KURUKSHETRA UNIVERSITY
KURUKSHETRA

(Established by the State Legislature Act XII of 1956)
("A+" Grade NAAC Accredited)

Scheme of Examination and Syllabus for

Undergraduate Programme

Subject: PHYSICS

Under Multiple Entry-Exit, Internships and

CBCS-LOCF in accordance to NEP 2020

w.e.f. 2023-24 (in phased manner)

Kurukshetra University Kurukshetra

Scheme and Syllabus of Examination for Undergraduate programme
Subject: PHYSICS
Under Multiple Entry-Exit, Internships and
CBCS-LOCF in accordance to NEP 2020
w.e.f. 2023-24 (in phased manner)

Semester	Course Type	Course Code	Nomenclature of paper	Credits	Contact hours	Internal marks	End term Marks	Total Marks	Duration of exam (Hrs) T + P
1	CC-1/ MCC-1	B23-PHY-101	Mechanics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	MCC-2	B23-PHY-102	Mathematical Physics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	CC-M1	B23-PHY-103	Elementary Mechanics	1	1	10	20	30	3
			Practicum	1	2	5	15	20	3
	MDC 1	B23-PHY-104	Physics Fundamentals-I	2	2	15	35	75	3
			Practicum	1	2	5	20	25	3
2	CC-2 MCC-3	B23-PHY-201	Electricity and Magnetism& EM Theory	3	3	20	50	70	3
			Practicum	1	3	10	20	30	3
	CC-M2	B23-PHY-202	Elementary Electricity, Magnetism & EM Theory	1	1	10	20	30	3
			Practicum	1	2	5	15	20	3
	DSEC-1	B23-PHY-203	Computational Physics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	MDC- 2	B23-PHY-204	Physics Fundamentals-II	2	2	15	35	50	3
			Practicum	1	2	5	20	25	3

3	CC-3/ MCC-4	B23-PHY-301	Thermodynamics & Statistical Physics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	MCC-2	B23-PHY-102	Mathematical Physics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	MCC-5	B23-PHY-303	Classical Mechanics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	MDC 3	B23-PHY-304	Elements of Modern Physics	2	2	15	35	50	3
			Practicum	1	2	5	20	25	3
4	CC-4/ MCC-6	B23-PHY-401	Waves and Optics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	MCC-7	B23-PHY-402	Introductory Quantum Mechanics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	MCC-8	B23-PHY-403	Atomic Spectroscopy	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	DSE-1	B23-PHY-404	Laser Physics and Fiber Optics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
		OR							
		B23-PHY-405	Physics of Nano Materials	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
5	CC-5 MCC-9	B23-PHY-501	Modern Physics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	MCC-10	B23-PHY-502	Nuclear Physics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3

	DSE-2	B23-PHY-503	Environmental Physics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
		OR							
		B23-PHY-504	Non-Linear Dynamics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	DSE-3	B23-PHY-505	Instrumentation and Analytical Methods	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
		OR							
		B23-PHY-506	Renewable Energy and Energy Harvesting	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
6	CC-6 MCC-11	B23-PHY-601	Electronics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	MCC-12	B23-PHY-602	Solid State Physics-1	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	DSE-4	B23-PHY-603	Condensed Matter Physics-1	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
		OR							
		B23-PHY-604	Material Science	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	DSE-5	B23-PHY-605	Nuclear and Particle Physics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
		OR							
		B23-PHY-606	Modern Characterization Techniques	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3

7	CC-H1	B23-PHY-701	Advanced Mathematical Physics	4	4	30	70	100	3
	CC-H2	B23-PHY-702	Statistical Mechanics	4	4	30	70	100	3
	CC-H3	B23-PHY-703	Quantum Mechanics	4	4	30	70	100	3
	DSE-6	B23-PHY-704	Molecular Physics	4	4	30	70	100	3
		OR							
		B23-PHY-705	Sensors and Transducers	4	4	30	70	100	3
	PC-H1	B23-PHY-706	Practicum Course	4	8	30	70	100	6
8	CC-H4	B23-PHY-801	Electrodynamics and Plasma Physics	4	4	30	70	100	3
	CC-H5	B23-PHY-802	Advance Quantum Mechanics	4	4	30	70	100	3
	CC-H6	B23-PHY-803	Digital Electronics	4	4	30	70	100	3
	DSE-7	B23-PHY-804	Solid State Physics-II	4	4	30	70	100	3
		OR							
		B23-PHY-805	Condensed Matter Physics-II	4	4	30	70	100	3
	PC-H2	B23-PHY-806	Practicum Course	4	8	30	70	100	6
	Research	B23-PHY-R-807	Project/ Dissertation	12			300	300	

Scheme of Examination for VAC/VOC

Semester	Course Type	Course Code	Nomenclature of paper	Credits	Contact hours	Internal marks	End term Marks	Total Marks	Duration of exam (Hrs) T + P
3	VAC-3	B23-VAC-316	Indian Astronomy in the 18^{th} and 19^{th} Centuries	2	2	15	35	50	3
3	VAC-3	B23-VAC-318	Basics of Indian Astronomy	2	2	15	35	50	3
3	VAC-3	B23-VAC-326	Exploring the Journey of Indian Space Satellites	2	2	15	35	50	3
4	VAC-4	B23-VAC-419	Physics in Everyday Life	2	2	15	35	50	3
4	VAC-4	B23-VAC-423	Radiations and its Hazards in Daily Life	2	2	15	35	50	3
1	VOC-1	B23-VOC-114	Refrigeration and Air Conditioning	2	2	15	35	50	3
3	VOC-3	B23-VOC-322	Maintenance of Laboratory Instruments	2	2	15	35	50	3
3	VOC-3	B23-VOC-323	Installation and Maintenance of Solar Panels	2	2	15	35	50	3

Kurukshetra University Kurukshetra
Undergraduate Programs
Course: CC-1/MCC-1

Session: 2023-24			
Part A - Introduction			
Subject	Physics		
Semester	1st		
Name of the Course	Mechanics		
Course Code	B23-PHY-101		
Course Type: (CC/MCC/MDC/CC-M/ DSEC /VOC/DSE/PC/AEC/VAC)	CC/MCC		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Physics as main subject at level 4 (i.e. 10+2 or equivalent)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the dynamics of system of particles, conservation of energy and momentum application of both translational and rotational dynamics motions simultaneously in analyzing rolling with slipping. 2. Differentiate between elastic and plastic body. Elastic constants, determination and their physical significance. Torque and its significance. 3. Familiar about the special theory of relativity and its applications. Michelson's Morley experiments and its finding. 4. Analyze the two body Central Force problem and its applications 5. Learn to present observations, results, analysis and different concepts related to experiments of Mechanics.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5

Max. Marks:100 **Internal Assessment Marks:30** **End Term Exam Marks: 70**	**Time:3hrs**

Part B- Contents of the Course

Instructions for Paper- Setter

1.Nine questions will be set in total.

2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.

3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.

4. 20% numerical problems are to be set.

5. Use of scientific (non-programmable) calculator is allowed.

Unit	Topics	Contact Hours
I	**Fundamentals of Dynamics**: Rigid body, Moment of Inertia, Radius of Gyration, Theorems of perpendicular and parallel axis (with proof), Moment of Inertia of ring, Disc, Angular Disc, Solid cylinder, Solid sphere, Hollow sphere, Rectangular plate, Square plate, Solid cone, Triangular plate, Torque, Rotational Kinetic Energy, Angular momentum, Law of conservation of angular momentum, Rolling motion, condition for pure rolling, acceleration of body rolling down an inclined plane, Fly wheel, Moment of Inertia of an irregular body.	11
II	**Elasticity:** Deforming force, Elastic limit, stress, strain and their types, Hooke's law, Modulus of rigidity, Relation between shear angle and angle of twist, elastic energy stored/volume in an elastic body, Elongation produced in heavy rod due to its own weight and elastic potential energy stored in it, Tension in rotating rod, Poisson's ratio and its limiting value, Elastic Constants and their relations. Torque required for twisting cylinder, Hollow shaft is stiffer than solid one. Bending of beam, bending moment and its magnitude, Flexural rigidity, Geometrical moment of inertia for beam of rectangular cross-section and circular cross-section. Bending of cantilever (loaded by a weight W at its free end), weight of cantilever uniformly distributed over its entire length. Dispersion of a centrally loaded beam supported at its ends, determination of elastic constants for material of wire by Searle's method.	12
III	**Special Theory of Relativity:** Michelson's Morley experiment and its outcomes, Postulates of special theory of relativity, Lorentz Transformations, Simultaneity and order of events, Lorentz contraction, Time dilation, Relativistic transformation of velocity, relativistic addition of velocities, variation of mass-energy equivalence, relativistic Doppler effect, relativistic kinematics, transformation of energy and momentum, transformation of force, Problems of relativistic dynamics.	11

IV	**Gravitation and central force motion:** Law of gravitation, Potential and field due to spherical shell and solid sphere. Motion of a particle under central force field, Two body problem and its reduction to one body problem and its solution, compound pendulum or physical pendulum in form of elliptical lamina and expression of time period, determination of g by means of bar pendulum, Normal coordinates and normal modes, Normal modes of vibration for given spring mass system, possible angular frequencies of oscillation of two identical simple pendulums of length (l) and small bob of mass (m_0 joined together with spring of spring constant (k).	11
	Practicum 1. Measurement of length (or diameter) using Vernier Caliper, screw gauge and travelling microscope. 2. To study the random error in observations. 3. To determine the area of window using a sextant. 4. Moment of Inertia of a Fly Wheel 5. Moment of Inertia of irregular body using a Torsion Pendulum. 6. Young's Modulus by Bending of Beam. 7. Modulus of rigidity of material of wire by Maxwell's Needle. 8. Elastic constants by Searle's method. 9. To determine the value of 'g' by using Bar pendulum. 10. To find the Poisson ratio of rubber by Rubber tube method. 11. To compare Moment of Inertia of a solid Sphere, Hollow Sphere and solid Disc of same mass with the help of Torsion Pendulum. 12. To determine the bending moment of a cantilever beam with uniformly distributed load, uniformly varying load and point load. **Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination.**	30
Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory (20 Marks)** • Class Participation: **05 Marks** • Seminar/presentation/assignment/quiz/class test etc.: **05 Marks** • Mid-Term Exam: **10 Marks** ➢ **Practicum (10 Marks)** • Class Participation: **Nil** • Seminar/Demonstration/Viva-voce/Lab records etc.: **10 Marks** • Mid-Term Exam: **Nil**		**End Term Examination : 50 Marks** **: 20 Marks**
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

1. Mechanics "Berkeley Physics Course Vol. I", Charles Kittel, Tata McGraw-Hill
2. Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000
3. Elements of Properties of Matter, D.S. Mathur, S .Chand & Com. Pt. Ltd., New Delhi
4. Physics, Resnick, Halliday & Walker, Wiley
5. Physics for scientists and Engineers with Modern Phys., J.W. Jewett, R.A. Serway, 2010, Cengage Learning
6. An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill.
7. Properties of Matter, R. Murgeshan, S. Chand & Com. Pt. Ltd., New Delhi
8. Classical Mechanics, J.C. Upadhyaya, Himalaya Publishing House.
9. B.Sc. Practical Physics, C.L. Arora, S. Chand Publisher, New Delhi
10. Advanced Level Practical Physics, M. Nelkon and Ogborn, Henemann Education Books Ltd., New Delhi
11. Practical Physics, S.S. Srivastava and M.K. Gupta, Atma Ram & Sons, Delhi
12. Practical Physics, S.L. Gupta and V. Kumar, Pragati Prakashan Meerut
13. Modern Approach to Practical Physics, R.K. Singla, Modern Publishers, Jalandhar
14. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House.

Kurukshetra University Kurukshetra
Undergraduate Programs
Course: MCC-2

Session: 2023-24			
Part A - Introduction			
Subject	Physics		
Semester	1st		
Name of the Course	**Mathematical Physics**		
Course Code	B23-PHY-102		
Course Type: (CC/MCC/MDC/CC-M/ DSEC /VOC/DSE/PC/AEC/VAC)	MCC		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Physics as main subject at level 4 (i.e. 10+2 or equivalent)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Learn the Fourier analysis of periodic functions and their applications in physical problems. Learn the beta, gamma and the error functions and their applications in doing integrations. 2. Acquire knowledge of methods to solve partial differential equations with the examples of important partial differential equations in Physics. 3. Write given function in terms of sine and cosine terms in Fourier series and also to get knowledge in Fourier transforms 4. Learn about beta gamma function, their properties, solve Legendre equations find generating function for Legendre Polynomial, Hermite equation, study orthogonal properties of Hermite Polynomials, recurrence relations of complex numbers and their properties such as analyticity, poles and residues. 5. Learn about the methods to solve the mathematical problem using Fortran		
Credits	Theory	Practical	Total
	3	1	4

Contact Hours	3	2	5
Max. Marks:100 **Internal Assessment Marks:30** **End Term Exam Marks: 70**		**Time:3hrs**	

Part B- Contents of the Course

Instructions for Paper- Setter

1.Nine questions will be set in total.

2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.

3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.

4. 20% numerical problems are to be set.

5. Use of scientific (non-programmable) calculator is allowed.

Unit	Topics	Contact Hours
I	**Theory of Errors:** Systematic and Random errors, Propagation of errors, Normal law of errors, Standard and Probable error, Least square fit, error on slope and intercept of fitted line. **Matrices:** Normal Matrices, Orthogonal Matrices, Hermitian Matrices, Unitary Matrices, Symmetric and Anti-symmetric Matrices, Conjugate of a Matrix, Anti-hermition Matrices, Trace of Matrix, Eigen values and eigen vectors of Matrices, Diagonalization of Matrices.	11
II	**Method of expansion of a function:** Taylor's expansion, Power series, Laurent's theorem. Partial and ordinary differential equations, Partial Differential equations, First order differential equations, Method of separation of variables, Singular points, Vibrations of an elastic string, One dimensional Heat Flow, Heat conduction equation for a 3-dimensional rectangular configuration and apply it to the cooling of a brick (assuming constant initial temperature distribution), vibrations of rectangular and circular membrane, Method of Frobenius, Diffusion equation, Laplace's equation in problems of rectangular , cylindrical and spherical symmetry, Inhomogeneous partial differential equation-Green's function.	12
III	**Fourier series and Integrals:** Introduction, Evaluation of coefficients of Fourier series, cosine series, sine series, Dirichlet's theorem; representation of Even and odd functions, Extension of interval, complex form of Fourier series, Properties of Fourier series: Convergence, Integration, Differentiation, Parseval's theorem, Physical applications of Fourier series analysis: square wave, Half wave rectifier, Full wave rectifier, sawtooth wave, triangular wave; Fourier Integrals, deduction of expressions for the Fourier Transform and its inverse.	11

IV	**Beta and Gamma Functions:** Definition of gamma function, beta function, other forms of beta function, Relationship between beta and gamma function, Legendre's equation, Legendre's Polynomial, Legendre's function of second kind, General solution of Legendre's equation, Generating function of Legendre's polynomial, orthogonality of Legendre's polynomials, Deduction of Rodrigue's formula for the Legendre's Polynomials, Hermite Polynomial, Hermite differential equation, Generating function of Hermite Polynomial, deduction of recursion relation for H_n of 1^{st} kind and 2^{nd}.	11
	Practicum **Review of FORTRAN Programming fundamentals:** FORTRAN Preliminaries: Integer and floating point arithmetic expression, built in functions, executable and non-executable statements, input and output statements, Formats, IF, DO, FOR and GO TO statements, Dimension arrays, statement function and function subprogram. To print out all natural (even/odd) numbers between given limits using computer. 1. Compute the product of two matrices of different dimension using DO loop 2. Numerical integration by Simpson 1/3 rule 3. Fitting of a straight line using Least-Square method 4. Using array variable, find out the average and standard deviation 5. Write a program to evaluate the function $Y=1 / [C (1 + e \cos \theta)]$ and $V=\sqrt{ [C M G (e2 + e \cos \theta + 1)]}$ e = 1.1, C = 3.0(E+08), M = 5.893(E+24), G = 6.67(E-11) for varying value of θ from 0 to π. 6. To find maximum, minimum and range of a given set of numbers using computer. 7. To evaluate sum of finite series. 8. Find the roots of a quadratic equation. 9. To find integration of a definite integral by trapezoidal rule. 10. To find the area of a triangle, sphere and cylinder. 11. Given values for a, b, c and d and a set of values for the variable x evaluate the function defined by. $f(x) = ax^2 + bx + c$ if $x < d$ $f(x) = 0$ if $x = d$ $f(x) = ax^2 + bx - c$ if $x > d$ For each value of x and print the value of x and f(x). Write a program for an arbitrary number of x values. **Note: Teachers will discuss the fundamentals of FORTRAN Programming to the students. Thereafter student will perform at least six experiments. The examiner will allot one practical at the time of end term examination.**	30
Suggested Evaluation Methods		

Internal Assessment: ➢ **Theory (20 Marks)** • Class Participation: **05 Marks** • Seminar/presentation/assignment/quiz/class test etc.: **05 Marks** • Mid-Term Exam: **10 Marks** ➢ **Practicum (10 Marks)** • Class Participation: **Nil** • Seminar/Demonstration/Viva-voce/Lab records etc.: **10 Marks** • Mid-Term Exam: **Nil**	**End Term Examination : 50 Marks** **20 Marks**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Mathematical Methods for Physicists: Arfken, Weber, 2005, Harris, Elsevier
2. Fourier Analysis by M.R. Spiegel, 2004, Tata McGraw-Hill.
3. Mathematics for Physicists, Susan M. Lea, 2004, Thomson Brooks/Cole.
4. An Introduction to Ordinary Differential Equations, Earl A Coddington, 1961, PHI Learning.
5. Differential Equations, George F. Simmons, 2006, Tata McGraw-Hill.
6. Essential Mathematical Methods, K.F. Riley and M.P. Hobson, 2011, Cambridge University Press
7. Partial Differential Equations for Scientists and Engineers, S.J. Farlow, 1993, Dover Publications.
8. Mathematical methods for Scientists and Engineers, D.A. McQuarrie, 2003, Viva Books.
9. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House
10. Advanced level Physics Practical's, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
11. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Edn, 2011, Kitab Mahal
12. Engineering Practical Physics, S. Panigrahi & B.Mallick, 2015, Cengage Learning India Pvt. Ltd.
13. Practical Physics, G.L. Squires, 2015, 4th Edition, Cambridge University Press.
14. A Laboratory Manual of Physics for undergraduate classes, D.P. Khandelwal, 1985, Vani Pub.
15. Introduction to Numerical Analysis, S.S. Sastry, 5th Edn. , 2012, PHI Learning Pvt. Ltd.
16. Schaum's Outline of Programming with C++. J. Hubbard, 2000, McGraw-Hill Pub.
17. Numerical Recipes in C: The Art of Scientific Computing, W.H. Pressetal, 3rd Edn. , 2007, Cambridge University Press.
18. A first course in Numerical Methods, U.M. Ascher & C. Greif, 2012, PHI Learning.
19. Elementary Numerical Analysis, K.E. Atkinson, 3rd Edn . , 2007 , Wiley India Edition.
20. Numerical Methods for Scientists & Engineers, R.W. Hamming, 1973, Courier Dover Pub.
21. An Introduction to Computational Physics, T.Pang, 2 nd Edn. , 2006,Cambridge Univ. Press
22. Computational Physics, Darren Walker, 1 st Edn., 2015, Scientific International Pvt. Ltd.

Kurukshetra University Kurukshetra
Undergraduate Programs
Course: CC-M1

Session: 2023-24			
Part A - Introduction			
Subject	Physics		
Semester	1st		
Name of the Course	Elementary Mechanics		
Course Code	B23-PHY-103		
Course Type: (CC/MCC/MDC/CC-M/ DSEC /VOC/DSE/PC/AEC/VAC)	CC-M		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Physics as main subject at level 4 (i.e. 10+2 or equivalent) and Physics not as major subject in 1st sem		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the dynamics of system of particles, Determination of moment of inertia using Theorems of parallel and perpendicular axis. Application of both translational and rotational dynamics motions simultaneously in analyzing rolling with slipping 2. Differentiate between elastic and plastic bodies. Elastic constants, determination and their physical significance. Torque and its significance in rotatory motion 3. Familiar about the special theory of relativity and its applications. Michelson's Morley experiment and its findings. 4. Analyze the two body Central Force problem and its applications 5. Learn to present observations, results, analysis and different concepts related to experiments of Mechanics		
Credits	Theory	Practical	Total
	1	1	2
Contact Hours	1	2	3

Max. Marks:50 **Internal Assessment Marks:15** **End Term Exam Marks: 35**	**Time:3hrs**

Part B- Contents of the Course

Instructions for Paper- Setter

1.Nine questions will be set in total.

2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.

3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.

4. 20% numerical problems are to be set.

5. Use of scientific (non-programmable) calculator is allowed.

Unit	Topics	Contact Hours
I	**Fundamentals of Dynamics**: Rigid body, Moment of Inertia, Radius of Gyration, Theorems of perpendicular and parallel axis (with proof), Moment of Inertia of ring, Disc, Angular Disc, Solid cylinder.	3
II	**Elasticity:** Deforming force, Elastic limit, stress, strain and their types, Hooks law, Module of elasticity Relation between shear angle and angle of twist, Poisson's ratio and its limiting value. Torque required for twisting cylinder.	4
III	**Special Theory of Relativity:** Michelson's Morley experiment and its outcomes, Postulates of special theory of relativity, Lorentz Transformations, Lorentz contraction, Time dilation, Relativistic transformation of velocity, relativistic addition of velocities, variation of mass-energy equivalence	4
IV	**Gravitation and central force motion:** Law of gravitation, Potential and field due to spherical shell and solid sphere. Motion of a particle under central force field, Normal coordinates and normal modes, Normal modes of vibration for given spring mass system, possible angular frequencies of oscillation of two identical simple pendulums of length (l) and small bob of mass (m_0 joined together with spring of spring constant (k).	4
	Practicum 1. Measurement of length (or diameter) using vernier caliper, screw gauge and travelling microscope. 2. To study the random error in observations. 3. To determine the area of window using a sextant. 4. Moment of Inertia of a Fly Wheel 5. Moment of Inertia of irregular body using a Torsion Pendulum. 6. Young's Modulus by Bending of Beam. 7. Young's modulus by Koenig's method. 8. Modulus of rigidity of material of wire by Maxwell's Needle.	15

	9. Elastic constant by Searle's method. 10. To determine the value of 'g' by using Bar pendulum. **Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination.**	
Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory (10 Marks)** • Class Participation: **04 Marks** • Seminar/presentation/assignment/quiz/class test etc.: **Nil** • Mid-Term Exam: **6 Marks** ➢ **Practicum (5 Marks)** • Class Participation: **Nil** • Seminar/Demonstration/Viva-voce/Lab records etc.: **5 Marks** • Mid-Term Exam: **Nil**		**End Term Examination : 20 Marks** **15 Marks**
Part C-Learning Resources		
Recommended Books/e-resources/LMS: **1.** Mechanics "Berkeley Physics Course Vol. I", Charles Kittel, Tata McGraw-Hill **2.** Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000 **3.** Elements of Properties of Matter, D.S. Mathur, S .Chand & Com. Pt. Ltd., New Delhi **4.** Physics, Resnick, Halliday & Walker, Wiley **5.** Physics for scientists and Engineers with Modern Phys., J.W. Jewett, R.A. Serway, 2010, Cengage Learning **6.** An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill. **7.** Properties of Matter, R. Murgeshan, S. Chand & Com. Pt. Ltd., New Delhi **8.** Classical Mechanics, J.C. Upadhyaya, Himalaya Publishing House **9.** B.Sc. Practical Physics, C.L. Arora, S. Chand Publisher, New Delhi **10.** Advanced Level Practical Physics, M. Nelkon and Ogborn, Henemann Education Books Ltd., New Delhi **11.** Practical Physics, S.S. Srivastava and M.K. Gupta, Atma Ram & Sons, Delhi **12.** Practical Physics, S.L. Gupta and V. Kumar, Pragati Prakashan Meerut **13.** Modern Approach to Practical Physics, R.K. Singla, Modern Publishers, Jalandhar **14.** Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House.		

Kurukshetra University Kurukshetra
Undergraduate Programs
Course: MDC-1

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<tr><td colspan="4">Session: 2023-24</td></tr>
<tr><td colspan="4">Part A - Introduction</td></tr>
<tr><td>Subject</td><td colspan="3">Physics</td></tr>
<tr><td>Semester</td><td colspan="3">1st</td></tr>
<tr><td>Name of the Course</td><td colspan="3">Physics Fundamentals –I</td></tr>
<tr><td>Course Code</td><td colspan="3">B23-PHY-104</td></tr>
<tr><td>Course Type: (CC/MCC/MDC/CC-M/ DSEC /VOC/DSE/PC/AEC/VAC)</td><td colspan="3">MDC</td></tr>
<tr><td>Level of the course (As per Annexure-I</td><td colspan="3">100-199</td></tr>
<tr><td>Pre-requisite for the course (if any)</td><td colspan="3">Not studied Physics subject at level 4 (i.e. 10+2 or equivalent)</td></tr>
<tr><td>Course Learning Outcomes(CLO):</td><td colspan="3">After completing this course, the learner will be able to:
1. Have knowledge about the nature, scope and impact of physics on technological development of the society.
2. Understand and describe motion of an object in one dimension.
3. Understand and describe the laws of motion and their applications in daily life.
4. Understand and appreciate the importance of laws of conservation of energy and momentum in daily life.
5. Learn to present observations, results, analysis and different concepts related to experiments of Physics Fundamentals –I</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>2</td><td>1</td><td>3</td></tr>
<tr><td>Contact Hours</td><td>2</td><td>2</td><td>4</td></tr>
<tr><td colspan="2">Max. Marks:75
Internal Assessment Marks:20
End Term Exam Marks: 55</td><td colspan="2">Time:3hrs</td></tr>
<tr><td colspan="4">Part B- Contents of the Course</td></tr>
</table>

Instructions for Paper- Setter

1.Nine questions will be set in total.

2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.

3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.

4. 20% numerical problems are to be set.

5. Use of scientific (non-programmable) calculator is allowed.

Unit	Topics	Contact Hours
I	Physics-Nature, scope & excitement, Major discoveries in physics, major contribution by Indian Physicists, Fundamental physical constants, Physics in relation to other sciences, impact of physics on society and on latest development in science & technology. System of Measuring Units-Need for measurement, measuring process, concept of mass, length, time; Fundamental and derive units, system of units, concepts of error, types of error (only definition), Accuracy and precision in measurement, least count and applications of measuring instruments -Vernier caliper, Screw Gauge	8
II	Motion of objects in one dimension- position of the object, origin/reference point, frame of reference, definitions and examples of motion in one, two and three dimension, Scalar and Vector quantities, description of motion along a straight line- distance and displacement, uniform motion and non-uniform motion, average and instantaneous speed, average and instantaneous velocity, acceleration; graphical analysis of straight line motion- distance- time graph, velocity-time graph, equation of motions and their applications.	8
III	Causes of motion- concept of force, Newton's Ist law of motion, inertia and mass; Newton's 2^{nd} law of motion, momentum and force; 3^{rd} law of motion, daily life applications of Newton's laws of motion. Universal law of gravitation and its importance, acceleration due to gravity and free fall of a body; mass and weight of an object on earth and moon, concept of thrust and pressure and importance in daily life, buoyancy and Archimedes principle-the physics behind floating of objects on water.	7
IV	Work, energy, types of energy-Kinetic energy and Potential energy, P.E. of an object at a height; law of conservation of energy and its applications. Conservation of linear and angular momentum, collision (elastic and inelastic) and conservation laws in collisions- importance in daily life; concepts of center of mass-Physics behind cycling, rock climbing and skating.	7
	Practicum 1. To measure the diameter of a small spherical / cylindrical body. 2. To measure the length, width and height of the given rectangular block.	30

	3. To measure the internal diameter and depth of a given beaker/calorimeter and hence find its volume. 4. Use of screw gauge:(i) to measure diameter of a given wire and (ii) to measure thickness of a given sheet 5. To determine radius of curvature of a given spherical surface by a spherometer. 6. To find the downward force, along an inclined plane, acting on a roller due to gravitational pull of the earth and study its relationship with the angle of inclination by plotting graph between force and sin θ 7. To find the weight of a given body using parallelogram law of vectors. 8. Verification of Archimedes principle. 9. Verification of Work-energy theorem. 10. Acceleration due to gravity (g) by bar pendulum. 11. To determine the moment of Inertia of a fly-wheel. 12. Study of law of conservation of linear momentum and Kinetic Energy. **Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination.**	

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory (15 Marks)** • Class Participation: **04 Marks** • Seminar/presentation/assignment/quiz/class test etc.: **04 Marks** • Mid-Term Exam: **7 Marks** ➢ **Practicum (5 Marks)** • Class Participation: **Nil** • Seminar/Demonstration/Viva-voce/Lab records etc.: **5 Marks** • Mid-Term Exam: **Nil**	**End Term Examination : 35 Marks** **: 20 Marks**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Essential University Physics, Vol.-1 &2 by Richard Wolfson, Pearson Education, Patparganj, Delhi, India.
2. Concept of Physics by H.C. Verma, Bharti Bhawan, Ansari Road, Daryaganj, New Delhi, India.
3. Modern Physics (2nd edition), by S.L. Kakani and Shubhra Kakani, Viva Books, New Delhi.
4. Physics for Scientists and Engineers with Modern Physics, 7th edition, by Raymond A. Serway and John W. Jewett, Jr., Thomson Higher Education 10 Davis Drive Belmont, CA 94002-3098 USA.
5. Physics For You, Fifth Edition, by Keith Johnson, OUP Oxford; 5th edition (23 June 2016).
6. B.Sc Practical Physics, C. L. Arora, R Chand & Co. New Delhi
7. B.Sc Practical Physics, Harnam Singh and Dr. P.S. Hemne, S Chand & Company Ltd.

Kurukshetra University Kurukshetra
Undergraduate Programs
Course: CC-2/MCC-3

Session: 2023-24	
Part A - Introduction	
Subject	Physics
Semester	2nd
Name of the Course	**Electricity, Magnetism and EM Theory**
Course Code	B23-PHY-201
Course Type: (CC/MCC/MDC/CC-M/ DSEC /VOC/DSE/PC/AEC/VAC)	CC/MCC
Level of the course (As per Annexure-I	100-199
Pre-requisite for the course (if any)	Appeared or passed the 1st sem (B.Sc. Physical Science/ equivalent)
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain and differentiate the vector and scalar formalisms of electrostatics. Also be able to apply Gauss's Divergence & Stokes theorem to solve various problems in electrostatics 2. Describe the magnetic materials & important properties of magnetic field. Understand the properties and theories of dia-, para- & ferromagnetic materials. 3. Derive Maxwell equations and their physical significance and familiar about the propagation of electromagnetic waves i.e. boundary conditions at the interface between different media. The students will also be able to have basic idea about the propagation of electromagnetic waves in free space and in medium. 4. Understand D.C. and A.C. circuits, able to apply and analyse using networks. Analyze DC/AC circuits consisting of parallel and/or series combinations of voltage sources and resistors and to describe the graphical relationship of resistance, capacitor and inductor. 5. Learn to present observations, results, analysis and

	different concepts related to experiments of Electricity and Magnetism.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 **Internal Assessment Marks:30** **End Term Exam Marks: 70**		**Time:3hrs**	

Part B- Contents of the Course

Instructions for Paper- Setter

1.Nine questions will be set in total.

2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.

3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.

4. 20% numerical problems are to be set.

5. Use of scientific (non-programmable) calculator is allowed.

Unit	Topics	Contact Hours
I	**Vector Background** a**nd Electric Field** : Gradient of a scalar and its physical significance, Line, Surface and Volume integrals of a vector and their physical significance, Flux of a vector field, Divergence and curl of a vector and their physical significance, Gauss's divergence theorem, Stoke's theorem. Conservative nature of Electrostatic Field, Electrostatic Potential, Potential as line integral of field, potential difference Derivation of electric field E from potential as gradient. Derivation of Laplace and Poisson equations. Electric flux, Gauss's Law, Differential form of Gauss's law and applications of Gauss's law. Mechanical force of charged surface, Energy per unit volume.	11
II	**Magnetic Field:** Biot-Savart law and its simple applications: straight wire and circular loop, Current Loop as a Magnetic Dipole and its Dipole Moment, Ampere's Circuital Law and its applications to (1) Solenoid and (2) Toroid, properties of B: curl and divergence, **Magnetic Properties of Matter:** Force on a dipole in an external field, Electric currents in Atoms, Electron spin and Magnetic moment, types of magnetic materials, Magnetization vector (M), Magnetic Intensity (H), Magnetic Susceptibility and permeability, Relation between B, H and M, Electronic theory of dia and paramagnetism, Domain theory of ferromagnetism (Langevin's theory), Cycle of Magnetization- B-H curve and hysteresis loop: Energy dissipation, Hysteresis loss and importance of Hysteresis Curve	12
III	**Time varying electromagnetic fields:** Electromagnetic induction,	11

	Faraday's laws of induction and Lenz's Law, Self-inductance, Mutual inductance, Energy stored in a Magnetic field, Derivation of Maxwell's equations, Displacement current, Maxwell's equations in differential and integral form and their physical significance. **Electromagnetic Waves:** Electromagnetic waves, Transverse nature of electromagnetic wave, energy transported by electromagnetic waves, Poynting vector, Poynting's theorem. Propagation of Plane electromagnetic waves in free space & Dielectrics	
IV	**DC current Circuits:** Electric current and current density, Electrical conductivity and Ohm's law (Review), Kirchhoff's laws for D.C. networks, Network theorems: Thevenin's theorem, Norton theorem, Superposition theorem. **Alternating Current Circuits:** A resonance circuit, Phasor, Complex Reactance and Impedance, Analysis for RL, RC and LC Circuits, Series LCR Circuit: (1) Resonance, (2) Power Dissipation (3) Quality Factor and (4) Band Width, Parallel LCR Circuit.	11
	Practicum 1. Use of Multimeter for measuring Resistance, A.C. and D.C. Voltage and Current, checking of electrical fuses. 2. Low resistance by Carey Foster's bridge with calibration. 3. Determination of Impedance of an A.C. circuit and its verification. 4. Frequency of A.C. mains using an electromagnet. 5. Frequency of A.C. mains Electrical vibrator. 6. High resistance by substitution method. 7. To compare capacitances using De'Sauty bridge. 8. To study the Characteristics of a Series RC Circuit. 9. To study a series LCR circuit and determine its (a) Resonant frequency, (b) Quality factor. 10. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor. 11. To verify the Thevenin and Norton theorems. 12. To verify the Superposition and Maximum Power Transfer Theorems. 13. Self-inductance by Anderson's bridge. 14. Verification of laws of electromagnetic induction. 15. Study of B-H curves of various materials using C.R.O, and determination of various parameters. **Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination.**	30
Suggested Evaluation Methods		

Internal Assessment: ➢ **Theory (20 Marks)** • Class Participation: **05 Marks** • Seminar/presentation/assignment/quiz/class test etc.: **05 Marks** • Mid-Term Exam: **10 Marks** ➢ **Practicum (10 Marks)** • Class Participation: **Nil** • Seminar/Demonstration/Viva-voce/Lab records etc.: **10 Marks** • Mid-Term Exam: **Nil**	**End Term Examination : 50 Marks** **20 Marks**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Electricity and Magnetism (Berkley, Phys. Course 2), Edward M. Purcell, 1986 McGraw-Hill Education
2. Electricity and Magnetism: A.S. Mahajan & A.A. Rangwala (Tata- McGraw Hill), 1988.
3. Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury, 2012, Tata McGraw
4. Introduction to Electrodynamics, D.J. Griffiths, 3rd Edn., 1998, Benjamin Cummings.
5. Feynman Lectures Vol.2, R.P. Feynman, R.B. Leighton, M. Sands, 2008, Pearson Education
6. Elements of Electromagnetics, M.N.O. Sadiku, 2010, Oxford University Press.
7. Electricity and Magnetism, J.H.Fewkes & J.Yarwood. Vol. I, 1991, Oxford Univ. Press.
8. Field and Wave Electromagnetics (2^{nd} Edn.), David K. Cheng , Addison-Wesley Publishing Company.
9. B.Sc. Practical Physics, C.L. Arora, S. Chand Publisher, New Delhi
10. Advanced Level Practical Physics, M. Nelkon and Ogborn, Henemann Education Books Ltd., New Delhi
11. Practical Physics, S.S. Srivastava and M.K. Gupta, Atma Ram & Sons, Delhi
12. Practical Physics, S.L. Gupta and V. Kumar, Pragati Prakashan Meerut
13. Modern Approach to Practical Physics, R.K. Singla, Modern Publishers, Jalandhar
14. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House

Kurukshetra University Kurukshetra
Undergraduate Programs
Course: CC-M2

Session: 2023-24			
Part A - Introduction			
Subject	Physics		
Semester	2nd		
Name of the Course	**Elementary Electricity, Magnetism & EM Theory**		
Course Code	B23-PHY-202		
Course Type: (CC/MCC/MDC/CC-M/ DSEC /VOC/DSE/PC/AEC/VAC)	CC-M		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Physics not as major subject in 2nd sem		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain and differentiate the vector and scalar formalisms of electrostatics. Also be able to apply Gauss's Divergence & Stokes theorem to solve various problems in electrostatics 2. Describe the magnetic materials & important properties of magnetic field. Understand the properties and theories of dia-, para- & ferromagnetic materials 3. Derive Maxwell equations and their physical significance and familiar boundary conditions at the interface between different media. The students will also be able to have basic idea about the propagation of electromagnetic waves 4. Analyze DC/AC circuits consisting of parallel and/or series combinations of voltage sources and resistors and to describe the graphical relationship of resistance, capacitor and inductor 5. Learn to present observations, results, analysis and different concepts related to experiments of Electricity and Magnetism		
Credits	Theory	Practical	Total

	1	1	2
Contact Hours	1	2	3

Max. Marks:50 **Internal Assessment Marks:15** **End Term Exam Marks: 35**	**Time:3hrs**

Part B- Contents of the Course

Instructions for Paper- Setter

1.Nine questions will be set in total.

2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.

3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.

4. 20% numerical problems are to be set.

5. Use of scientific (non-programmable) calculator is allowed.

Unit	Topics	Contact Hours
I	**Vector background and electric field:** Gradient of a scalar and its physical significance, Line, Surface and Volume integrals of a vector and their physical significance, Flux of a vector field, Divergence and curl of a vector and their physical significance, Gauss's divergence theorem, Stoke's theorem.	4
II	**Magnetic field and magnetic properties :** Magnetic induction, Magnetic flux, Solenoidal nature of vector field of induction, properties of B (i) $\nabla.B = 0$ (ii) $\nabla \times B = \mu_o J$, Magnetic Materials, types, Hysteresis curve and importance of Hysteresis Curve.	3
III	**Time varying electromagnetic fields and electromagnetic waves :** Electromagnetic induction, Faraday's laws of induction and Lenz's Law, Derivation of Maxwell's equations and their physical significance. Boundary conditions at interface between two different media, Propagation of electromagnetic wave (Basic idea, no derivation), Poynting vector and Poynting theorem.	4
IV	**D.C. and A.C. circuits:** D.C. Network theorems: Thevenin's theorem, Norton theorem, Superposition theorem; Analysis of LCR Series and parallel resonant circuits.	4
	Practicum 1. Use of Multimeter for measuring Resistance, A.C. and D.C. Voltage and Current, checking of electrical fuses. 2. Low resistance by Carey Foster's bridge with calibration. 3. Determination of Impedance of an A.C. circuit and its verification. 4. Frequency of A.C. mains using an electromagnet. 5. Frequency of A.C. mains Electrical vibrator.	30

	6. High resistance by substitution method. 7. To compare capacitances using De'Sauty bridge. 8. To study the Characteristics of a Series RC Circuit. 9. To study a series LCR circuit and determine its (a) Resonant frequency, (b) Quality factor. 10. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor. **Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination.**	
Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory (10 Marks)** • Class Participation: **04 Marks** • Seminar/presentation/assignment/quiz/class test etc.: **Nil** • Mid-Term Exam: **6 Marks** ➢ **Practicum (5 Marks)** • Class Participation: **Nil** • Seminar/Demonstration/Viva-voce/Lab records etc.: 0**5 Marks** • Mid-Term Exam: **Nil**		**End Term Examination : 20 Marks** **: 15 Marks**
Part C-Learning Resources		
Recommended Books/e-resources/LMS: **1.** Electricity and Magnetism (Berkley, Phys. Course 2), Edward M. Purcell, 1986 McGraw-Hill Education **2.** Electricity and Magnetism: A.S. Mahajan & A.A. Rangwala (Tata- McGraw Hill), 1988. **3.** Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury, 2012, Tata McGraw **4.** Introduction to Electrodynamics, D.J. Griffiths, 3rd Edn., 1998, Benjamin Cummings. **5.** Feynman Lectures Vol.2, R.P. Feynman, R.B. Leighton, M. Sands, 2008, Pearson Education **6.** Elements of Electromagnetics, M.N.O. Sadiku, 2010, Oxford University Press. **7.** Electricity and Magnetism, J.H.Fewkes & J.Yarwood. Vol. I, 1991, Oxford Univ. Press. **8.** Field and Wave Electromagnetics (2nd Edn.), David K. Cheng , Addison-Wesley Publishing Company.		

Kurukshetra University Kurukshetra
Undergraduate Programs
Course: DSEC-1

<table>
<tr><td colspan="4">Session: 2023-24</td></tr>
<tr><td colspan="4">Part A - Introduction</td></tr>
<tr><td>Subject</td><td colspan="3">Physics</td></tr>
<tr><td>Semester</td><td colspan="3">2nd</td></tr>
<tr><td>Name of the Course</td><td colspan="3">Computational Physics</td></tr>
<tr><td>Course Code</td><td colspan="3">B23-PHY-203</td></tr>
<tr><td>Course Type: (CC/MCC/MDC/CC-M/ DSEC /VOC/DSE/PC/AEC/VAC)</td><td colspan="3">DSEC</td></tr>
<tr><td>Level of the course (As per Annexure-I</td><td colspan="3">100-199</td></tr>
<tr><td>Pre-requisite for the course (if any)</td><td colspan="3">Appeared or passed the 1st sem (B.Sc. Physical Science/ equivalent)</td></tr>
<tr><td>Course Learning Outcomes(CLO):</td><td colspan="3">After completing this course, the learner will be able to:
1. Understand the programming language and their use in various applications
2. Develop Python programs to solve computational problems
3. Select a suitable programming to solve differential equations
4. Find the integral value of a function using appropriate method.
5. Understand how to develop a programme for a particular problem and it will improve logical thinking that helps to solve scientific problems using Python language.</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>4</td></tr>
<tr><td>Contact Hours</td><td>3</td><td>2</td><td>5</td></tr>
<tr><td colspan="2">Max. Marks:100
Internal Assessment Marks:30
End Term Exam Marks: 70</td><td colspan="2">Time:3hrs</td></tr>
<tr><td colspan="4">Part B- Contents of the Course</td></tr>
</table>

Instructions for Paper- Setter

1.Nine questions will be set in total.

2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.

3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.

4. 20% numerical problems are to be set.

5. Use of scientific (non-programmable) calculator is allowed.

Unit	Topics	Contact Hours
I	**Introduction to Programming using Python**: Structure of a Python Program, Functions, Interpreter shell, Indentation. Identifiers and keywords, Literals, Strings, Basic operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment Operator, Bit wise operator). Standard libraries in Python, notion of class, object and method.	11
II	**Creating Python Programs**: Identifiers and keywords; Literals, numbers, and strings; Operators; Expressions; Input/output statements; Defining functions; Control structures (conditional statements, loop control statements, break, continue and pass, exit function), default arguments. Mutable and immutable objects. Testing and debugging a program	12
III	**Differentiation:** Taylor series method, Newton's forward and backward difference formula, Stirling's formula. Numerical solutions of partial differential equations using Taylors's series method	11
IV	**Integration:** Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Gaussian Quadrature, Legendre– Gauss Quadrature, Numerical double integration.	11
	Practicum 1. Write a Python program to illustrate the various functions of the "Math" module. 2. Write a function that takes the lengths of three sides: side1, side2 and side3 of the triangle as the input from the user using input function and return the area of the triangle as the output. Also, assert that sum of the length of any two sides is greater than the third side. 3. Write a Python function that takes a number as an input from the user and computes its factorial. 4. Write a function that takes a number with two or more digits as an input and finds its reverse and computes the sum of its digits. 5. Write a function that takes two numbers as input parameters and returns their least common multiple and highest common factor. 6. Write a Python function to calculate the sum and product of two compatible matrices. 7. Write a function that takes a list of numbers as input from the user and produces the corresponding cumulative list where each element in the	30

	list present at index i is the sum of elements at index j <= i. 8. Write a function that takes n as an input and creates a list of n lists such that ith list contains first five multiples of i. 9. Solution of differential equations using Taylor's series method**.** 10. Numerical integration using (a) Simpson 1/3 and 3/8 rule 11. Gauss quadrature methods for one and two dimensional integrals **Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination.**	

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory (20 Marks)** • Class Participation: **05 Marks** • Seminar/presentation/assignment/quiz/class test etc.: **05 Marks** • Mid-Term Exam: **10 Marks** ➢ **Practicum (10 Marks)** • Class Participation: **Nil** • Seminar/Demonstration/Viva-voce/Lab records etc.: **10 Marks** • Mid-Term Exam: **Nil**	**End Term Examination : 50 Marks** **: 20 Marks**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Sheetal Taneja, Naveen Kumar, Python Programming "A Modular Approach" Pearson India.
2. E. Balaguruswamy, Introduction to Computing and Problem Solving using Python, 2nd edition, McGraw Hill Education, 2018
3. R C Desai, Fortran Programming and Numerical methods, Tata McGraw Hill, New Delhi.
4. Suresh Chandra, Computer Applications in Physics, Narosa Publishing House
5. M L De Jong, Introduction to Computation Physics, Addison-Wesley publishing company.
6. R C Verma, P K Ahluwalia and K C Sharma, Computational Physics an Introduction, New Age International Publisher.
7. S S Sastry Introductory methods of numerical Analysis, Prentice Hall of India Pvt. Ltd.
8. V Rajaraman, Computer Oriented Numerical Method, Prentice Hall of India Pvt. Ltd.
9. C Balachandra Rao and C K Santha, Numerical Methods, University Press
10. K E Atkinson, An introduction to numerical analysis, John Wiley and Sons.

Kurukshetra University Kurukshetra
Undergraduate Programs
Course: MDC-2

Session: 2023-24			
Part A - Introduction			
Subject	Physics		
Semester	2nd		
Name of the Course	**Physics Fundamentals-II**		
Course Code	B23-PHY-204		
Course Type: (CC/MCC/MDC/CC-M/ DSEC /VOC/DSE/PC/AEC/VAC)	MDC		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Not studied Physics subject at level 4 (i.e. 10+2 or equivalent)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Have basic knowledge about nature of light, the associated phenomena and their importance in daily life 2. Understand and describe the working of important optical instruments through the learning of image formation by mirrors and lenses 3. Have basic knowledge about electric current, electric circuit, electric components, and practical utility of heating and magnetic effects of electric current 4. Grasp an introductory idea about the generation of X-rays, α-, β- and γ-rays through an understanding of composition of atom & nucleus 5. Understand the observations, results, analysis and different concepts related to experiments of light & optics.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4

Max. Marks:75 **Internal Assessment Marks:20** **End Term Exam Marks: 55**	**Time:3hrs**

Part B- Contents of the Course

Instructions for Paper- Setter

1.Nine questions will be set in total.

2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.

3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.

4. 20% numerical problems are to be set.

5. Use of scientific (non-programmable) calculator is allowed.

Unit	Topics	Contact Hours
I	Light and optics-Nature and properties of light, its speed, frequency and wavelength; Reflection of light-types of reflection and their importance in daily life, laws of reflection, multiple reflection by mirrors and their applications. Refraction of light- laws of refraction, refractive index, refraction of light through prism (dispersion of light), formation Rainbow, twinkling of stars, advance Sunrise and delayed Sunset; Scattering of light and blue colour of the sky; apparent depth, total internal reflection and its important applications	7
II	Image formation through reflection-images formed by plane mirrors, multiple images formed by two flat mirrors and optical illusions; images formed by parabolic mirrors and spherical mirrors- Concave and convex mirrors, ray diagrams, mirror equation and magnification; applications of plane and curved mirrors in daily life. Image formation through refraction- images by convex and concave lenses, ray diagrams and lens equation. Optical instruments- Camera, eye, telescope and microscope	8
III	Electricity- electric charge, types of charges, unit of charge, frictional electricity, electricity by conduction and electric current, units of electric current, measurement of current, conductors and insulators; resistance, resistivity and Ohm's law, electric potential and potential difference, emf; Electric circuit- resistor, capacitor, battery, ammeter and voltmeter; Series and parallel combinations of resistors, electrical wiring in houses and electrical safety (fuse, hot wire, neutral, ground and short circuit), electric power and electric power transmission; Heating effect of current and its practical applications. Magnetic effect of electric current- Magnetic field and field lines, bar magnet, magnetic field and direction of field due to a current- through	8

	straight conductor and through a circular loop; solenoid, electromagnet	
IV	Structure of an atom- Rutherford's model of an atom, Bohr's model of an atom and composition of the atom-electron, proton and neutron, orbits or shells (energy levels in an atom), distribution of electrons in different shells of the atom, atomic number and atomic mass of an atom, core shell and outer shell, valency of an atom, excitation and ionization of the atom, meaning of atomic transitions; Discovery of X-rays, Generation of X-rays, their characteristics, applications and harmful effects; Composition of nucleus, meaning of nuclear transitions and properties of α-, β- and γ-rays	7
	Practicum 1. To find the focal length of a convex mirror using a convex lens. 2. To find the value of v for different values of u in the case of a concave mirror and to find the focal length 3. To find the focal length of a concave lens using a convex lens. 4. To determine the refractive index of a glass slab 5. To find the refractive index of a liquid using a convex lens and plane mirror 6. To determine the resistivity of different wires by plotting a graph for potential difference versus current. 7. To verify Ohm's law for metallic conductor and to determine its resistance. 8. To find the frequency of AC mains with a sonometer. 9. Use of Multimeter for measuring Resistance, A.C. and D.C. Voltage and Current, checking of electrical fuses. 10. Use of Multimeter to check the working condition of diode, an LED, a resistor and a capacitor. **Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination.**	30
Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory (15 Marks)** • Class Participation: **04 Marks** • Seminar/presentation/assignment/quiz/class test etc.: **04 Marks** • Mid-Term Exam: **7 Marks** ➢ **Practicum (05 Marks)** • Class Participation: **Nil** • Seminar/Demonstration/Viva-voce/Lab records etc.: **05 Marks** • Mid-Term Exam: **Nil**		**End Term Examination : 35 Marks** **20 Marks**
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

1. Essential University Physics, Vol.-1 &2 by Richard Wolfson, Pearson Education, Patparganj, Delhi, India.
2. Concept of Physics by H.C. Verma, Bharti Bhawan, Ansari Road, Daryaganj, New Delhi, India.
3. Modern Physics (2^{nd} edition), by S.L. Kakani and Shubhra Kakani, Viva Books, New Delhi.
4. Physics for Scientists and Engineers with Modern Physics, 7^{th} edition, by Raymond A. Serway and John W. Jewett, Jr., Thomson Higher Education 10 Davis Drive Belmont, CA 94002-3098 USA.
5. Physics For You (Fifth Edition) by Keith Johnson.
6. B.Sc Practical Physics, C. L. Arora, R Chand & Co. New Delhi
7. B.Sc Practical Physics, Harnam Singh and Dr. P.S. Hemne, S Chand & Company Ltd.