GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	**:**	**DIPLOMA IN CE/ME/EE/EC/IT/CM /MT/PK/AE/TX**
LEVEL NAME	**:**	**BASIC SCIENCE COURSES**
COURSE CODE	**:**	**PH201E**
COURSE TITLE	**:**	**ENGINEERING PHYSICS**
PREREQUISITE	**:**	**NIL**
TEACHING SCHEME	**:**	**TH: 04; TU: 00; PR: 02(CLOCK HRs.)**
TOTAL CREDITS	**:**	**05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)**
TH. TEE	**:**	**03 HRs**
PR. TEE	**:**	**02 HRs (Internal)**
PT.	**:**	**01 HR**

❖ RATIONALE:

Engineering physics is an essential part of the educational system and of an advanced society, therefore this course essentially required for engineering courses. The different streams of physics provides fundamental facts, principals and laws are very helpful in having better understanding of the other technology courses which contributes to the technological infrastructure and provides trained personnel needed to take advantage of scientific advances and discoveries. Physics is an exciting intellectual adventure that inspires young people and expands the frontiers of our knowledge about Nature.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply the principal and laws of Physics on physically observable things to their respective disciplines.
2. Illustrate broad ideas about different physical phenomena.
3. Apply fundamental physics in various Engineering fields.
4. Select proper measuring instruments on the basis of range and least count to measure the physical quantities.
5. Calibrate different measuring instruments.
6. Handle instruments carefully to avoid any type of devastation.

❖ **COURSE DETAILS:**

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. General Properties of solids	1. Relate Deformation in bodies by the action of external forces. 2. Identify least count and range of instruments. 3. State hook's law of elasticity. 4. Define different terms related to elasticity. 5. Differentiate accuracy and precision. 6. Describe the types of modules of elasticity. 7. Illustrate the Searle's apparatus. 8. Solve the numerical based on Elasticity.	1.1 Elasticity, Plasticity, Rigidity. Deformation in bodies by the action of external forces, Stress and Strain with their types, Elastic Limit, Hook's Law, yield point, factor of safety, breaking stress, ultimate stress. Applications of elasticity. Types of modulus of Elasticity with relation between them. 1.2 Searle's method to find out Young's modulus of elasticity. Least count and range of instruments: Vernier caliper, outside micrometer screw gauge, Travelling microscope. (Numerical based on above)	**06**
2. General Properties of liquids	1. Define the terms related with general properties of liquid. 2. State the factors affecting surface tension and viscosity. 3. Select the laws of viscosity to find the coefficient of viscosity of freely falling body. 4. Classify the types of flow of liquid with significance of Reynold's number. 5. Illustrate the phenomenon of Capillarity and angle of contact of liquid and glass. 6. Solve the numerical based on general properties of matter.	**2.1**Surface Tension, Factors affecting surface tension, Molecular force, cohesive and adhesive force, Angle of contact with its significance and capillary action (no derivation), Effect of impurity and temperature on surface tension. Application.(Numerical based on above) **2.2** Viscous force, Definition of viscosity, Newton's law of viscosity, Reynolds's number and its significance, critical velocity, streamline flow, turbulent flow, Stoke's law, statement and formula (no derivation), Coefficient of viscosity and S.I. unit. Application.(Numerical based on above)	**08**
3. Transmission of heat and Gas laws	1. List the modes of transmission of heat. 2. Define the terms related to expansion of solid due to heat. 3. State the laws related to gas and specific heat. 4. Describe Mayor's relation. 5. Apply the adiabatic and isothermal expansion for bulk modulus of elasticity. 6. Solve the numerical related to gas laws and heat.	**3.1**Heat: Three modes of transmission of heat- conduction, convention, radiation. Good and bad conductor of heat with examples, Law of thermal conductivity and S.I. units, Coefficient of linear, aerial and cubical expansion, relation between them (no derivation).(Numerical based on above) **3.2** Boyles law, Charle's law, Gay Lussac's law, absolute zero temperature, Kelvin scale of temperature, General gas equation (statement only), two specific heats	**10**

		of gases, relation between them, Mayer's relation. . Isothermal process and adiabatic process(Numerical based on above)	
4. Wave motion and Acoustics	1. Define different terms related to Acoustics. 2. Reproduce the formula for velocity of sound with end correction. 3. Classify the different types of wave by their characteristics. 4. Recognize sound absorbing textile material. 5. Describe the phenomenon of resonance with examples. 6. Describe the Doppler effect and Sabine's formula. 7. Implement the conditions for good acoustics in auditorium. 8. Solve the numerical related to wave motion and acoustics.	4.1 Definition of wave motion, amplitude, period, frequency & wavelength, relation between velocity, frequency & wavelength. Progressive wave, Stationary waves, longitudinal and transverse wave. Node, Antinode. forced and free vibration, definition of resonance with example, procedure to find resonance with the help of tunning fork. Formula for velocity of sound with end correction, various factors which depends on it.(Numerical based on above) 4.2Introduction to Doppler Effect and its applications. Echo, Reverberation, Reverberation Time. Absorption coefficient of material, Sabine's formula for reverberation time, Factors affecting the Reverberation of time and acoustics of building. Sound absorbing materials. (Numerical based on above)	**14**
5. Modern Physics	1. Define the terms related to topics in modern physics. 2. List the properties applications of LASER. 3. State the characteristics of photo electric effect. 4. State the applications related to X-ray, LASER, and photo cell. 5. Implement the photoelectric effect to develop photocell. 6. Illustrate the construction and working of Ruby LASER 7. Describe the production of X-rays. 8. Solve the numerical base on Photo-electricity and X-rays.	5.1 Photon, properties of photons, Planck's hypothesis, Threshold frequency, threshold wavelength and work function, Photoelectric effect with characteristics properties. Principle, Construction and working of Photoelectric cell with applications. Einstein's photoelectric equation. (Numerical based on above) 5.2 Properties of laser, Types of laser, absorption, spontaneous and stimulated emission. Definition of Pumping and its type, Population inversion, Metastable state. Ruby laser: Principle, construction and working. Applications of LASER in Engineering and biomedical Engineering. 5.3Introduction to X-rays, Properties of X-rays, production of X-ray using Coolidge tube. Formula for Minimum wavelength of X-rays, Applications of X-rays in Engineering, medical and scientific field.(Numerical based on above)	**18**

6. Optical Fiber and Nanotechnology	1. Define the terms related to Optical fiber and nanotechnology. 2. Draw the diagram for inner structure of optical fiber. 3. State the applications of Optical fiber and nanotechnology. 4. Clarify the properties of nanoparticles are different than other particles. 5. Describe the principle of optical fiber. 6. Solve the numerical based on optical fiber.	6.1 Optical fiber, Material of Optical fiber. Structure of optical fiber and its types. Principle of Optical fiber- total internal reflection. Acceptance angle, Numerical aperture. Applications of Optical Fiber.(Numerical problems) 6.2 Definition of nanoscale, nanometer, nanoparticle, nanostructured materials with examples, Application of nanotechnology in Engineering and Technology, medical, cosmetics, environmental, space and defense.	**08**
		Total Hrs.	**64**

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Pract-icals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify the various instruments used in Physics laboratory and follow precautionary measures.	General Properties of solids	2
2	Determine least count and range of Vernier Caliper, Outside micrometer screw gauge and calculate its zero error.		2
3	Calculate the diameter of a small spherical body by Outside micrometer screw gauge.		2
4	Measure the outer diameter of a cylindrical body by Vernier Caliper.		2
5	Calculate the value of Young's modulus of elasticity of given wire and identify the type of material from standard value.		2
6	Find rise of liquid in capillary tube and compute surface tension of liquid.	General Properties of liquids	2
7	Compose the relation between terminal velocity and radius of spherical body with different materials passing through the liquid.		2
8	Find the most viscous fluid from given fluids by calculating coefficient of viscosity.		2
9	Analyze the effect of volume on pressure at constant temperature.	Transmission of heat and gas laws	2
10	Calculate mechanical equivalent of heat, J by electrical method.		2
11	Determine inner diameter of resonance tube using Vernier Caliper.	Wave Motion and Acoustics	2
12	Find the velocity of sound with the help of resonance tube. OR Determine the unknown frequency of tuning fork by sonometer.		2
13	Measure the angle of divergence of Laser.	Modern Physics	2
14	Find total internal reflection of light by pin method. OR Calculate the surface area (SA), volume (V) and SA/V of an object and measure dimensions required for it.	Optical Fiber and Nanotechnology	2
		Skill Assessment	**4**
		Total Hrs.	**32**

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	General Properties of solids	06(00)	00(04)	00(00)	**06(04)**
02	General Properties of liquids	02(00)	08(06)	00(00)	**10(06)**
03	Transmission of heat and gas laws	02(00)	04(04)	06(04)	**12(08)**
04	Wave Motion and Acoustics	04(04)	04(02)	06(00)	**14(06)**
05	Modern Physics	02(04)	10(04)	06(00)	**18(08)**
06	Optical fiber and Nanotechnology	02(02)	08(00)	00(06)	**10(08)**
	Total	**18(10)**	**34(20)**	**18(10)**	**70 (40)**

R – Remember U – Understand A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	5	R	2	6	R	2	6	R	2	**5/7**
	4	U	2																
02	1	R	4	2	U	4	2	U	4	1	U	4	3	U	4				**3/5**
03	3	U	4	4	R	4	4	U	4	4	R	4	3	A	4				**3/5**
04	6	U	4	5	U	4	6	U	4	5	R	4	5	U	4				**3/5**
05	5	A	6	4	A	6	2	U	6										**2/3**
06	5	U	6	3	A	6	6	A	6										**2/3**

T= Unit/Topic Number L= Level of Question M= Marks

R-Remember U-Understand A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	**CA** (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	**70**	**28**	Theory Answer Sheets	1, 2, 3
				Total	**100**	**40**		
Direct Assessment Practical	**CA** (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	**25**	**10**		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	**50**	**20**	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Drawing circuit diagram/figure, selection of equipment's.	10
2	Performance	20
3	Calculation, Result, Drawing Graphs (if any)	10
4	Viva voce	10
	TOTAL	**50**

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (Cos)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	-	-	-	-	-	-	-	-	2	-	-
2	3	-	-	-	-	-	-	-	-	2	-	-
3	3	-	-	-	-	-	-	-	-	2	-	-
4	3	-	2	2	-	-	-	2	-	2	-	-
5	3	-	2	2	-	-	-	2	-	2	-	-
6	3	-	2	2	-	-	-	2	-	2	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Modern Physics	B.L.Thereja, S.Chand & Company Ltd 5th Edition, 2014	13:978-8-12-190163-5
2.	Engineering Physics	V.Rajendran, The McGraw Hill Education Pvt. Ltd,1st Edition, 2010	13: 978-0-07-107014-0
3.	Conceptual Physics	P.G.Hewitt, San Francisco Addison Wesley- 10th Edition, 2006	13: 9780321909107
4.	Engineering Physics	R.K.Gaur And S.L.Gupta, Dhanpatrai Publication New Delhi,1987	97-8-18-992822-3

❖ E-REFERENCES:

https://www.youtube.com/watch?v=7vT-988yH3M , assessed on 5th march 2016
https://www.youtube.com/watch?v=XMWcQ4Fn_3I , assessed on 4th march 2016
https://www.youtube.com/watch?v=6L3Y6UnWe6M , assessed of 5th march 2016
https://www.youtube.com/watch?v=KjUlKF6_4LI , assessed on 2nd march 2016

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

1. Vernier Caliper (Least count= 0.01 cm and range= 0 to 12 cm)
2. Screw gauge (Least count= 0.001 cm and range= 0 to 2.5 cm)
3. Young' Modulus- Searle's pattern with micrometer reading 0.001 cm.
4. Travelling microscope vertical and horizontal scales with range 0- 15 cm with least count 0.001 cm
5. resonance apparatus with glass tube and metal reservoir (L= 0- 100 cm)
6. sonometer teak wood with length 1m.
7. Tunning fork -256, 320, 384, 428, 480, 512 Hz.
8. Boyle's apparatus iron base double steel rod, 25 ml fitted with leveling screw on base
9. Stoke's apparatus with glass tube 50 cm.
10. Stop watch GEM 1/10 sec.
11. Ammeter (DC, 0-5 Amp)
12. Millimeter (DC, 0-1 Amp. G.E. type D 50)
13. Voltmeter (DC, 0-3V)
14. Rheostat single tube of 6.5 cm dia., 30 cm length, 5 Amp, 18 ohm, provided with Bakelite solider with phosphor, bronze contacts.
15. Joule's calorimeter with mass 198 cal/gms.
16. Laser

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	M. K. Malke	I/C Physics Department	Government Polytechnic, Nagpur.
2.	Dr. K. S. Moon	Associate Professor	Dharampeth M P Deo Memorial Science College, Nagpur
3.	Mrs. Farheen Baig	Assistant Professor	Priyadarshini College of Engineering, Nagpur
4.	Mrs. M.B. Mahaley	HOD, Physics Department	SDMP, Nagpur
5.	Dr. S. B. Raut	Lecturer	Government Polytechnic, Nagpur.
6	Mrs. S.B. Adulkar	Lecturer	Government Polytechnic, Nagpur.

(Member Secretary PBOS) **(Chairman PBOS)**