Ch. Ranbir Singh University, Jind

Scheme and Syllabus of Examination for Undergraduate Programme

Subject: PHYSICS

Under Multiple Entry-Exit, Internships and
CBCS-LOCF in accordance to NEP2020
w.e.f. 2024-25 (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	B24-PHY-101	Mechanics	2	2	15	35	50	3
			Practicum	2	4	15	35	50	3
	MCC-2	B24-PHY-102	Mathematical Physics-1	2	2	15	35	50	3
			Practicum	2	4	15	35	50	3
	CC-M1	B24-PHY-103	Elementary Mechanics	1	1	10	20	30	3
			Practicum	1	2	5	15	20	3
	MDC1	B24-PHY-104	Physics Fundamentals-I	2	2	15	35	50	3
			Practicum	1	2	5	20	25	3
2	CC-2 MCC-3	B24-PHY-201	Electricity and Magnetism & EM Theory	2	2	15	35	50	3
			Practicum	2	4	15	35	50	3
	CC-M2	B24-PHY-202	Elementary Electricity & Magnetism	1	1	10	20	30	3
			Practicum	1	2	5	15	20	3
	DSEC-1	B24-PHY-203	Computational Physics	2	2	15	35	50	3
			Practicum	2	4	15	35	50	3
	MDC-2	B24-PHY-204	Physics Fundamentals-II	2	2	15	35	50	3
			Practicum	1	2	5	20	25	3

Ch. Ranbir Singh University, Jind
Undergraduate Programs
Course: CC-1/MCC-1

Session: 2024-25			
Part A - Introduction			
Subject	Physics		
Semester	1st		
Name of the Course	Mechanics		
Course Code	B24-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

	2	2	4
Contact Hours	2	4	6
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, Solid cylinder, Solid sphere, Hollow sphere, Rectangular 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.	8
II	**Elasticity:** Deforming force, Elastic limit, stress, strain and their types, Hooks law, Module of elasticity Relation between shear angle and angle of twist, elastic energy stored/volume in an elastic body, Poisson's ratio and its limiting value, Relation between Young modulus, Bulk modulus and Poisson ratio. Derive the Relation between Young's modulus, Bulk modulus and Modulus of rigidity. Torque required for twisting cylinder.	8
III	**Special Theory of Relativity:** Frames of reference, Galilean transformations, inertial and non-inertial frames, Michelson Morley's Experiment, postulates of special theory of relativity, length contraction, time dilation, relativistic transformation of velocity, relativistic variation of mass, mass-energy equivalence.	7
IV	**Gravitation and central force motion:** Law of gravitation, Motion of a Particle under Central Force Field. Two Body Problem and its Reduction to One Body Problem and its Solution. Kepler's Laws for planetary motion (Statements Only), orbit for artificial satellites.	7
	Practicum 1. Measurement of length (or diameter) using vernier caliper, screw gauge and travelling microscope.	60

	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 Modulus by Bending of Beam. 7. Modulus of rigidity of material of wire by Maxwell's Needle. 8. Elastic constant by Searle's method. 9. To determine the value of 'g' by using Bar pendulum. 10. To find the Poisson ratio of rubber. 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 Eight 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 (15 Marks)** • Class Participation: **05** • Seminar/Demonstration/Viva-voce/Lab records etc.: **10 Marks** • Mid-Term Exam: **Nil**	**End Term Examination : 35 Marks** **: 35 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.

Ch. Ranbir Singh University, Jind
Undergraduate Programs
Course: MCC-2

<table>
<tr><th colspan="4">Session: 2024-25</th></tr>
<tr><th colspan="4">PartA - Introduction</th></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">Mathematical Physics 1</td></tr>
<tr><td>Course Code</td><td colspan="3">B24-PHY-102</td></tr>
<tr><td>CourseType: (CC/MCC/MDC/CC-M/ DSEC /VOC/DSE/PC/AEC/VAC)</td><td colspan="3">MCC</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">Physics as main 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. 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 and sole Hermite equation and study orthogonal properties of Hermite Polynomials and 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</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>2</td><td>2</td><td>4</td></tr>
</table>

Contact Hours	2	4	6
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	**Matrices:** Basics of Matrices, Symmetric and Anti-symmetric Matrices, Orthogonal Matrices, Hermitian and Anti-hermitian Matrices, Unitary Matrices, Conjugate of a Matrix, Trace of Matrix, Eigen values and Eigen vectors of Matrices, Diagonalization of Matrices.	7
II	**Vector Calculus**: Scalar product, Vector product, Scalar triple product and their interpretation in terms of area and volume respectively. Scalar and Vector fields, Vector Differentiation: Directional derivatives and normal derivative. Gradient of a scalar field and its geometrical interpretation. Divergence and curl of a vector field. Del and Laplacian operators.	8
III	**Ordinary Differential Equations**: First order differential equations of degree one and those reducible to this form, Method of separation of variables, Homogeneous Differential Equations, Linear Differential Equations, Exact and Inexact equations, Integrating Factor, Applications to physics problems, Linear Differential Equations of Second Order with constant Coefficients. Vibrating mass on a spring, Current in RC & LC Circuit.	8
IV	**Fourier series :** Introduction, Dirichlet Conditions (Statement only), Evaluation of coefficients of Fourier series, cosine series, sine series, Physical applications of Fourier series analysis, square wave, Half wave rectifier, Full wave rectifier, A triangular wave.	7
	Practicum **Review of Programming fundamentals in any one language form MATLAB/ Scilab/ FORTRAN/C++/ Phython:** Integer and floating point arithmetic expression, built in functions, executable and non-executable statements, input and output statements, Formats, IF, loops, DO, FOR and	60

GO TO statements, Dimension arrays, statement function and function subprogram.

1. Read and write a matrix of given using looping statement.
2. Compute the product of two matrices of different dimension using DO loop.
3. To print out all natural (even/odd) numbers between given limits using computer.
4. Fitting of a straight line using Least-Square Fitting method
5. Using array variable, find out the average and standard deviation
6. To evaluate sum of finite series.
7. To find out the Sine & Cosine Series using Taylor's series.
8. To plot the flow of current in RC & LC circuit.
9. To find the roots of a quadratic equation.
10. To find integration of a definite integral by trapezoidal rule.
11. To find the area of a triangle, sphere and cylinder.
12. To find the eigen values of a matrix.
13. To plot square wave and sine wave.
14. 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 have to give the review of Programming fundamentals to the students. There after student will perform at least Eight 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 (15 Marks)**
- Class Participation: **05**
- Seminar/Demonstration/Viva-voce/Lab records etc.: **10 Marks**
- Mid-Term Exam: **Nil**

End Term Examination : 35 Marks

: 35 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.

Ch. Ranbir Singh University, Jind
Undergraduate Programs
Course: CC-M1

Session: 2024-25			
Part A - Introduction			
Subject	Physics		
Semester	1st		
Name of the Course	Elementary Mechanics		
Course Code	B24-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 body. 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 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
	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, Solid Sphere.	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.	4
III	**Special Theory of Relativity:** Galilean Transformation**,** Michelson's Morley experiments and its outcome, Postulate of special theory of relativity, Lorentz Transformation, Lorentz contraction, Time dilation.	4
IV	**Gravitation and central force motion:** Law of gravitation, Motion of a Particle under Central Force Field. Kepler's Laws for planetary motion (Statements Only).	4
	Practicum 1. Measurement of length using vernier caliper. 2. Measurement of diameter using screw gauge. 3. To study the random error in observations. 4. To determine the area of window using a sextant. 5. Moment of Inertia of a Fly Wheel 6. Moment of Inertia of irregular body using a Torsion Pendulum. 7. Young Modulus by Bending of Beam. 8. Young's modulus by Koenig's method. 9. Modulus of rigidity of material of wire by Maxwell's Needle. 10. Elastic constant by Searle's method. 11. To determine the value of 'g' by using Bar pendulum. **Note: Student will perform at least five experiments. The examiner will allot one practical at the time of end term examination.**	15

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.

Ch. Ranbir Singh University, Jind
Undergraduate Programs
Course: MDC-1

<table>
<tr><td colspan="4">Session: 2024-25</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">B24-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 Fundamental –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, Physics in relation to other sciences, Impact of Physics on Society, latest developments in Science and 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)	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.	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.	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) (Qualitative idea only)- importance in daily life.	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. 3. To measure the internal diameter and depth of a given beaker/calorimeter and hence find its volume. 4. Measurement of length using vernier caliper. 5. Measurement of diameter using screw gauge. 6. To determine radius of curvature of a given spherical surface by a spherometer.	30

	7. 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 8. To find the weight of a given body using parallelogram law of vectors. 9. Verification of Archimedes principle. 10. Verification of Work-energy theorem. 11. Acceleration due to gravity (g) by bar pendulum. 12. To determine the moment of Inertia of a fly-wheel. 13. Study of law of conservation of linear momentum and KE. **Note: Student will perform at least five 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 (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, 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.

Ch. Ranbir Singh University, Jind
Undergraduate Programs
Course: CC-2/MCC-3

<table>
<tr><th colspan="4">Session: 2024-25</th></tr>
<tr><th colspan="4">Part A - Introduction</th></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">Electricity, Magnetism and EM Theory</td></tr>
<tr><td>Course Code</td><td colspan="3">B24-PHY-201</td></tr>
<tr><td>Course Type: (CC/MCC/MDC/CC-M/ DSEC /VOC/DSE/PC/AEC/VAC)</td><td colspan="3">CC/MCC</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. 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. Learn to present observations, results, analysis and different concepts related to experiments of Electricity and Magnetism.</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>2</td><td>2</td><td>4</td></tr>
</table>

Contact Hours	2	4	6
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, Flux of a vector field, Divergence and curl of a vector and their physical significance, 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. Mechanical force of charged surface.	8
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. **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).	8
III	**Time varying electromagnetic fields:** Electromagnetic induction, 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.	7
IV	**Electromagnetic Waves:** Electromagnetic waves, Transverse nature of electromagnetic wave, energy transported by electromagnetic waves, Poynting vector, Poynting's theorem.	7

	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's bridge. 8. To study the Characteristics of a Series RC Circuit. 9. To study a series LCR circuit 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 Q. 11. Self-inductance by Anderson's bridge. 12. Verification of laws of electromagnetic induction. 13. Study of B-H curves of various materials using C.R.O, and determination of various parameters. **Note: Student will perform at least Eight experiments. The examiner will allot one practical at the time of end term examination.**	60

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 (15 Marks)** • Class Participation: **05** • Seminar/Demonstration/Viva-voce/Lab records etc.: **10 Marks** • Mid-Term Exam: **Nil**	**End Term Examination : 35 Marks** **: 35 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.

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

Ch. Ranbir Singh University, Jind
Undergraduate Programs
Course: CC-M2

Session: 2024-25			
Part A - Introduction			
Subject	Physics		
Semester	2nd		
Name of the Course	**Elementary Electricity & Magnetism**		
Course Code	B24-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. 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 4. 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.	4
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.	3
III	**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.	4
IV	**DC current Circuits:** Electric currents and current density, Electrical conductivity and Ohm's law (Review), Kirchhoff's laws for D.C. networks.	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. 6. High resistance by substitution method. 7. To compare capacitances using De'Sauty's bridge. 8. To study the Characteristics of a Series RC Circuit. 9. To study a series LCR circuit LCR circuit and determine its (a) Resonant frequency, (b) Quality factor. 10. To study a parallel LCR circuit and determine its (a) Anti-resonant	30

	frequency and (b) Quality factor Q. **Note: Student will perform at least four 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 (2^{nd} Edn.), David K. Cheng , Addison-Wesley Publishing Company.

Ch. Ranbir Singh University, Jind
Undergraduate Programs
Course: DSEC-1

Session: 2024-25			
Part A - Introduction			
Subject	Physics		
Semester	2nd		
Name of the Course	**Computational Physics**		
Course Code	B24-PHY-203		
Course Type: (CC/MCC/MDC/CC-M/ DSEC /VOC/DSE/PC/AEC/VAC)	**DSEC**		
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. 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.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
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	**Solution of Algebraic and Transcendental Equations**. Fixed-Point Iteration Method, Bisection Method, Secant Method, Newton-Raphson Method, Comparison and Error Estimation..	7
II	**Interpolation: -** Forward and Backward Differences. Symbolic Relation. Differences of a Polynomial. Newton' Forward and Backward Interpolation Formulas. Divided Differences. Newton's General Interpolation Formula.	8
III	**Solution of ODE First order Differential equation:** Euler, modified Euler and Runge- Kutta second order methods Second order differential equation e.g. First order differential equation, Radioactive decay, Current in RC, LC circuits with DC source.	8
IV	**Numerical Differentiation and Integration:** Forward and Backward difference formula, Trapezoidal rule, Simpson's 1/3 and 3/8 rule,	7
	Practicum **Followings Programs will be performed from any one of these languages.** **MATLAB/ Scilab/ FORTRAN/C++/ Phython:** 1. Numerical Integration using Simpson 1/3. 2. Numerical Integration using Trapezoidal Method. 3. Solution of first-order differential equation using Taylor series method 4. Solution of first-order differential equation using Euler method. 5. Solution of first-order differential equation using Modified Euler method. 6. Solution of first-order differential equation using Runge-Kutta method. 7. Solution of second-order differential equation using Runge-Kutta method. 8. To find roots of an equation by using Bisection method. 9. To find roots of an equation by using Newton-Raphson Method. 10. Interpretation and Extrapolation by using Lagrangian method 11. Solution of differential equations using Taylor's series method**.** 12. Solution of Simultaneous Linear Algebraic equations by Gauss-Jordan elimination method.	60

	Note: Student will perform at least Eight 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 (15 Marks)** • Class Participation: **05** • Seminar/Demonstration/Viva-voce/Lab records etc.: **10 Marks** • Mid-Term Exam: **Nil**		**End Term Examination : 35 Marks** **: 35 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.

Ch. Ranbir Singh University, Jind
Undergraduate Programs
Course: MDC-2

Session: 2024-25			
Part A - Introduction			
Subject	Physics		
Semester	2nd		
Name of the Course	**Physics Fundamentals-II**		
Course Code	B24-PHY-204		
CourseType: (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 electric current 4 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. **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, total internal reflection.	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.	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;.	8
IV	**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 current and its practical applications	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.	30

	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 five 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 (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, 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.