

List of Papers in Six Semesters (B.Sc.Degree)					
Semester-wise Titles of the Papers in Physics					
Year	Sem.	Course Code	Paper Title	Theory/ Practical	Credits
<i>Certificate Course in Basic Physics</i>					
FIRST YEAR	Sem I	CPT1001	Mechanics	Theory	(04)
		CPP 1002	Mechanical Properties of Matter	Practical	(02)
	Sem II	CPT 1003	Electricity and Magnetism	Theory	(04)
		CPP 1004	Demonstrative Aspects of Electricity & Magnetism	Practical	(02)
<i>Diploma in Applied Physics</i>					
SECOND YEAR	Sem III	DPT 2001	Thermodynamics and Statistical Physics	Theory	(04)
		DPP 2002	Demonstrative Aspects of Thermal Properties & Statistical Physics	Practical	(02)
	Sem IV	DPT 2003	Optics	Theory	(04)
		DPP 2004	Demonstrative Aspects of Geometrical and Physical Optics	Practical	(02)
<i>Bachelor of Science</i>					
THIRD YEAR	Sem V	BPT3001	Solid State Physics	Theory	(04)
		BPP3002	Demonstrative Aspects of Solid State Physics	Practical	(02)
		BPT 3003	Basic Electronics	Theory	(04)
		BPP 3002	Demonstrative Aspects of Basic Electronics	Practical	(02)
	Sem VI	BPT 3003	Modern Physics & Elementary Quantum Mechanics	Theory	(04)
		BPP3004	Demonstrative Aspects of Modern Physics & Elementary Quantum Mechanics	Practical	(02)
		BPT 3005	Analog and Digital Electronics	Theory	(04)
		BPP 3006	Demonstrative Aspects of Analog & Digital Circuits	Practical	(02)

Subject prerequisites:

1. For Semester I: 12th pass with subjects Physics, Chemistry & Mathematics
2. For Semester II: Passed Semester I with Physics
3. For Semester III: Passed Semester II with Certificate Course in Basic Physics
4. For Semester IV: Passed Semester III
5. For Semester V: Passed Semester IV with Diploma in Applied Physics
6. For Semester VI: Passed Semester V

CERTIFICATE COURSE IN BASIC PHYSICS		
Programme: <i>Certificate Course in Basic Physics</i>		Year: I Semester: I Paper-I
Subject: Physics		
Course Code:	Course Title: Mechanics	
Course Outcomes		
<ol style="list-style-type: none"> 1. Understanding of Vector Algebra and Vector Calculus. 2. Understand the physical interpretation of gradient, divergence and curl. 3. Study of gravitational field and potential and understanding of Kepler's laws of Planetary motion. 4. Understanding of different frames of references and conservation laws. 5. Understand the dynamics of rigid body and concept of moment of inertia. Study of moment of inertia of different bodies and its applications. 6. Study the properties of matter, response of the classical systems to external forces and their elastic deformation and its applications. 7. Comprehend the dynamics of Fluid and concept of viscosity and surface tension along with its applications. 		
Credits: 04		Core Compulsory
Max. Marks: 100 External Exam: 75 Internal Assessment : 25		Min. Passing Marks: 33
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0		
Unit	Topic	No. of Lectures
Unit I	Vectors Algebra Vector algebra. Scalar and vector products, scalar and vector triple products Derivative of a vector with respect to a parameter, Del operator, gradient divergence and curl, Gauss divergence theorem, Stokes curl theorem and Green's theorem, Line, surface and volume integral of a vector function.	10
Unit II	Gravitation field and potential Gravitational field and potential, Gravitational potential energy, Gravitational field Intensity and potential due to a ring, a spherical shell, solid sphere and circular disc, gravitational self-energy, Inverse square law of forces, Kepler's laws of planetary motion.	10

Unit III	Conservation Laws Frames of reference, Concept of inertial and Non-inertial frames of references Work energy theorem, Conservative and non-Conservative forces, Linear restoring force, Gradient of potential, Conservation of energy for the particle Energy function, Concept of Centre of mass, Angular momentum and torque Laws of conservation of total energy, total linear momentum and total angular momentum along with their examples.	15
Unit IV	Dynamics of rigid body and Moment of Inertia Translatory and Rotatory motion, Equation of motion for Rotating rigid body, angular momentum vector and moment of inertia, Theorem of parallel and perpendicular axes, Moment of inertia of a cylinder, rod, lamina, ring, disc, spherical shell, solid sphere, kinetic energy of rotation, rolling along a slope, Application to compound pendulum.	10
Unit V	Properties of Matter Basic concept, Elastic constants and their Interrelations, torsion of cylinder, bending of beam, bending moment, Cantilever, shape of Girders/ rail tracks, Viscosity, Stokes's law, Poiseuille's formula, Equation of continuity, Bernoulli's theorem, Surface tension and its molecular interpretation.	15

Suggested Reading

- 1.R. Resnick and D. Hilliday : Physics Vol-I
- 2.Berkeley Physics Course : Mechanics Vol-I
- 3.R.P. Feynman, R.B.Lightan and M.Sand : The Feynman Lectures in Physics
- 4.D.S. Mathur : Mechanics
- 5.D.S. Mathur : Elements of Properties of Matter
6. Murray Spiegel, Seymour Lipschutz, Dennis Spellman, "Schaum's Outline Series: Vector Analysis", McGraw Hill, 2017.
7. J. C. Upadhaya: Mechanics, S. Chand

Suggested Online Link:

1. MIT Open Learning - Massachusetts Institute of Technology, <https://openlearning.mit.edu/>
2. National Programme on Technology Enhanced Learning (NPTEL), <https://www.youtube.com/user/nptelhrd>
3. Swayam Prabha - DTH Channel, https://www.swayamprabha.gov.in/index.php/program/current_he/8

This course can be opted as an elective by the students of following subjects: The course can be opted as an elective, which is open to all students.

Suggested Continuous Evaluation (25 Marks):

Continuous internal evaluation shall be based on allotted assignment and class tests. The marks shall be as follows:

Class Test/Assignment/ attendance- (10+10+5)

Course Prerequisites: Physics and Mathematics in 12th

CERTIFICATE COURSE IN BASIC PHYSICS		
Programme: <i>Certificate Course in Basic Physics</i>		Year: I Semester: I Practical (Lab)
Subject: Physics Practical (Lab)		
Course Code	Course Title: Mechanical Properties of Matter (Lab)	
Course Outcomes:		
1. Experimental physics has the most striking impact on the industry wherever the instruments are used to study and determine the mechanical properties.		
2. Measurement precision and perfection is achieved through Lab Experiments.		
Credits: 02		Core Compulsory
Max. Marks: 50 Internal (Record File): 15 External Practical Exam: 20 External Viva Voce : 15		Min. Passing Marks: 17
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4		
Unit	Topic	No. of Lectures
Lab Experiment List		
	<ol style="list-style-type: none"> 1. To study the Motion of Spring and calculate (a) Spring constant, (b) g and (c) Modulus of rigidity. 2. To determine the Moment of Inertia of a Flywheel. 3. To determine g and velocity for a freely falling body using Digital Timing Technique. 4. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method). 5. To determine the Young's Modulus of a Wire by Optical Lever Method. 6. To determine the Young's Modulus by bending of beam. 7. To determine the Modulus of Rigidity of a Wire by Maxwell's needle. To determine the elastic Constants of a wire by Searle's method. 8. To determine the value of g using Bar Pendulum. 9. To determine the value of g using Kater's Pendulum. 10. To determine Surface Tension. 11. To determine the modulus of rigidity by Barton's Apparatus (Horizontal and Vertical) 12. To determine the elastic constants by Searle's method 	60

Suggested Readings:

1. M. Yadav, Practical Physics, Vol 1, KedarNath Ramnath Publication, 2023.
2. B.L. Worsnop, H.T. Flint, "Advanced Practical Physics for Students", Methuen & Co., Ltd., London, 1962.
3. S. Panigrahi, B. Mallick, "Engineering Practical Physics", Cengage Learning India Pvt. Ltd., 2015.
4. S.L. Gupta, V. Kumar, "Practical Physics", Pragati Prakashan, Meerut, 2014.

Suggestive Digital Platforms / Web Links:

1. Virtual Labs at Amrita Vishwa Vidyapeetham, <https://vlab.amrita.edu/?sub=1&brch=74>
2. Digital Platforms /Web Links of other virtual labs may be suggested / added to this lists by individual Universities

Suggested Continuous Evaluation Methods:

Continuous internal evaluation shall be based on attendance of student in Lab and presentation of practical in the record file. The marks shall be as follows

Record File (15 marks)

PREREQUISITE: Opted / Passed Semester I, Theory Paper-1

Further Suggestions:

- The institution may suggest a minimum number of experiments (say 6) to be performed by each student per semester from the Lab Experiment List.

CERTIFICATE COURSE IN BASIC PHYSICS		
Programme: <i>Certificate Course in Basic Physics</i>		Year: I Semester: I Vocational/ Minor
Subject: Physics		
Course Code:	Course Title: Basic Instrumentation Skills-I	
Credits: 03	Vocational/Minor (Experiments/hands on training)	
Max. Marks: 100 External Exam: 75 Internal Assessment: 25	Min. Passing Marks: 33	
Total No. of Lectures-Tutorials-Practical (in hours per week): 3-0-0		
Unit	Topic	No. of Lectures
Unit I	Errors and Mechanical Tools: Instruments accuracy, precision, sensitivity, resolution, range, least count of different instruments, Errors in measurements, Types of errors. Hand tools and their Uses: Identification, specifications, uses and maintenance of commonly used hand tools: Tweezers Screwdriver (Combination Set), Pliers, Wire Cutters, Wire Strippers, Crimping Tools, Sockets & Hex drivers, Clamps, Rotary Tools: Grinders, Portable Drill Machine, Small Hand Saws.	15
Unit II	Electrical & Electronics Cables and Connector Different type of electrical cables and their Specifications. Types of wires & cables, Standard wire gauge (SWG), Practice on different type of cable joint Testing phase , neutral and Earth by tester and multi-meter and test lamp.	10
Unit III	Domestic Wiring Introduction and explanation of electrical wiring systems, cleat wiring, casino & Capping, house wiring, specification and types, rating & material, Demonstration & Practice on connecting common electrical accessories in circuits and testing them in series board., Testing & replacement of different types of fuses, switches, plug, sockets. Identification of different wiring materials and their specification, Removing of insulation from assorted wires and cable, Making a switch board with electrical accessories, Making Extension board.	20

Suggested Reading

1. B L Theraja: A text book in Electrical Technology
2. S. Salivahanan & N. S. Kumar: Electronic Devices and Circuits 3rd Edn
3. Shashi Bhushan Sinha, Handbook of Repair and Maintenance of Domestic Electronics Appliances hand book.
4. M. Lotia, Modern Basic Electrical & House Wiring Servicing

Suggested OnlineLink:

1. MITOpenLearning-MassachusettsInstituteofTechnology,<https://openlearning.mit.edu/>
2. NationalProgrammeonTechnologyEnhancedLearning(NPTEL),<https://www.youtube.com/user/nptelhrd>
3. SwayamPrabha - DTH Channel,[https:// www.swayamprabha.gov.in/index.php/program/current_he/8](https://www.swayamprabha.gov.in/index.php/program/current_he/8)

Suggested Continuous Evaluation (25Marks):

Continuous internal evaluation shall be based on allotted assignment and class tests. The marks shall be as follows:

Class Test/Assignment/ attendance- (10+10+5)

CERTIFICATE COURSE IN BASIC PHYSICS		
Programme: <i>Certificate Course in Basic Physics</i>		Year: I Semester: II Paper-I
Subject: Physics		
Course Code:	Course Title: Electricity and Magnetism	
Course Outcomes:		
<p>1. Understanding of Electric Field and Potential. Evaluation of Electric Field and Potential for different types of charge distributions.</p> <p>2. Study of Electric and Magnetic Fields in matter. Understand the concept of polarizability, Magnetization and Electric Displacement Vector.</p> <p>3. Study of Steady and Varying electric currents.</p> <p>4. Understanding of different aspects of alternating currents and its applications.</p> <p>5. Understand the Magnetostatics, Lorentz Force and Energy stored in magnetic Field.</p> <p>6. Comprehend the different aspects of Electromagnetic induction and its applications.</p>		
Credits: 04		Core Compulsory
Max. Marks: 100 External Exam: 75 Internal Assessment : 25		Min. Passing Marks: 33
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0		
Unit	Topic	No. of Lectures
Unit I	Electric field and potential Coulomb law, Gauss' theory, its integral and differential forms, line integral of Electric field, Electric field and potential due to an arbitrary charge distribution. Electrostatic energy, energy stored in an Electric field. Electric field and potential due to long charged wire, Spherical shell, sphere, disc, dipole.	15
Unit II	Electric and Magnetic fields in Matter Moments of charge distributions, Polar and non-polar molecule, polarization vector, electric displacement vector, three electric vectors, dielectric susceptibility and permittivity, polarizability, Clausius-Mossotti relation Magnetization, magnetic susceptibility, diamagnetic, paramagnetic and ferromagnetic substances, Hysteresis and B-H curve, Langevin's theories of Diamagnetism and paramagnetism, Weiss theory of ferromagnetism.	15
Unit III	Electric Currents (Steady and Varying) Current density, Equation of Continuity, Ohm's law and electrical conductivity, Lorentz Drude theory, Wiedmann-Frenz law, Kirchhoff's Laws and their applications, Transient current, Growth and decay of D. C. in L - R and L - C circuits, charging and discharging of a capacitor through a resistance	10

Unit IV	Magnetostatics Lorentz force, Bio-Savert's law, Ampere's law, Application of Biot-Savert law, magnetic field due steady current in a long straight wire, Interaction between two wires, field due a Helmholtz coil, solenoid and current loop, magnetic vector potential, permeability, Energy stored in Magnetic field.	10
Unit V	Electromagnetic Induction and Alternating Current Faraday's laws of induction, Lenz's law, Electromotive force, Measurement of magnetic field, Eddy current, Mutual inductance, Self-inductance. Impedance admittance and reactance, R-C, R-L and L-C circuits with alternating e.m.f. source, series and parallel L-C-R circuits, resonance and sharpness, Quality factor, Power in A. C. circuits, Choke coil.	10

Suggested Reading

1. Edward M. Purcell : Electricity and Magnetism
2. J.H. Fewkes & J.Yarwood : Electricity & Magnetism, Vol. I
3. D C Tayal : Electricity and Magnetism ", Himalaya Publishing House Pvt. Ltd., 2019.
4. D.J.Griffiths : Introduction to Electrodynamics .
5. Lal and Ahmed : Electricity and Magnetism
6. H. K. Malik and A.K. Singh "Engineering Physics", McGraw Hill Education (India) Private Limited, 2018.
7. Richard P. Feynman, Robert B. Leighton, Matthew Sands, "The Feynman Lectures on Physics Vol. 2", Pearson Education Limited, 2012.

Suggested Online Link:

1. MIT Open Learning - Massachusetts Institute of Technology, <https://openlearning.mit.edu/>
2. National Programme on Technology Enhanced Learning (NPTEL), <https://www.youtube.com/user/nptelhrd>
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This course can be opted as an elective by the students of following subjects: The course can be opted as an elective, which is open to all students.

Suggested Continuous Evaluation (25 Marks):

Continuous internal evaluation shall be based on allotted assignment and class tests. The marks shall be as follows:

Class Test/Assignment/ attendance- (10+10+5)

Course Prerequisites: Passed semester I, theory paper-1

CERTIFICATE COURSE IN BASIC PHYSICS		
Programme: <i>Certificate Course in Basic Physics</i>		Year: I Semester: II Practical (Lab)
Subject: Physics Practical (Lab)		
Course Code:	Course Title: Demonstrative Aspects of Electricity & Magnetism (Practical)	
Course Outcomes:		
<ol style="list-style-type: none"> 1. Experimental physics has the most striking impact on the industry wherever the instruments are used to study and determine the electric and magnetic properties. 2. Measurement precision and perfection is achieved through Lab Experiments. 		
Credits: 02	Core Compulsory	
Max. Marks: 50 Internal (Record File): 15 External Practical Exam: 20 External Viva Voce : 15	Min. Passing Marks: 17	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4		
Unit	Topic	No. of Lectures
Lab Experiment List		
	<ol style="list-style-type: none"> 1. Frequency of A.C. Mains. 2. Calibration of Voltmeter by potentiometer. 3. Calibration of ammeter by potentiometer. 4. Specific resistance determination. 5. Conversion of a Galvanometer into a Voltmeter. 6. Conversion of a Galvanometer into Ammeter. 7. Variation of magnetic field along the axis of a current carrying circular coil. 8. Comparison of capacities by Ballistic Galvanometer. 9. Determination of Ballistic Constant. 10. Electrochemical equivalent. 11. De Sauty's bridge- C1/ C2 12. R1/R2 by potentiometer. 13. Study of R-C, L-C-R circuits. 14. Determination of self inductance, mutual inductance. 15. Magnetic field determination by search coil and ballistic galvanometer. 	60

Suggested Readings:

1. M. Yadav, Practical Physics, Vol 1, KedarNath Ramnath Publication, 2023.
2. B.L. Worsnop, H.T. Flint, "Advanced Practical Physics for Students", Methuen & Co., Ltd., London, 1962.
3. S. Panigrahi, B. Mallick, "Engineering Practical Physics", Cengage Learning India Pvt. Ltd., 2015.
4. S.L. Gupta, V. Kumar, "Practical Physics", PragatiPrakashan, Meerut, 2014.

Suggestive Digital Platforms / Web Links:

1. Virtual Labs at Amrita Vishwa Vidyapeetham, <https://vlab.amrita.edu/?sub=1&brch=74>
2. Digital Platforms /Web Links of other virtual labs may be suggested / added to this lists by individual Universities

Suggested Continuous Evaluation Methods:

Continuous internal evaluation shall be based on allotted assignment and class tests. The marks shall be as follows:

Record File (15 marks)

PREREQUISITE: Passed Semester I

Further Suggestions:

- The institution may suggest a minimum number of experiments (say 6) to be performed by each student per semester from the Lab Experiment List.

CERTIFICATE COURSE IN BASIC PHYSICS		
Programme: Certificate Course in Basic Physics		Year: I Semester: II Vocational/Minor
Subject: Physics		
Course Code:	Course Title: Basic Instrumentation Skills -II	
Credits: 03		Vocational (Experiments/hands on training)
Max. Marks: 100 External Exam: 75 Internal Assessment: 25		Min. Passing Marks: 33
Total No. of Lectures-Tutorials-Practical (in hours per week): 3-0-0		
Unit	Topic	No. of Lectures
Unit I	Batteries and Maintenance: Types of Batteries, Primary Cell, Secondary Cell, Wet charged, Dry-charged, Low maintenance, Construction of Battery, Case Cover plates, Separator, Cells, Electrolyte, Principles of Batteries, Lead Acid battery, Electrochemical reaction, Measure the voltages of the given cells/battery using analog/ digital multimeter, Charge and discharge the battery through load resistor, Maintain the secondary cells, Measure the specific gravity of the electrolyte using hydrometer.	20
Unit II	Testing of Batteries: Testing Factor affecting charging, Cause of battery failure, diagnosis and testing, visual inspection, Heavy load test Professional, Test a battery and verify whether the battery is ready for use or needs recharging.	10
Unit III	Soldering: Solders, flux and soldering technique. Different types of soldering guns related to Temperature and wattages, types of tips, Solder materials and their grading. Use of flux and other materials, Selection of soldering gun for specific requirement, Soldering and De-soldering stations and their specifications. Soldering/ De-soldering and Various Switches, Practice soldering on different electronic components, small transformer, Practice de-soldering	15

Suggested Reading

1. B L Theraja: A text book in Electrical Technology
2. M G Say: Performance and design of AC machines
3. S. Salivahanan & N. S. Kumar: Electronic Devices and Circuits, , 3rd Edn
4. Shashi Bhushan Sinha, Handbook of Repair and Maintenance of Domestic Electronics Appliances hand book.
5. M. Lotia, Modern Basic Electrical & House Wiring Servicing

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1. MIT Open Learning-Massachusetts Institute of Technology, <https://openlearning.mit.edu/>
2. National Programme on Technology Enhanced Learning (NPTEL), <https://www.youtube.com/user/nptelhrd>
3. SwayamPrabha - DTH Channel, https://www.swayamprabha.gov.in/index.php/program/current_he/8

Suggested Continuous Evaluation (25Marks):

Continuous internal evaluation shall be based on allotted assignment and class tests. The marks shall be as follows:

Class Test/Assignment/ attendance- (10+10+5)

Minor/Elective (04 Credit, One from the list EI 1)

Students having major in Physics will have to choose the elective/minor from sl. no. 1-4 only. Other faculty students (Arts/Commerce) have to choice sl. no. 1.

1. Elementary Physics-I
2. Numerical Methods
3. Computer Programming
4. Waves and Oscillations

CERTIFICATE COURSE IN BASIC PHYSICS		
Programme: <i>Certificate Course in Basic Physics</i>	Year: I	Semester: I/II
Subject: Physics		
CourseCode:	CourseTitle: Elementary Physics-I	
Credits: 04	Vocational/Minor(Experiments/hands on training)	
Max.Marks: 100 External Exam: 75 Internal Assessment: 25	Min.PassingMarks: 33	
Total No.of Lectures-Tutorials-Practical (in hours per week):4-0-0		
Unit	Topic	No. of Lectures
Unit I	Basic Idea of Physics and it's uses in daily life, Electric charge, Conductors, Insulators and Semiconductors, Coulomb's law, Quantization and conservation of charge, Basic Idea of electric field	15
Unit II	Resistance, Resistance in Series and Parallel, Direct and Alternating Current, Color codes for Resistors, Household Circuits, Wiring in Houses, Importance of fuse, Power and Power Losses, Unit of power loss, Heating effect of electric current, Uses of heating effect of current.	15
Unit III	Transformers, Types of transformers, Step up transformer, Step down transformer, Auto transformer, Central tap transformer, Wiring of transformer.	10
Unit IV	Short and open circuits, Shorts in series circuit, shorts in parallel circuit, Open in series circuit, Open in parallel circuit, Duality in series and parallel circuits.	10

Unit V	Ammeters- Voltmeters and their uses, Measurements of thickness, Diameter and depth by Vernier- calipers Screw gauge and Spherometer, Multimeter and its uses, Dynamometer and Wattmeter, Block diagram of basic CRO, Construction of CRT, Electron gun, electrostatic focusing and acceleration.	10
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Suggested Reading:

1. Physics: Rowell and Herbert, Cambridge University Press,
2. Electrical Technology : B. L. Theraja, S. Chand & company.

Suggested Online Link:

1. MIT Open Learning - Massachusetts Institute of Technology, <https://openlearning.mit.edu/>
2. National Programme on Technology Enhanced Learning (NPTEL),
<https://www.youtube.com/user/nptelhrd>
3. Swayam Prabha - DTH Channel,
https://www.swayamprabha.gov.in/index.php/program/current_he/8

Suggested Continuous Evaluation (25 Marks):

Continuous internal evaluation shall be based on allotted assignment and class tests. The marks shall be as follows:

Class Test/Assignment/ attendance- (10+10+5)

CERTIFICATE COURSE IN BASIC PHYSICS	
Programme: <i>Certificate Course in Basic Physics</i>	Year: I/ Semester: I/II
Subject: Physics	
Course Code:	Course Title: Numerical Methods

Credits: 04	Minor/Elective
Max. Marks: 100 External Exam: 75 Internal Assessment: 25	Min. Passing Marks: 33

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
Unit I	Ordinary Differential Equations Brief review of ordinary differential equations, Exact equations, Equations reducible to exact equations, Equations of the first order and higher degrees Clairaut's equation. Applications of ODEs in concerned engineering branch Linear differential equations with constant co-efficient, Complimentary functions and particular integral, Method of variation of parameters, Equations reducible to linear equations with constant co-efficient (Cauchy's and Legendre's linear equations), Initial and Boundary value problems Simultaneous linear equations with constant co-efficient, Applications of differential equations in concerned engineering branch.	15
Unit II	Partial Differential Equations Formulation of Partial Differential Equations (PDE), Solution of PDE, Linear PDE of First Order (Lagrange's Linear Equation), Non-linear Equation of First Order (Standard Forms), Charpit's Method, Homogeneous Linear Equations with Constant Coefficients, Non-homogeneous Linear Equations. Applications of PDE: Method of separation of variables, Solution of one dimensional wave and heat equation and two dimensional Laplace's equation.	15
Unit III	Transforms Theory Laplace Transform: Laplace Transforms of standard functions and their properties, Inverse Laplace Transforms, General Properties of inverse Laplace transforms and Convolution Theorem, Laplace Transforms of periodic functions, Dirac-delta Function, Heaviside's Unit Function, Solution of ODE	15

	and linear simultaneous differential equations using Laplace transforms Fourier Transform: Fourier integral representation, Fourier sine, cosine and complex transform, Finite Fourier Transforms and their applications. Z – Transforms: Z–Transforms & its properties, inversion of Z – transform and applications of Z – transform	
Unit IV	Probability and Statistics Review of probability, Conditional probability and sampling theorems, Discrete and Continuous Probability Distribution, Probability Mass & Probability Density Functions, Distribution function, Discrete and Continuous probability distributions, Binomial, Poisson and Normal distributions.	15

Suggested Reading

1. Advanced Engineering Mathematics by E. Kreyszig, John Wiley and Sons, NC, New York.
2. Differential Equations by S. L. Ross, John Wiley & Sons, New York.
3. An Introduction to Probability Theory & its Applications by W. Feller, Wiley.
4. Probability and Statistics for Engineers and Scientists by R.E. Walpole, S. L. Myers and K. Ye, Pearson.
5. Integral Transforms and Their Applications by Lokenath Dennath and Dambaru Bhatta, Chapman and Hall/CRC Press.

Suggested Online Link:

1. MIT Open Learning - Massachusetts Institute of Technology, <https://openlearning.mit.edu/>
2. National Programme on Technology Enhanced Learning (NPTEL), <https://www.youtube.com/user/nptelhrd>
3. Swayam Prabha - DTH Channel, https://www.swayamprabha.gov.in/index.php/program/current_he/8

Suggested Continuous Evaluation (25 Marks):

Continuous internal evaluation shall be based on allotted assignment and class tests. The marks shall be as follows:

Class Test/Assignment/ attendance- (10+10+5)

CERTIFICATE COURSE IN BASIC PHYSICS	
Programme: <i>Certificate Course in Basic Physics</i>	Year: I Semester: I/II
Subject: Physics	
Course Code:	Course Title: Computer Programming

Credits: 04	Minor/Elective
Max. Marks: 100 External Exam: 75 Internal Assessment: 25	Min. Passing Marks: 33

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
Unit I	Programming Fundamentals Introduction to computer, block diagram and organization of computer, number system and binary arithmetic, processing data, hardware, software, firmware, types of programming language -Machine language, Assembly level language, higher level language, source file, object file, translator-assembler, compiler interpreter. Evolution and classification of programming languages.	15
Unit II	Programming Techniques Steps in program development, algorithm, flowchart, pseudo code. C Language: 'C' character set, literals, keywords, identifiers, data types and size, variable declaration, expression, labels, statements, formatted input output statements, types of operators, data type conversion, mixed mode arithmetics, control structures.	15
Unit III	Data Structures Storage classes, scope rules and visibility, arrays, pointers, dynamic storage allocation, structures and unions, self-referential structures. Relationship between pointers and arrays, dynamic arrays: Introduction to dynamic data structures linked lists, stack, and binary trees.	15
Unit IV	Functions and File Handling 'C' functions, library functions, parameter passing, recursion, 'C' files function for file handling, 'C' pre-processors and command line arguments macros and conditional compiler directives.	15

Suggested Reading

1. C Programming Language by Brian W. Kenigham and Dennis Ritchie, Prentice Hall of India.
2. Programming with C by Byron Gottfried, Tata McGraw Hill.
3. The Complete Reference C by Herbert Schildt, Tata McGraw Hill.
4. Let us C by Yashwant Kanetkar, BPB Publication.
5. A Structured Programming Approach in C by B.A. Forouzan and R.F. Gilberg, Cengage Learning.

Suggested Online Link:

1. MIT Open Learning - Massachusetts Institute of Technology, <https://openlearning.mit.edu/>
2. National Programme on Technology Enhanced Learning (NPTEL),
<https://www.youtube.com/user/nptelhrd>
3. Swayam Prabha - DTH Channel,
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Suggested Continuous Evaluation (25 Marks):

Continuous internal evaluation shall be based on allotted assignment and class tests. The marks shall be as follows:

Class Test/Assignment/ attendance- (10+10+5)

CERTIFICATE COURSE IN BASIC PHYSICS	
Programme: <i>Certificate Course in Basic Physics</i>	Year: I Semester: I/II
Subject: Physics	
Course Code:	Course Title: Waves and Oscillations

Credits: 04	Minor/Elective
Max. Marks: 100 External Exam: 75 Internal Assessment: 25	Min. Passing Marks: 33

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
Unit I	Analysis of wave motion Characteristics, Differential equation of a wave motion, principle of superposition, Interference, Beats, stationary waves, Energy of stationary waves, Wave velocity and group velocity, Fourier theorem, Fourier analysis of square, triangular and saw-tooth waves. Energy density of plane acoustic waves, Acoustic intensity, Measurement of acoustic intensity – the dB scale Characteristics and loudness of Musical sound, Acoustic impedance Reflection and transmission of acoustic waves. Acoustics of buildings, reverberation time, Sabine’s formula, Principle of sonar system.	15
Unit II	Ultrasonics Classification of Sound waves, Ultrasonics, Quartz crystal and Piezo electric effect, Magnetostriction effect, Properties of Ultrasonic, Detection of ultrasonic waves, Determination of velocity of ultrasonic waves in liquid (Acoustic grating method) . Application of Ultrasonics.	15
Unit III	Simple Harmonic Oscillations Periodic motion, SHM in mechanical systems, Energy of Simple harmonic oscillator, Superposition of SHM(s), Oscillations of two masses connected by a spring, Non-linear (An-harmonic) oscillator and its applications to simple pendulum. Applications of Simple harmonic motion in compound pendulum Torsional pendulum and LC circuit, Composition of two SHM(s) of different frequency ratio, Lissajous’ figures for equal frequencies ratio and 2:1 frequencies ratio	15
Unit IV	Damped and Forced Harmonic Oscillations Damping force, Different cases for over, critical and under damping, Mechanical damped harmonic oscillators, Logarithmic decrement, Power Dissipation, Relaxation time & Quality Factor.	15

	Forced oscillations, Mechanical driven harmonic oscillators, Transient and steady state behavior, Power absorption, phenomenon of resonance, amplitude resonance, velocity resonance, sharpness of resonance/Fidelity, Bandwidth and quality factor.	
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Suggested Reading

1. R. Resnick and D. Halliday: Physics Vol-I
2. D. S. Mathur: Mechanics
3. Brijlal and Subrahmanyam: Waves and Oscillations
4. B.S. Semwal and M.S.Panwar : Wave Phenomena and MaterialScience
5. Berkeley Physics Course: Mechanics Vol-I
6. R. K. Ghose: The mathematics of waves an Vibrations
7. D. P. Khandelwal: Oscillations and Waves
8. I. I. Pain: Physics of Vibration
9. A. P. French: Vibrations and Waves

Suggested Online Link:

1. MIT Open Learning - Massachusetts Institute of Technology, <https://openlearning.mit.edu/>
2. National Programme on Technology Enhanced Learning (NPTEL), <https://www.youtube.com/user/nptelhrd>
3. Swayam Prabha - DTH Channel, https://www.swayamprabha.gov.in/index.php/program/current_he/8

Suggested Continuous Evaluation (25 Marks):

Continuous internal evaluation shall be based on allotted assignment and class tests. The marks shall be as follows:

Class Test/Assignment/ attendance- (10+10+5)