND SPECIFIC HEATS OF GASES		
	6.1	Boyles law, Charle's law, Gay Lussac's law, absolute zero temperature, Kelvin scale of temperature		
	6.2	General gas equation(statement only), two specific heats of gases, relation between them.		
7	6.3	Isothermal and adiabatic expansion of gas	06	05
		LIGHT, LASER AND SOUND		
	7	PROPERTIES OF LIGHT		
	7.1	Reflection, refraction, Snell's law, physical significance of refractive index		

	7.2	Definition of dispersion, polarization, diffraction of light		
	7.3	Principal of super position of waves, interference of light, constructive and destructive interference		
8	8	LASER	06	04
	8.1	Properties of laser, spontaneous and stimulated emission		
	8.2	Population inversion, optical pumping		
	8.3	Construction and working of He-Ne laser.		
9	9	SOUND	06	06
	9.1	Definition of wave motion, amplitude, period, frequency & wavelength, relation between velocity, frequency & wavelength		
	9.2	Equation of progressive wave (no derivation), longitudinal and transverse wave.		
	9.3	Definition of stationary wave, node and antinode, forces and free vibration, definition of resonance with example		
	9.4	Formula for velocity of sound with end correction (no derivation)		
10	10	CURRENT ELECTRICITY AND THERMO ELECTRICITY	08	06
	10.1	Ohm's law, specific resistance, Wheatstone bridge		
	10.2	Meter bridge, potentiometer, principle of potentiometer		
	10.3	Comparison of EMF of two cells by single cell method and double cell method.		
	10.4	Heating effect of electric current, Joule's law		
	10.5	Seeback's effect and Peltier effect		
11	MODERN PHYSICS		06	04
	11	PHOTO ELECTRICITY		
	11.1	Concept of photons, Planck's hypothesis, properties of photons, photoelectric effect		
	11.2	Work function, Einstein's photoelectric equation		
	11.3	Photoelectric cell, working and application		
12	12	X-RAY	06	05
	12.1	Introduction to X-ray, production of X-ray using Coolidge tube		
	12.2	Properties of X-rays, engineering, medical and scientific application		
13	13	NANOTECHNOLOGY	06	04
	13.1	Definition of nanoscale, nanometer, nanoparticle, definition and example of nanostructured materials		
	13.2	Application of nanotechnology in electronics, automobiles, medical, textile, cosmetics, environmental, space and defense.		
Total			80	64

B. LIST OF PRACTICALS/LABORATORY EXPERIMENTS/ASSIGNMENTS:

S.No.	Title of Practical/Lab.Work/Assignments	Hrs.
1.	To use Vernier caliper for measurement of length and diameter of given object.	2
2.	To use micrometer screw gauge for measurement of diameter and thickness of the given object.	4
3.	To calculate surface tension of liquid by capillary rise method by using travelling microscope.	2
4.	To determine young modulus by Searl's method.	2
5.	To determine coefficient of viscosity of liquid by Stoke's method.	4

6.	To determine total internal reflection by glass slab.	2
7.	To determine velocity of sound by resonance tube method.	2
8.	To determine specific resistance of given wire by meter bridge.	2
9.	To compare EMF of two cells by single cell method using potentiometer.	2
10.	To compare EMF of two cell by sum and difference method using potentiometer.	4
11.	To determine Joule's mechanical equivalent of heat by electrical method.	2
12.	To determine specific resistance of material of a given wire by Voltmeter-Ammeter method.	2

❖ **ASSESSMENT OF LABORATORY EXPERIMENT/ASSIGNMENTS :**

Continuous assessment of Term Work .

❖ **SUGGESTED IMPLEMENTATION STRATEGIES :**

1. Lecture method
2. Improved lecture method.
3. Q & A technique.
4. Demonstration
5. Case study
6. Seminars
7. Field visit

❖ **SUGGESTED LEARNING RESOURCES :**

1. **PRINT :**

A) Text books

1. Applied Physics by Praakash Manikpure, S. Chand Publication.
2. Basic Physics by D. T. Gaikawad, S. Chand Publication.
3. Basic Physics by V. S. Thakre and others by Vision Publication.
4. Test book of Engineering Physics by M. N. Avadhanulu.

B) Reference books

1. Fundamental Physics by David Halliday, Wiley Publication.
2. Fundamental of magnetism and electricity by Vasudeva, S. Chand Pub.

C) Manuals/Journals.

2. **NON PRINT :** CDs / PPT / Transparencies / Charts / Models

C. **SPECIFICATION TABLE :**

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
1	Units and Measurements	09	03	03	03	09
2	Elasticity	09	03	05	02	09
3	Surface Tension	09	03	04	02	09
4	viscosity	09	03	04	02	09
5	Transmission of Heat	09	03	04	02	09
6	Gas laws and Sp. Heat	09	03	04	02	09
7	Properties of Light	09	03	04	02	09
8	LASER	09	03	04	02	09
9	Sound	09	03	04	02	09

10	Current Electricity	12	03	05	04	12
11	Photo electricity	09	03	03	03	09
12	X-rays	09	02	03	04	09
13	Nanotechnology	09	02	03	03	09
Total		120	37	50	33	120

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	M. K. Malke	I/C Physics Department	Govt.Poly, Nagpur
2.	Dr. K. S. Moon	Assistant Professor	Dharampeth Science College, Nagpur
3.	Mrs. Gupte	Lecturer in Physics	Datta Meghe Polytechnic, Nagpur
4.	Miss. F. I. Beig	Lecturer in Physics	NIT Engineering college, Nagpur.
5.	Mr. Nishant Tayade	Lecturer in Physics	NIT Polytechnic college, Nagpur
6.	Mrs. S. M. Kapse	Visiting Lecturer in Physics	Govt.Poly
7.	Miss. S. M. Dafe	Visiting Lecturer in Physics	Govt.Poly
8.	Mr. A. S. Lihitkar	Visiting Lecturer in Physics	Govt.Poly

(Member Secretary PBOS)

(Incharge- Physics)

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COURSE CURRICULUM**PROGRAMME : DIPLOMA IN CE/ME/AU/PK/MT/EE/EC****LEVEL NAME : BASIC SCIENCE COURSES****COURSE CODE : CH 1201****COURSE TITLE : ENGINEERING CHEMISTRY****PREREQUISITE : NIL****TEACHING SCHEME: TH :04; TU :00; PR :02; TOTAL CREDITS: 06 (Hrs/Week)****(1 CREDIT = 1 CLOCK HR.)****EVALUATION SCHEME:**

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MIN.	32	--	40	---	10	---	---

(# - External & Internal Assessment ; @ - Internal Assessment only)**TIME ALLOTTED FOR TERM EXAM : 03 HRS.****TIME ALLOTTED FOR PROGRESSIVE TEST : 01 HR.****❖ RATIONALE :**

Engineering chemistry is one of the important course in engineering field. The principles of Chemistry have wide applications in all the branches of engineering .By learning this course the student may select the proper materials . It is helpful in having better understanding of other technology courses.

❖ OBJECTIVES : The students will be able to understand

1. Structure of atom
- 2 Applications of electrolysis in engineering
3. Importance of various materials used in engineering .
4. Difference between soft and hard water , PH value and it' s importance.
5. Use of metals and alloys in engineering field.
6. Properties of Non metallic engg. material
7. Lubricants used in engg.

❖ SKILLS :

The student will be able to -

1. Develop analytical skills for various analysis
2. Analyse the water sample (Acidity, alkalinity , hardness ,PH value)
3. Find the percentage of iron in given ferrous alloy
4. Prepare Bakelite plastic.
5. Compare rate of corrosion

CONTENTS :**A. THEORY :**

SR. NO.	CHAPTER		MARKS	HOURS
1.	ATOMIC STRUCTURE		12	10
	1.1	Definition of Atom, Fundamental Particles of Atom – their Mass,		

		Charge, Location.		
	1.2	Definition of Atomic no, Atomic Mass no., Isotopes & Isobars, & their distinction with suitable examples.		
	1.3	Postulates of Bohr's Theory		
	1.4	Definition, Shape of the orbitals & distinction between Orbits & Orbitals.		
	1.5	Hund's Rule, Filling Up of the Orbitals by Aufbau's Principle (till Atomic no. 30).		
	1.6	Definition & types of valency (Electrovalency & Covalency).		
	1.7	Octet Rule, Duplet Rule.		
	1.8	Formation of Electrovalent e.g. NaCl, CaCl ₂ , MgO, AlCl ₃ .		
	1.9	Formation of Covalent Compounds CO ₂ , H ₂ O, Cl ₂ , NH ₃ , C ₂ H ₄ , N ₂ , C ₂ H ₂ .		
	1.10	Distinction between electrovalent & covalent compounds.		
2.	ELECTROCHEMISTRY		12	10
	2.1	Definition & differentiation of Atom, Ion. Definition of Ionisation & Electrolytic dissociation.		
	2.2	Arrhenius Theory of Ionisation.		
	2.3	Degree of Ionisation & factors affecting degree of ionization.		
	2.4	Significance of the terms involved in Electrolysis- Such as Conductors, Insulators, Dielectrics, Electrolyte, Non Electrolyte, Electrolysis, Electrolytic Cell, Electrodes.		
	2.5	Mechanism of Electrolysis – Primary & Secondary Reactions at Cathode & Anode.		
	2.6	Electrochemical Series for Cations & Anions, Electrolysis of CuSO ₄ Solution by using Cu Electrode & Platinum Electrode.		
	2.7	Electrolysis of NaCl solution & fused NaCl by using carbon electrode.		
	2.8	Faraday's first & second law of Electrolysis & Numericals.		
	2.9	Electrochemical Cells & Batteries, Definition, types such as Primary & Secondary Cells & their examples. Construction, Working & Applications of Dry Cell & Lead – Acid Storage Cell. Types of batteries and their comparison.		
	2.10	Applications of Electrolysis such as Electroplating & Electro refining.		
3.	WATER		16	10
	3.1	Characteristics, Sources, Impurities, Hard & Soft Water, Causes of Hardness, Types of Hardness.		
	3.2	Degree of Hardness & its units.		
	3.3	Ill Effects of Hard Water in Industries, Domestic Field.		
	3.4	Ill Effects of Hard Water in Steam Generation, Scale & Sludge Formation – Causes, Disadvantage & Removal.		
	3.5	Softening Methods such as Boiling, Clark's, Lime Soda.		
	3.6	Permutite (Zeolite) process with Principle & Chemical Reactions.		
	3.7	Ion Exchange Methods with Principle & Chemical Reactions		
	3.8	Characteristics of Potable Water – Its treatment by Screening, Sedimentation, Coagulation, Filtration,		
	3.9	Sterilization with Principle, Process & Chemical Reactions.		
	3.10	pH & Its Applications in Engineering, Numericals.		
4.	METALS & ALLOYS		12	10
	4.1	Occurrence of metals, definitions of mineral, ore, Examples of ores in the form of oxides, sulphides and Carbonates. Gangue, flux, slag.		

	4.2	General physical methods of concentration of ore (gravity separation, froth floatation & magnetic separation method) Chemical methods of concentration of ore (Calcinations & Roasting)		
	4.3	Extraction of Iron by using blast furnace . Reaction in blast furnace		
	4.4	Steel , its classification on the basis of percentage of carbon & their physical properties and applications . Physical properties and applications of some commonly used metals such as Fe , Cu , Al , Ni , Cr , Sn , Zn , W. in industries		
	4.5	Alloys : Definition . Preparation of alloy by fusion method. Purposes of making alloys.		
	4.6	Classification of Alloys i) Ferrous and non ferrous alloys.		
	4.7	Alloy steel and their applications. (Heat resisting steel , magnetic steel , stainless steel and High speed steel.)		
	4.8	Non ferrous alloys: Compositions , properties and applications of a) Duralumin b) Phosphor Bronze c) Monel metal d) Wood's metal. e) Babbit metal.		
5.	CORROSION		08	08
	5.1	Definition, Types, Atmospheric or Chemical Corrosion, Mechanism, Factors Affecting Atmospheric Corrosion		
	5.2	Immersed Corrosion or Electrochemical Corrosion, Factors Affecting Electrochemical Corrosion		
	5.3	Mechanism of Electrochemical Corrosion		
	5.4	Protection of Metals by Purification of Metals, Alloy Formation, Cathode Protection, Controlling the External Conditions & Application of Protective Coatings like metal coating by -		
	5.4.1	Galvanising, Tinning, Sherardizing		
	5.4.2	Metal Spraying,		
	5.4.3	Paint, App Metal Cladding.		
	5.5	Cementation or Diffusion Method, their Definition, Procedure, Uses, Advantages & Disadvantages. Examples of Non Corrosive Materials.		
6.	NON METALLIC MATERIALS		12	08
	Plastics			
	6.1	Definition of Plastic, Formation of Plastic by Addition & Condensation Polymerisation by giving e.g. of Polyethylene & Bakelite plastic Respectively		
	6.2	Types of Plastic, Thermosoftening & Thermosetting Plastic, with Definition, Distinction & examples.		
	6.3	Compounding of Plastics – Resins, Fillers, Plasticizers, Accelerators, Pigments & their examples. Engineering Applications of Plastic based on their properties.		
	Rubber			
	6.4	Natural Rubber: Its Processing, Drawbacks of Natural Rubber, Vulcanisation of Rubber with Chemical Reaction.		
	6.5	Synthetic Rubber: Definition, & e.g, Distinction Between natural & synthetic rubber.		
	6.6	Properties of rubber such as elasticity, tack, abrasion resistant, stress & strain and related engg. application.		
	Thermal Insulating Materials			
6.7	Definition & Characteristics of Thermal insulators. Preparation, Properties & Applications of Thermocole & glasswool.			

	6.8	Properties & Applications of Asbestos, Cork & varnish.		
7.	Lubricants		08	08
	7.1	Definition, Types of Lubricants, Functions of Lubricants.		
	7.2	Lubrication : Types of lubrication.1)Fluid film lubrication 2)Boundary lubrication.3) Extreme pressure lubrication.		
	7.3	Characteristics of Lubricants.- Viscosity, viscosity index, oiliness, flash and fire point		
	7.4	Volatility, cloud and pour point. neutralization number , emulsification		
	7.5	Selection of Lubricant for various types of machines such as I.C engine ,steam engine cylinder		
	7.6	Gear system ,cutting tools		
	7.7	Delicate and simple machines, tractors and rollers		
Total			80	64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

S.No.	Title of Practical/Lab.Work/Assignments	Hrs.
1.	To Determine degree of hardness of water by EDTA Method.	02
2.	To Determine Chloride content in a given sample of water.	02
3.	To Determine alkalinity of given sample of water. (OH^- , CO_3^{2-} HCO_3^-)	02
4.	To Estimate iron in the ferrous alloy by KMnO_4 method.	02
5.	To find the Electrochemical equivalent (e.c.e) of Copper.	02
6.	To perform electrorefining of copper.	02
7.	To prepare Phenol formaldehyde plastic.	02
8.	To Determine PH value of water by Lovibond comparator/_ PH meter.	02
9.	To Determine coefficient of viscosity of given oil. By Ostwalds viscometer.	02
10.	To determine acid value of a plastic material by using KOH/NaOH solution	02
11.	To observe the process of corrosion of given Aluminium strip in acidic and basic medium and find relation between decrease in weight due to corrosion	02
12.	Study Experiments : - To draw electronic configuration and Orbital Electronic configuration of following atoms:- Na ,O ,Cl ,F, Al ,K ,and Ca . - To draw electronic diagram of following molecules NaCl, CaCl_2, MgO , NH_3, CO_2, H_2O, CH_4 , C_2H_4, C_2H_2, N_2, O_2, Cl_2. - Flow sheet of extraction of metal from its ore . - Labeled diagram of Blast furnace with Chemical reaction .in different zones. - Chart showing properties & uses of common metals such as Fe ,Cu ,Al ,Ni ,Cr , Sn ,Zn ,W. To draw labeled diagram of Mechanism of electrochemical corrosion (Hydrogen evolution and Oxygen absorption)	10 (02 hrs. each)

❖ **ASSESSMENT OF LABORATORY EXPERIENCES/ASSIGNMENTS :**

Continuous assessment of Term Work .

❖ **SUGGESTED IMPLEMENTATION STRATEGIES :**

- Lecture method**
- Improved lecture method.**
- Q & A technique.**
- Demonstration**
- Case study**

❖ SUGGESTED LEARNING RESOURCES :

1. **PRINT** : Text books/Reference books/Manuals/Journals.
2. **NON PRINT** : CDs / PPT / Transperencies / Charts / Models

C. SPECIFICATION TABLE :

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
1.	Atomic Structure	18	06	06	06	18
2.	Electrochemistry	18	06	06	06	18
3.	Water	24	10	08	06	24
4.	Metals & Alloys	18	08	06	04	18
5.	Corrosion	12	04	04	04	12
6.	Non Metallic Materials	18	08	06	04	18
7.	Lubricant	12	04	04	04	12
Total		120	46	40	34	120

D. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Introduction to Engineering Chemistry	Minaxi B Lohani, Upma Misra. S.Chand Publication	81-219-3505-9
2.	Engineering Chemistry	B.Sivasankar, McGraw Hill Publ. 2008	9780070669321
3.	S.Chand's – Basic Chemistry	D.T.Gaikwad, A.S Wekhande, S.Chand Publication 2010	81-219-3515-15
4.			

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Dr.P.J.Sondawale	Lecturer in Chemistry.	Govt.Polytechnic,Nagpur
2.	Prof. S.R.Gaidhar	Lecturer in Chemistry.	Govt.Polytechnic,Nagpur
3.	Prof.M.B.Deshmukh.	Lecturer in Chemistry	Shri Datta Meghe Polytechnic,Nagpur

(Member Secretary PBOS)

(HOD-Chem.)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM**PROGRAMME : DIPLOMA IN CE/ME/AU/PK/MT/EE/EC/IT/CM****LEVEL NAME : GENERAL STUDIES****COURSE CODE : MH1201****COURSE TITLE : BASIC ENGINEERING MATHEMATICS****PREREQUISITE : NIL****TEACHING SCHEME: TH :03 TU :01 PR :00 TOTAL CREDITS: 04 (Hrs/Week)****(1 CREDIT = 1 CLOCK HR.)****EVALUATION SCHEME:**

MARKS	THEORY			TUTORIAL/PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	80	20	100	NIL	25@	NIL	125
MIN.	32	--	40	---	10	---	---

(# - External & Internal Assessment ; @ - Internal Assessment only)**TIME ALLOTTED FOR TERM EXAM : 03 HRS.****TIME ALLOTTED FOR PROGRESSIVE TEST : 01 HR.****❖ RATIONALE :**

The subject is classified under basic sciences and intends to teach students basic facts, concepts and principles of Mathematics as a tool to analyze Engineering problems. Mathematics lay down the foundation for understanding core Technology subjects.

❖ OBJECTIVES :

- This subject helps the students to develop logical thinking which is useful in comprehending the principles of all other subjects.
- Analytical and systematic approach towards any problem is developed through learning of this subject.
- Mathematics being a versatile subject can be used at every stage of Human Life.

CONTENTS :**A. THEORY :**

SR. NO.	CHAPTER		MARKS	HOURS
1.	LOGARITHM		06	04
	1.1	Definition of Logarithm		
	1.2	Definition of Natural and Common Logarithm		
	1.3	Laws of Logarithm, Change of base formula		
	1.4	Examples based on 1.1,1.2&1.3		
2.	PARTIAL FRACTIONS		06	04
	2.1	Definition of Rational Fraction, Proper, Improper and Partial Fraction		
	2.2	Resolving Rational Fraction into Partial Fractions		
	2.2.1	Denominator containing non repeated linear factors		
	2.2.2	Denominator containing repeated linear factors		
	2.2.3	Denominator containing irreducible non repeated quadratic factors		

3.	DETERMINANTS		06	04
	3.1	Definition of Determinant		
	3.2	Order of Determinant		
	3.3	Expansion of Determinant of order 2 and 3		
	3.4	Cramer's Rule :Solution of simultaneous equations in 3 unknowns		
4.	BINOMIAL THEOREM		06	04
	4.1	Definition of Factorial Notation		
	4.2	Definition of Permutation and Combination with formula		
	4.3	Binomial Theorem for positive index		
	4.4	General Term, Middle Terms and Term independent of x		
	4.5	Approximate value (simple examples)		
5.	TRIGONOMETRY : I		08	04
	5.1	Trigonometric Ratios of any angle		
	5.2	Relation between degree and radian		
	5.3	Fundamental Identities		
	5.4	Examples based on Fundamental Identities		
6.	TRIGONOMETRY : II		16	10
	6.1	Trigonometric Ratios of Allied angles		
	6.2	Trigonometric Ratios of Compound angles		
	6.3	Trigonometric Ratios of Multiple and Sub-multiple angles		
7.	TRIGONOMETRY : III		12	06
	7.1	Definition of Inverse Trigonometric Functions		
	7.2	Principle values of Inverse Trigonometric Functions		
	7.3	Relation between Inverse Trigonometric Functions		
8.	CO-ORDINATE GEOMETRY : I		10	06
	8.1	Slope and Intercepts of Straight Line		
	8.2	Equation of Straight Line : Slope-point form , Slope-intercept form , Two points form , Two intercepts form and General Equation		
	8.3	Angle between two Straight Lines		
	8.4	Length of perpendicular from a point on a line		
9.	CO-ORDINATE GEOMETRY : II		10	06
	9.1	Equation of Circle : Standard form , centre radius form & diameter form		
	9.2	General Equation of Circle , it's centre and radius		
	9.3	Equation of Tangent and Normal to the circle		
Total			80	48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Sr.No.	Title of Practical/Lab.Work/Assignments	Hrs.
1.	Logarithm	02
2.	Partial Fractions	02
3.	Determinants : Examples on Determinant of order-3	02
4.	Binomial Theorem	02
5.	Trigonometry : Fundamental Identities	02
6.	Trigonometry : Allied, Compound & Multiple angles	02
7.	Trigonometry : Factorization de-factorization formulae	02

8.	Inverse Trigonometric functions	02
9.	Straight line	01
10.	Circle	01
Total		16

❖ **ASSESSMENT OF LABORATORY EXPERIENCES/ASSIGNMENTS :**

Continuous assessment of Term Work .

❖ **SUGGESTED IMPLEMENTATION STRATEGIES :**

1. **Lecture method**
2. **Improved lecture method.**
3. **Q & A technique.**

❖ **SUGGESTED LEARNING RESOURCES :**

1. **PRINT :** Text books/Reference books/Manuals/Journals.
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C. SPECIFICATION TABLE :

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
1.	Logarithm	09	02	04	02	08
2.	Partial Fractions	09	02	06	00	08
3.	Determinants	09	02	04	04	10
4.	Binomial Theorem	09	04	04	02	10
5.	Trigonometry : I	12	04	04	04	12
6.	Trigonometry : II	24	04	12	08	24
7.	Trigonometry : III	18	04	08	06	18
8.	Co-Ordinate Geometry : I	15	06	06	04	16
9.	Co-Ordinate Geometry : II	15	06	04	04	14
Total		120	34	52	34	120

D. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Mathematics for Polytechnic	S.P.DESHPANDE, Pune Vidyarthi Griha Prakashan	
2.	Plane Trigonometry Part-I	S.L.LONEY, Arihant Prakashan, Meerut	978-81-88222-41-0
3.	Higher Engineering Mathematics	B.S.GREWAL, Khanna Publication New Delhi	81-7409-195-5
4.	Engineering Mathematics	S.S.SASTRY, Prentice Hall of India New Delhi	
5.	Basic Mathematics	D.T .GAIKWAD,S.Chand Publication,New Delhi,first-2011	81-219-3331-5
6.	Higher Algebra	Hall & Knight, New World Education Publisher, New	

Delhi

E. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Dr. K.C.DESHMUKH	Professor & H.O.D.	Department of Maths , R.T.M.University , Nagpur
2.	Dr. P.B. BAHATKAR	Assistant Professor	Y.C.C.E. , Nagpur
3.	Mr.S.M.SAYYED	Lecturer(Selection Grade)	G.P.Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM**PROGRAMME : DIPLOMA IN CE/ME/AU/PK/MT/EE/EC/IT/CM****LEVEL NAME : GENERAL STUDIES****COURSE CODE : MH 1202****COURSE TITLE : ENGINEERING MATHEMATICS****PREREQUISITE : MH1201****TEACHING SCHEME: TH :03 TU :01 PR : 00; TOTAL CREDITS: 04 (Hrs/Week)****(1 CREDIT = 1 CLOCK HR.)****EVALUATION SCHEME:**

MARKS	THEORY			TUTORIAL/PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	80	20	100	NIL	25@	NIL	125
MIN.	32	--	40	---	10	---	---

(# - External & Internal Assessment ; @ - Internal Assessment only)**TIME ALLOTTED FOR TERM EXAM : 03 HRS.****TIME ALLOTTED FOR PROGRESSIVE TEST : 01 HR.****❖ RATIONALE :**

Mathematics is the backbone of Technical courses , Understanding of Engineering concepts require logical approach and thinking. The course is extension of Basic Mathematics of first semester and stepping into the prerequisites to learn Applied Mathematics. Engineering Mathematics lay down the foundation to understand and express principles and laws involved in other Technological subjects.

❖ OBJECTIVES : The students will be able to

- Acquire knowledge of Mathematical terms , concepts , principles and different methods.
- Develop the ability to apply Mathematical methods to solve technical problems , to execute management , plans with precision.
- Acquire sufficient Mathematical techniques necessary for daily and practical problems.

CONTENTS :**A. THEORY :**

SR. NO.	CHAPTER		MARKS	HOURS
1.	FUNCTION AND LIMITS		20	12
	1.1	Definition of Function , value of a function		
	1.2	Types of Functions		
	1.3	Examples based on 1.1 & 1.2		
	1.4	Concept of Limit		
	1.5	Algebra of Limits		
	1.6	Limits of Algebraic Functions		
	1.7	Limits of Trigonometric Functions		
	1.8	Limits of Exponential & Logarithmic Functions		
2.	DERIVATIVES		20	12

	2.1	Definition of Derivative , Notations		
	2.2	Derivative of Standard Functions		
	2.3	Rules for Differentiation (Without Proof)		
	2.4	Derivative of Composite Functions		
	2.5	Derivative of Inverse Trigonometric Functions		
	2.6	Derivative of Implicit Functions		
	2.7	Logarithmic Differentiation		
	2.8	Derivative of Parametric Functions		
	2.9	Second order Differentiation		
3.	APPLICATION OF DERIVATIVE		08	06
	3.1	Geometrical meaning of Derivative		
	3.2	Equation of Tangent & Normal		
	3.3	Maxima & Minima		
	3.4	Radius of curvature		
4.	STATISTICS		16	10
	4.1	Measures of central tendency (Mean only)		
	4.2	Combined Mean		
	4.3	Measures of Dispersion		
	4.4	Range , Mean Deviation , Standard Deviation		
	4.5	Variance and Coefficient of Variation		
	4.6	Comparison of two sets of observations		
5.	MATRICES		16	08
	5.1	Definition of Matrix		
	5.2	Types of Matrices : Null , Row , Column , Square , Diagonal , Scalar , Unit & Triangular Matrix		
	5.3	Algebra of Matrices		
	5.4	Transpose of Matrix , Ad-joint of Matrix & Inverse of Matrix		
	5.5	Solution of system of linear equations 2 & 3 unknowns by Inverse Matrix Method		
Total			80	48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Sr. No.	Title of Assignments	Hrs.
1.	Functions	01
2.	Limits of Algebraic & Trigonometric functions	01
3.	Limits of Exponential & Logarithmic functions	02
4.	Derivative of Simple & Composite functions	02
5.	Derivative of Implicit functions and Logarithmic Differentiation	01
6.	Derivative of Inverse Trigonometric functions & Parametric functions	02
7.	Statistics : Mean & Combined Mean	02
8.	Statistics : M.D., S.D., Variance & Coefficient of variation	02
9.	Matrix : Algebra of Matrices	02
10.	Matrix : Adjoint matrix & solution of simultaneous equations in 3 variables	01
Total		16

❖ **ASSESSMENT OF LABORATORY EXPERIENCES/ASSIGNMENTS :**

Continuous assessment of Term Work.

❖ **SUGGESTED IMPLEMENTATION STRATEGIES :**

1. **Lecture method**
2. **Improved lecture method.**
3. **Q & A technique.**

❖ **SUGGESTED LEARNING RESOURCES :**

1. **PRINT :** Text books/Reference books/Manuals/Journals.
2. **NON PRINT :** CDs / PPT / Transparencies / Charts / Models

C. SPECIFICATION TABLE :

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
1.	Function And Limits	30	08	16	06	30
2.	Derivatives	30	08	16	06	30
3.	Application Of Derivative	12	02	04	06	12
4.	Statistics	24	04	12	08	24
5.	Matrices	24	04	12	08	24
Total		120	26	60	34	120

D. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Mathematics for Polytechnic	S. P. DESHPANDE, Pune Vidyarthi Griha Prakashan, Pune,	
2.	Fundamental Of Mathematical Statistics	S .C .GUPTA & KAPOOR, S.Chand Pulpication, Eleanth-2005	0471262501
3.	Engineering Mathematics	S.S .SHASTRY, Prentice Hall Of India, fourth-2008	978-81-203-3616-2
4.	Calculus: single variable	ROBERT T SMITH, Tata Mcgraw Hill, third-2007	10:0073314196
5.	Engineering Mathematics	D.T.GAIKAWAD, S.Chand Publication, New Delhi, first-2010	81-219-3356-0

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2.	Dr. P. B. BAHATKAR	Assistant Professor	Y.C.C.E. , Nagpur
3.	Mr. S. M. SAYYED	Lecturer (Selection Grade)	G.P.Nagpur

(Member Secretary PBOS)

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GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)
COURSE CURRICULUM

PROGRAMME : DIPLOMA IN CE/ME/AU/PK

LEVEL NAME : BASIC SCIENCE COURSES

COURSE CODE : MH1203

COURSE TITLE : APPLIED MATHEMATICS

PREREQUISITE : MH 1202

TEACHING SCHEME: TH :03; TU :01; PR : NIL TOTAL CREDITS: 04 (Hrs/Week)

(1 CREDIT = 1 CLOCK HR.)

EVALUATION SCHEME:

MARKS	THEORY			TUTORIAL/PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	80	20	100	NIL	25@	NIL	125
MIN.	32	--	40	---	10	---	----

(# - External & Internal Assessment ; @ - Internal Assessment only)

TIME ALLOTTED FOR TERM EXAM : 03 HRS.

TIME ALLOTTED FOR PROGRESSIVE TEST : 01 HR.

❖ **RATIONALE :**

The study of mathematics is necessary to develop in the student the skills essential for studying new technological development. This subject introduces some applications of engineering, through which the student can understand the link of mathematics with engineering principles.

❖ **OBJECTIVES :The student will able to:**

- Apply mathematical term, concept, principles and different methods for studying engineering subjects.
- Apply mathematical methods to solve technical problems.
- Execute management plans with precision.
- Use mathematical techniques necessary for daily & practical problems.

CONTENTS :

A. THEORY :

SER. NO.	CHAPTER		MARKS	HOURS
1.	INTEGRATION		16	10
	1.1	Definition of integration as anti-derivative		
	1.2	Integration of Standard Functions		
	1.3	Rules for Integration		
	1.4	Methods of Integration		
	1.4.1	Integration by Substitution		
	1.4.2	Integration of Rational Functions		
	1.4.3	Integration by Trigonometric Transformation		
	1.4.4	Integration by parts		

2.	DEFINITE INTEGRATION & APPLICATIONS		16	08
	2.1	Definition of Definite integral		
	2.2	Properties of Definite integral		
	2.3	Examples based on 2.1 & 2.2		
	2.4	Applications : Area under the curve , Area bounded by two curves , Volume of revolution , Centre of gravity of a rod , Plane lamina		
3.	DIFFERENTIAL EQUATIONS & APPLICATIONS		20	10
	3.1	Definition of Differential Equation		
	3.2	Order & Degree of Differential Equation		
	3.3	Formation of Differential Equation for function containing single constant		
	3.4	Methods of solving Differential Equations of 1 st & 2 nd order		
	3.4.1	Variable Separable Method , Reducible to Variable Separable		
	3.4.2	Homogenous Differential Equation , Exact Differential Equation		
	3.4.3	Linear and Bernoulli Equations		
	3.5	Applications : Rectilinear Motion (Motion under constant and variable acceleration) , Simple Harmonic Motion		
4.	PROBABILITY DISTRIBUTION		12	08
	4.1	Binomial Distribution		
	4.2	Poisson's Distribution		
	4.3	Normal Distribution		
5.	NUMRICAL METHODS		16	12
	5.1	Solution of Algebraic equation		
	5.1.1	Bisection Method		
	5.1.2	Regula-Falsi Method		
	5.1.3	Newton-Raphson Method		
	5.2	Solution of Simultaneous equations containing 3 unknowns		
	5.2.1	Gauss Elimination Method		
	5.2.2	Iterative Methods : Gauss-Seidal & Jacobi's Method		
Total			80	48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

S.No.	Title of Practical/Lab.Work/Assignments	Hrs.
1.	Integration : Example on substitution method, rational functions	02
2.	Integration : Examples on trigonometric transformations , integration by parts	02
3.	Definite integration	01
4.	Application of definite integral	01
5.	Differential equation	02
6.	Application of differential equation	02
7.	Probability Distribution	01
8.	Probability Distribution	01
9.	Numerical method : Solution of algebraic equations	02
10.	Numerical method : Solution of Simultaneous equations	02
Total		16

❖ ASSESSMENT OF LABORATORY EXPERIENCES/ASSIGNMENTS :

Continuous assessment of Term Work.

❖ **SUGGESTED IMPLEMENTATION STRATEGIES :**

1. Lecture method
2. Improved lecture method.
3. Q & A technique.

❖ **SUGGESTED LEARNING RESOURCES :**

1. **PRINT :** Text books/Reference books/Manuals/Journals.
2. **NON PRINT :** CDs / PPT / Transperencies / Charts / Models

C. SPECIFICATION TABLE :

Chapter No.	Title of Chapter	Marks (1.5 x Marks allotted to chapter)	Distribution of Marks			
			Knowledge	Comprehension	Application	Total
1.	Integration	24	08	12	04	24
2.	Definite Integration & Applications	24	08	08	08	24
3.	Differential Equations & Applications	30	06	14	10	30
4.	Probability Distribution	18	02	04	12	18
5.	Numerical Methods	24	04	08	12	24
Total		120	28	46	46	120

D. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Mathematics For Polytechnic	S.P.DESHPANDE, Vidyarthi Griha Prakashan Pune	
2.	Higher Engineering Mathematics	B.S.GREWAL, Khanna Publication, New Delhi, fourth-2006	13:9788174091956
3.	Calculus: single variable	ROBERT T SMITH, Tata Mcgraw Hill-third-2007	10:0073314196
4.	Applied Mathematics	P .N. WARTIKAR, Pune Vidyarthi Griha, Pune-first 1995	8185825017
5.	Numerical methods For Scientific & Engineering Computations	M.K.JAIN & OTHERS, Wiley Eastern Publication-fifth-	8122420012

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2.	Dr. P. B. Bahatkar	Assistant Professor	Y.C.C.E. , Nagpur
3.	Mr. S. M. Sayyed	Lecturer(Selection Grade)	G.P.Nagpur

(Member Secretary PBOS)

(Incharge - Maths)