APPLIED PHYSICS   Course Code : 352301

Programme Name/s	: **Architecture Assistantship/ Architecture/ Interior Design & Decoration/ Interior Design/**
Programme Code	: **AA/ AT/ IX/ IZ**
Semester	: **Second**
Course Title	: **APPLIED PHYSICS**
Course Code	: **352301**

I. RATIONALE

Diploma engineers have to deal with various processes, materials, and machines. The comprehension of concepts and principles of applied physics related to vectors, motion, solids, fluids, gravitation, sound, photoelectricity, laser, X-rays, and nanomaterials will help students use relevant materials, processes, and methods in various technologies in the architecture industry.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to attain the following industry/employer expected outcomes through various teaching and learning experiences: Apply the principles of physics to solve broad-based relevant architectural problems.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Analyse given engineering structure using the concept of vector and scalar.
- CO2 - Apply principles of Newtonian physics for the given architectural design projects.
- CO3 - Select relevant material in industries by analyzing its physical properties.
- CO4 - Apply the concept of rotational dynamics in architectural design.
- CO5 - Apply the concepts of modern physics (X-rays, LASER, photosensors and nanotechnology) in architectural field.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Paper Duration	Assessment Scheme										Total Marks
				Actual Contact Hrs./Week			SLH	NLH			Theory				Based on LL & TL				Based on SL		
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
352301	APPLIED PHYSICS	BPS	AEC	3	-	2	1	6	3	3	30	70*#	100	40	25	10	-	-	-	-	125

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Total IKS Hrs for Sem. : 3 Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Explain significance of vectors in construction industry. TLO 1.2 Explain the difference between scalar and vector product TLO 1.3 Estimate the expression of triangle law of vector addition . TLO 1.4 Apply differential calculus method for displacement, velocity and acceleration. TLO 1.5 Estimate the integral calculus method in the measurement for the work.	**Unit - I Mathematical Methods** 1.1 Scalar quantities , vector quantities, examples of scalars and vectors 1.2 Types of product : Scalar product and vector product 1.3 Addition of vectors, subtraction of vectors, triangle law of vector addition. 1.4 Displacement, velocity and acceleration, calculus method for displacement , velocity and acceleration. 1.5 Integral calculus method in the measurement of work.	Demonstration Video Demonstrations Hands-on Presentations
2	TLO 2.1 Differentiate into various types of motion: linear motion, circular motion, projectile motion. TLO 2.2 Explain linear velocity, linear acceleration, angular velocity and angular acceleration TLO 2.3 Deduce an expression of universal gravitational constant , its unit and dimensions. TLO 2.4 Explain critical velocity. escape velocity and deduce relation between them. TLO 2.5 Explain kepler's laws in planetary motion.	**Unit - II Motion and Gravitation** 2.1 Different types of motion , linear motion , circular motion, projectile motion. 2.2 Linear velocity, linear acceleration , angular velocity , angular acceleration with units and examples. 2.3 Universal gravitational constant, its magnitude, MKS and CGS units and dimensions. 2.4 Critical velocity. escape velocity , relation between them. 2.5 Kepler's laws in planetary motion. 2.6 Ancient planetary symbols and meanings (IKS).	Improved lecture Model Demonstration Presentations Model Demonstration

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Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Apply the concept of elasticity and plasticity to select the material for engineering applications. TLO 3.2 Establish the relation between given types of moduli of elasticity. TLO 3.3 Predict the behaviour of given metallic wire. TLO 3.4 Apply Newton's law to find viscosity of given liquid. TLO 3.5 Explain Stoke's law for free fall of body through the given viscous medium. TLO 3.6 Explain molecular theory concern with surface tension. TLO 3.7 Apply the concept of capillarity to select the material for engineering applications.	**Unit - III Properties of matter** 3.1 Deforming force and restoring force, elasticity, plasticity and rigidity. 3.2 Stress , strain and their types with units and dimensions. 3.3 Elastic limit and Hooke's law, types of moduli of elasticity, stress- strain diagram, factors affecting elasticity 3.4 Viscosity, viscous force , velocity gradient, Newton's law of viscosity 3.5 Free fall of spherical body through viscous medium and Stokes' law , derivation of coefficient of viscosity, 3.6 Molecular theory , surface tension , surface energy , relation between them. 3.7 capillary, capillarity, angles of contact: acute angle, obtuse angle , applications of capillarity	Demonstration Model Demonstration Video Demonstrations Presentations
4	TLO 4.1 Find the parameters required to analyze the given wave motion. TLO 4.2 Differentiate between transverse waves and longitudinal waves. TLO 4.3 Explain the concept of superposition of waves and its applications. TLO 4.4 Explain the concept of echo and reverberation time. TLO 4.5 Explain the factors affecting acoustical planning in auditorium.	**Unit - IV Acoustics** 4.1 Amplitude, frequency, time-period, wavelength and velocity of wave and relation between velocity and frequency of the wave. 4.2 Various propperties and examples of transverse waves and longitudinal waves. 4.3 Superposition of waves and loudness of sound. 4.4 Acoustics, echo, reverberation, reverberation time and relation between them. 4.5 Focussing of sound, Echelon effect, external noise, Sabine's formula.	Demonstration Model Demonstration Video Demonstrations Presentations

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Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
5	TLO 5.1 Explain properties of photon on the basis of Planck's hypothesis. TLO 5.2 Explain the construction and working of given photoelectric device. TLO 5.3 Explain method to produce X-rays with its properties and engineering applications. TLO 5.4 Differentiate between LASER and ordinary light. TLO 5.5 Explain given terms related to LASER. TLO 5.6 Describe the properties of nanomaterials and its various applications.	**Unit - V Modern Physics (Photoelectricity , X rays, LASER and nanotechnology)** 5.1 Planck's hypothesis, properties of photons. 5.2 Photoelectric effect, threshold frequency, threshold wavelength, stopping potential, work function, characteristics of photoelectric effect, Einstein's photoelectric equation. 5.3 Photoelectric cell and light dependent resistor: principle, working and applications. 5.4 Production of X-rays by modern Coolidge tube, properties and engineering applications. 5.5 Laser; properties, absorption, spontaneous and stimulated emission. 5.6 Population inversion, active medium , optical pumping, three energy level system, He-Ne laser. 5.7 Engineering applications of Laser. 5.8 Nanotechnology: properties of nanomaterials(optical, magnetic and dielectric properties) , applications of nanomaterials, Metallic Bhasma (Ancient Ayurveda IKS)	Demonstration Model Demonstration Model Demonstration Presentations

VI.   LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Find the weight of given body by law of parallelogram of vectors.	1	* Determination of the weight of given body by law of parallelogram of vectors.	2	CO1
LLO 2.1 Use inclined plane to find the downward force.	2	Determination of relationship between angle of inclination and downward force.	2	CO1
LLO 3.1 Use projectile motion to find the range from its initial launch.	3	* Determination of range of projectile.	2	CO2
LLO 4.1 Use simple pendulum to find acceleration due to gravity.	4	* Determination of acceleration due to gravity by using simple pendulum.	2	CO2
LLO 5.1 Use Searle's method to determine Young's modulus of given wire.	5	Determination of Young's modulus of the given wire.	2	CO3
LLO 6.1 Compare Young's moduli of different materials of wires.	6	Comparison of Young's moduli of given materials of wires.	2	CO3
LLO 7.1 Use Stokes's law to determine coefficient of viscosity of given fluid.	7	* Determination of coefficient of viscosity of fluid by Stokes's law.	2	CO3
LLO 8.1 Use capillary rise method to find surface tension of water.	8	Determination of surface tension of water by capillary rise method.	2	CO3
LLO 9.1 Use helical spring to find force constant.	9	* Determination of force constant using helical spring.	2	CO4
LLO 10.1 Use resonance tube method to determine velocity of sound .	10	* Determinaytion of veliocity of sound by resonance tube method.	2	CO4
LLO 11.1 Use ultrasonic distance meter to measure distance of object.	11	Determination of distance of object by ultrasonometer.	2	CO4

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 12.1 Determine I -V characteristics of given photoelectric cell.	12	* Determination of I -V characteristics of given photoelectric cell.	2	CO5
LLO 13.1 Determine I - V characteristics of given light dependent resister.	13	* Determination of I - V characteristics of given light dependent resister..	2	CO5
LLO 14.1 Find divergence of given laser.	14	Determination of the divergence of given laser beam.	2	CO5
LLO 15.1 Use laser beam to find the refractive index of glass slab.	15	Determination of refractive index of glass slab using laser beam.(Virtual lab)	2	CO5

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Assignment

- 1) Prepare chart of various planets showing their velocities of revolution.
- 2) Enlist different types of laser and their uses in various fields.
- 3) Enlist applications of photocell in various fields such as engineering, medical and scientific etc.
- 4) Use mobile apps to measure various intensities of sound.
- 5) Prepare power point presentation or animation showing applications of LASER.
- 6) Give brief report of sound decibel range with respect to various zones such as schools, colleges, hospitals etc.
- 7) Enlist factors affecting echo in seminar hall.
- 8) Collect information about hologram and enlist its applications in different fields.
- 9) Prepare a diagrammatic chart showing relation between angles of contact and type of fluid.

Micro project

- 1) Prepare chart of measurements techniques using scalar and vector quantities.
- 2) Prepare chart differentiating various types of motion.
- 3) Prepare model showing solar system.
- 4) Prepare single beam balance to measure surface tension of water.
- 5) Prepare model to demonstrate Stokes's law of viscosity using household materials.
- 6) Prepare working model to demonstrate stress- strain behavior of different wires of different thickness and material.
- 7) Collect 3 to 5 different fluids and differentiate them on the basis of viscosity and demonstrate their applications.
- 8) Prepare simple photosensor using light dependent resistor.
- 9) Prepare model of ball rolling down on inclined plane to demonstrate the conservation of energy.
- 10) Prepare model showing reflection of sound wave at different incident angles.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Gravesand's apparatus or Parallelogram apparatus.(standard kit)	1

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Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
2	An inclined plane equipment, roller, steel pan, weight box, strong thread , meter scale	2
3	Metallic bob, strong cotton thread, stopwatch, meter scale, Vernier caliper, stand with clamp	4
4	Searles's apparatus (with slotted weights of 500 gram each) , thin long wires of different materials	5,6
5	Tall glass jar, stop watch, meter scale, Vernier caliper, small metallic spheres, micrometer screw gouge, glycerin	7
6	Travelling microscope, retort stand, beaker, capillary tube, pointer	8
7	Retort stand, helical spring, 6 slotted weights each of 50 grams, scale, stop watch	9
8	Resonance tube, Vernier caliper, tuning forks of different frequencies	10
9	Ultrasonometer	11
10	Experimental set up of characteristics of photoelectric cell	12
11	Experimental set up of characteristics of light dependent resistor, optical bench, source of light	13
12	He-Ne laser	14

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Mathematical Methods	CO1	6	2	2	4	8
2	II	Motion and Gravitation	CO2	9	4	4	4	12
3	III	Properties of matter	CO3	9	4	6	6	16
4	IV	Acoustics	CO4	10	4	6	6	16
5	V	Modern Physics (Photoelectricity , X rays, LASER and nanotechnology)	CO5	11	6	6	6	18
		Grand Total		**45**	**20**	**24**	**26**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- For laboratory learning 25 marks.
- Two unit tests of 30 marks and average of two unit tests.

Summative Assessment (Assessment of Learning)

- End semester assessment of 70 marks through online MCQ examination.

XI. SUGGESTED COS - POS MATRIX FORM

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Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	1	2	1	2	1	2			
CO2	3	1	2	2	2	1	2			
CO3	3	2	2	2	2	2	2			
CO4	3	2	2	2	2	2	2			
CO5	3	2	2	2	2	2	2			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	H.C Verma	Concept of Physics Part - I	Bharati Bhawan (Publishers & Distributors) ISBN: 978-8177091878
2	Aryabhatta	The Surya Siddhant	New Bhartiya Book Corporation ,ISBN: 8183150179
3	Prof Vinod Kumar Yadav And Dr Mina Talati	Applied Physics-I (with Lab Manual)	Khanna Publishers , ISBN :9789391505431
4	Dr. Hussain Jeeva khan	Applied Physics II (with Lab Manual)	Khanna Book Publishing ISBN: 9789391505578
5	David Halliday & Robert Resnick	Fundamental of Physics	John Wiley & Sons, ISBN : 978-1118230725

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	www.physicsclassroom.com	concepts of basic physics
2	http://nptel.ac.in/course.php?disciplineId=104	concepts of basic physics
3	http://hperphysics.phy-astr.gsu.edu/hbase/hph.html	concepts of basic physics
4	https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype	simulations
5	https://www.youtube.com/watch?v=GwtVXmZKrnQ	practical concept

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