GURU JAMBHESHWAR UNIVERSITY OF SCIENCE AND TECHNOLOGY, HISAR
(Established by State Legislature Act 17 of 1995)
'A+' Grade, NAAC Accredited State Govt. University

Acad./AC-III/ BOS&R-12/2025/ 4516
Dated: 01/8/25

To

The Controller of Examinations,
GJUST, Hisar.

Sub: Approval of the scheme of examinations and syllabi of Integrated B.Sc. (Physical Sciences) – M.Sc. Physics – 3rd and 4th semester w.e.f. academic session 2025-26 (batch 2024) as per NEP-2020 under scheme 'A' being run in University Teaching Department.

Sir,

I am directed to inform you that the Vice-Chancellor, on the recommendations of Dean, Faculty of Physical Sciences & Technology on 18.07.2025, is pleased to approve the scheme of examinations and syllabi of Integrated B.Sc. (Physical Sciences) – M.Sc. Physics – 3rd and 4th semester w.e.f. academic session 2025-26 (batch 2024) as per NEP-2020 under scheme 'A' being run in University Teaching Department, under Section 11(5) of the University Act, 1995 in anticipation of approval of the Academic Council.

A copy of the scheme of examinations & syllabi of above said programme(s) is enclosed herewith. You are therefore, requested to take further necessary action accordingly.

Yours faithfully
29/7/25
Assistant Registrar (Academic)
for Registrar

DA: As above

Endst. No. Acad./AC-III/BOS&R-12/2025/ 4517-20 Dated: 01/8/25

A copy of the above is forwarded to the following for information and necessary action:-

1. Dean, Faculty of Physical Sciences & Technology, GJUST, Hisar.
2. Chairperson, Department of Physics, GJUST, Hisar alongwith copy of scheme of examinations and syllabi of Integrated B.Sc. (Physical Sciences) – M.Sc. Physics – 3rd and 4th semester w.e.f. academic session 2025-26 (batch 2024) as per NEP-2020 under scheme 'A' being run in University Teaching Department. He is requested to arrange to upload the scheme of examinations & syllabi of above said programmes on the website of the University.
3. OSD to Vice-Chancellor (for kind information of the Vice-Chancellor), GJUST, Hisar.
4. P.A. to Registrar (for kind information of the Registrar), GJUST, Hisar.

29/7/25
Assistant Registrar (Academic)

UTD - III & IV sem

Department of Physics

Scheme of Examination and Syllabus for
Under Graduate Programme
(University Teaching Departments)
Under Multiple Entry and Exit, Internship and
CBCS-LOCF as per NEP-2020
For the batch 2024-25 (in phased manner)

Subject: Physics

Guru Jambheshwar University of Science &Technology
Hisar-125001, Haryana

(A+ NAAC Accredited State Govt. University)

Guru Jambheshwar University of Science and Technology
Hisar-125001, Haryana
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Scheme of Examination for UTD for the batch 2024-25
As per Scheme-A for UTD
Name of the Programme: Integrated B.Sc. (Physical Sciences)-M.Sc. Physics
According to National Education Policy-2020

SECOND YEAR

SEMESTER-III

Type of Course	Course Code	Nomenclature of Paper/Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hrs)
Discipline Specific Course	24CHE0301T	Chemistry-III	3	3	20	50	70	2.5
	24CHE0301P	Chemistry-III Lab	1	2	10	20	30	3
	24PHY0301T	Electricity and Magnetism	3	3	20	50	70	2.5
	24PHY0301P	Electricity and Magnetism Lab	1	2	10	20	30	3
	24MAT0301T	Differential Equations	4	4	30	70	100	3
Minor Course/ Vocational Course		To be opted from the Pool of MIC	4	4	30	70	100	3
Multidisciplinary Course		To be opted from the Pool of MDC	3	3	25	50	75	2.5
	OR							
		To be opted from the Pool of MDC	2	2	15	35	50	2
			1	2	10	15	25	3
Ability Enhancement Course		To be opted from the Pool of AEC	2	2	15	35	50	2
Skill Enhancement Course	24SEC0312T	Python Programming	2	2	15	35	50	2
	24SEC0312P	Python Programming Lab	1	2	10	15	25	3
			22				600	

SEMESTER-IV

Type of Course	Course Code	Nomenclature of Paper/Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hrs)
Discipline Specific Course	24CHE0401T	Chemistry-IV	3	3	20	50	70	2.5
	24CHE0401P	Chemistry-IV Lab	1	2	10	20	30	3
	24PHY0401T	Waves and Optics	3	3	20	50	70	2.5
	24PHY0401P	Waves and Optics Lab	1	2	10	20	30	3
	24MAT0401T	Mechanics	4	4	30	70	100	3
Minor Course/ Vocational Course		To be opted from the Pool of VOC	2	2	15	35	50	2
		To be opted from the Pool of VOC	2	2	15	35	50	2
Ability Enhancement Course			2	2	15	35	50	2
Value Added Course		To be opted from the Pool of VAC	2	2	15	35	50	2
			20				500	

Notes:

Students exit the programme after fourth semester and securing 96 credits including 4 credits of summer internship will be awarded UG diploma in the relevant Discipline/subject. Four credit of internship completed by a student during summer after 2nd or 4th semester, will be taken into account in 5th semester who pursue 5-year UG-PG Programme without taking exit option.

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Scheme and Syllabus of courses offered by Physics for B. Sc. Physical Science Programme w.e.f. session 2025-26
(For University Teaching Departments according to National Education Policy-2020)

Subject-Physics

SEMESTER – III

Type of Course	Course Code	Nomenclature	Credits	Hours/ Week	Marks			Exam hours
					External	Internal	Total	
Discipline Specific Course (DSC-A3)	24PHY0301T	Electricity and Magnetism	3	3	50	20	70	2.5
	24PHY0301P	Electricity and Magnetism lab	1	2	20	10	30	3
Minor Course (MIC3)	24MIC0328T	Electronics Instrumentation	4	4	70	30	100	3
Multidisciplinary Course (MDC3)	24MDC0311T	MATLAB Programming	2	2	35	15	50	2
	24MDC0311P	MATLAB Programming Lab	1	2	15	10	25	3
Skill Enhancement Course (SEC3)	24SEC0312T	Python Programming	2	2	35	15	50	2
	24SEC0312P	Python Programming Lab	1	2	15	10	25	3

SEMESTER – IV

Type of Course	Course Code	Nomenclature	Credits	Hours/Week	Marks			Exam hours
					External	Internal	Total	
Discipline Specific Course (DSC-A4)	24PHY0401T	Waves and Optics	3	3	50	20	70	2.5
	24PHY0401P	Waves and Optics Lab	1	2	20	10	30	3
Minor Course MIC-4 (VOC)	24VOC0428T	Electronics Circuits	2	2	35	15	50	2
	24VOC0428P	Electronics Circuits Lab	2	4	35	15	50	3
Value Added Course (VAC3)	24VAC0322T	Introduction to Space Technology	2	2	35	15	50	2

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Pool of Minor Courses (MIC) /VOC

Semester	Course Code	Nomenclature	Credits	Hours/Week	Marks		
					External	Internal	Total
Semester - III	24MIC0328T	Electronics Instrumentation	4	4	70	30	100
Semester - IV	24VOC0428T	Electronics Circuits	2	2	35	15	50
	24VOC0428T	Electronics Circuits Lab	2	2	35	15	50

Pool of Multidisciplinary Courses (MDC)

Semester	Course Code	Nomenclature	Credits	Hours/Week	Marks		
					External	Internal	Total
Semester - III	24MDC0311T	MATLAB Programming	2	2	35	15	50
	24MDC0311P	MATLAB Programming Lab	1	2	15	10	25

Pool of Skill Enhancement Courses (SEC)

Semester	Course Code	Nomenclature	Credits	Hours/Week	Marks		
					Internal	External	Total
Semester - III	24SEC0312T	Python Programming	2	2	35	15	50
	24SEC0312P	Python Programming Lab	1	2	15	10	25

Pool of Value-Added Courses (VAC)

Semester	Course Code	Nomenclature	Credits	Hours/Week	Marks		
					External	Internal	Total
Semester – III/IV	24VAC0322T	Introduction to Space Technology	2	2	35	15	50

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Physics
Discipline Specific Course (DSC)
Electricity and Magnetism (Semester III)

Paper Code: 24PHY0301T
45 Hrs (3Hrs /week)
Credits: 3
Time: 2.5 Hrs

External Marks: 50
Internal Marks: 20
Total Marks: 70

Note: The examiner is required to set seven questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to this, six more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt four questions in all selecting one from each unit in addition to the compulsory Question No.1. All questions carry equal marks. 20% numerical problems are to be set and use of scientific calculator (nonprogrammable) is allowed.

Unit-I

Vector Background and Electric Field: Gradient of a scalar, Line, Surface and Volume integrals of a vector, Divergence and curl of a vector, Gauss's divergence theorem, Stoke's theorem. Conservative nature of Electrostatic Field, Electrostatic Potential, 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.
Magnetic Field: Biot-Savart law and its 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.

Unit-II

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), B-H curve and hysteresis loop, importance of Hysteresis loop.
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.

Unit-III

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.
DC current Circuits: Electric current and current density, Electrical conductivity, and Ohm's law, 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.

References:

1. Fundamentals of Electricity and Magnetism, Arthur F. Kip, 2nd Edn.1981, McGraw-Hill.
2. Electricity and Magnetism, J.H. Fewkes and J. Yarwood. Vol. I, 1991, Oxford Univ.Press
3. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
4. Fundamentals of Electromagnetics, M.A.W. Miah, 1982, Tata McGraw Hill
5. Introduction to Electrodynamics, D.J. Griffiths, 3rd Edn, 1998, Benjamin Cummings.

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Electricity and Magnetism Lab

Paper Code: 24PHY0301P
30 Hrs (2 Hrs /week)
Credit: 1
Time: 3 Hrs

External Marks: 20
Internal Marks: 10
Total Marks: 30

Practical

1. To study the characteristics of a series RC Circuit.
2. To determine an unknown Low Resistance using Potentiometer.
3. To determine an unknown Low Resistance using Carey Foster's Bridge.
4. To determine the value of e/m by Bar magnet
5. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
6. To study the response curve of a parallel LCR circuit and determine its (a) Anti resonant frequency and (b) Quality factor Q.
7. Measurement of charge and current sensitivity and CDR of Ballistic Galvanometer
8. Determine a high resistance by leakage method using Ballistic Galvanometer.
9. Determination Wavelength of Ultrasonic Wave.
10. To study the damped oscillations
11. To study Lissajous Figures.

Note: The list of experiments may vary. Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination. Students are required to get minimum pass marks separately as per university rules in theory and practical components of the course.

Course Outcomes (CO)

After completing this course, the student will be able to:

CO1. Understand the concept of vectors, various types of integral, electric fields, Laplace and Poisson's equations and Gauss's and its applications.
CO2. Know about the magnetic fields and various laws that deal with the magnetic fields and their applications.
CO3. Understand the magnetic properties of matter and type of magnetic materials.
CO4. Comprehend about the time varying electromagnetic fields, Maxwell's equation and about the nature of electromagnetic waves.
CO5. Perform experiments on RC, LCR circuits, wavelength of electromagnetic waves, damped oscillations and Lissajous figures.

Reference Books

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing Houseab
2. A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Ed., 2011, Kitab Mahal
3. A Laboratory Manual of Physics for undergraduate classes, D.P.Khandelwal, 1985, Vani Pub

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Physics
Minor Course (MIC3)
Electronics Instrumentation (Semester III)

Paper Code: 24MIC0328T
60 Hrs (4 Hrs /week)
Credits: 4
Time: 3 Hrs

External Marks: 70
Internal Marks: 30
Total Marks: 100

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt five questions in all selecting one from each unit and the compulsory Question No.1. All questions carry equal marks

Unit-I

Basics of Measurement: Instruments accuracy, precision, sensitivity, resolution range etc., Errors in measurements and loading effects.
Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance, Specifications of multimeters and their significance.

Unit-II

Digital Multimeter: Block diagram and working of a digital multimeter, Working principle of time interval, frequency and period measurements using universal counter/ frequency counter, Time - base stability, Accuracy and resolution.
Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity, Principles of voltage measurement (block diagram only), Specifications of an electronic Voltmeter/ Multimeter and their significance.

Unit-III

Function Generators: Overview of function generators, their purpose, types of waveforms produced, and triggering methods, Generation of waveforms and important features like frequency range and modulation capabilities, working principle of generator, conversion of triangular to square and sine waves, Frequency response, Advance function generators.

Unit-IV

Cathode Ray Oscilloscope: Block diagram of basic CRO, Construction of CRT, Electron gun, electrostatic focusing and acceleration (qualitative treatment only), Brief discussion on screen phosphor, visual persistence & chemical composition, Time base operation, synchronization, Front panel controls,
Specifications of a CRO and their significance, Use of CRO for the measurement of voltage (dc and ac), frequency and time period. Special features of dual trace, Introduction to digital oscilloscope and probes, Digital storage Oscilloscope: Block diagram and principle of working.

Course Outcomes (CO)

After completing this course, the student will be able to:

CO1. Understand the basics of measurements and about multimeter.
CO2. Know about the use and working of digital multimeter and electronic voltmeter.
CO3. Understand the operations of function generators and its uses.
CO4. Understand the working and use of cathode ray oscilloscope in various electronic circuits.

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Reference Books:

1. D. Patranabis, 'Sensors and Transducers', Prentice Hall of India, 1999
2. Physics of Semiconductor Devices, S. M. Sze, Willey Publisher.
3. Integrated Electronics, Jacob Millman and C C Halkias, TATA McGraw-Hill Edition.
4. A text book in Electrical Technology- B L Theraja – S Chand & Co.
5. Basic Electronics and Linear Circuits, N N Bhargava, McGraw-Hill Edition

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Physics
Multidisciplinary Course (MDC3)
MATLAB Programming (Semester III)

Paper Code: 24MDC0311T
30 Hrs (2 Hrs /week)
Credits: 2
Time: 2 Hrs

External Marks: 35
Internal Marks: 15
Total Marks: 50

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

UNIT – I

Introduction to MATLAB: MATLAB environment and interface, Variables, data types, and basic operations, Using MATLAB as a calculator, working with arrays and Matrices, displaying output, and using basic formatting, MATLAB Programming: Writing and executing MATLAB, Control flow statements (if-else, for loops, while loops), Logical Operators and relational operators, working with built-in functions.

UNIT – II

Data Manipulation in MATLAB: Indexing and slicing arrays and matrices, working with vectors and matrices operations, basic input/output operations (reading from/writing to files), Importing and exporting data from various file formats, Data Visualization: plotting 2D graphs using MATLAB, customizing plot appearance (labels, titles, colors, etc.), creating multiple plots and subplots.

MATLAB Programming Lab

Paper Code: 24MDC0311P
30 Hrs (2 Hrs /week)
Credit: 1
Time: 3 Hrs

External Marks: 15
Internal Marks: 10
Total Marks: 25

Practical

1. Finding the solution of ordinary differential equations
2. Integration of a function.
3. Differentiation of a function.
4. Obtain the curve fitting for a given data.
5. Solution of equations for simple pendulum.
6. Addition and multiplication of two matrices.
7. Study of motion of a pendulum.
8. Study of Kepler's law

Note: The list of experiments may vary. Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination. Students are required to get minimum pass marks separately as per university rules in theory and practical components of the course.

Course Outcomes (COs)

After completing this course, the student will be able to:

CO1. Understand the basics of MATLAB i.e., various data types, statements and flow charts.
CO2. Know about the program writing in MATLAB and graph plotting.
CO3. Familiar with the MATLAB programming used in various fields.

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Reference Books:

1. "MATLAB: A Practical Introduction to Programming and Problem Solving" by Stormy Attaway, 4th Edition, Butterworth Heinemann publication.
2. "Programming in MATLAB" by E V Krishnamurthy and S K Sen, East-West Publication.
3. MATLAB the Language of Technical Computing by The MathWorks, Inc.
4. "Computational Physics using MATLAB", Nicholas J Giordano and Hisao Nakanishi.

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Physics
Skill Enhancement Course (SEC3)
Python Programming (Semester III)

Paper Code: 24SEC0312T
30 Hrs (2 Hrs /week)
Credits: 2
Time: 2 Hrs

External Marks: 35
Internal Marks: 15
Total Marks: 50

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

UNIT – I

Basic Elements of Python: The Python interpreter, the print statement, comments, Python as simple calculator, objects and expressions, variables (numeric, character and sequence types) and assignments, mathematical operators. Strings, Lists, Tuples and Dictionaries, type conversions, input statement, list methods. List mutability Formatting in the print statement. Control Structures: Conditional operations, if, if-else, if-elif-else, while and for Loops, break and continue, Functions: Inbuilt functions, user-defined functions, local and global variables, passing functions, modules, importing modules, math module, making new modules.

UNIT – II

NumPy Fundamentals: Importing Numpy, Difference between List and NumPy array, Adding, removing and sorting elements, creating arrays using ones(), zeros(), random(), arange(), linspace(). Basic array operations (sum, max, min, mean, variance), 2-d and 3-d arrays, matrix operations, reshaping and transposing arrays, savetxt() and loadtxt(), create a Pandas dataframe from an array and then write the data frame to a csv file. Plotting with Matplotlib: matplotlib.pyplot functions, Plotting of functions given in closed form as well as in the form of discrete data and making histograms.

24SEC0312P: Python Programming Lab

Paper Code: 24SEC0312P
30 Hrs (2 Hrs /week)
Credit: 1
Time: 3 Hrs

External Marks: 15
Internal Marks: 10
Total Marks: 25

List of Programs:

1. Plot the displacement-time and velocity-time graph for the undamped, under damped critically damped and over damped oscillator using matplotlib
2. Use recurrence relation for Legendre polynomials to generate and plot these polynomials for the first few orders using matplotlib. To study Zener diode as a voltage regulator.
3. To generate array of N random numbers drawn from a given distribution (uniform, binomial, Poisson and gaussian) and plot them using matplotlib for increasing N to verify the distribution. Verify the central limit theorem.
4. To implement the transformation of physical observables under Galilean, Lorentz and Rotation transformation
5. Least Square fitting: Algorithm for least square fitting and its relation to maximum likelihood for normally distributed data.
6. Make Python function for least square fitting, use it for fitting given data (x,y) and estimate the parameters a, b as well as uncertainties in the parameters for the following cases:

(a) Linear ($y=ax+b$) (b) Power law ($y=ax^b$) and (c) exponential ($y=ae^x$).

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Note: The list of experiments may vary. Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination. Students are required to get minimum pass marks separately as per university rules in theory and practical components of the course.

Course Outcomes (COs)

After completing this course, the student will be able to:

CO1. Understand the basics of Python i.e., various data types, statements and structures.
CO2. Know about the Python fundamentals and program writing.
CO3. Familiar with the basics programming in Python Language.

Reference Books:

1. Documentation at the Python home page (https://docs.python.org/3/) and the tutorials there (https://docs.python.org/3/tutorial/).
2. Documentation of NumPy and Matplotlib : https://numpy.org/doc/stable/user/ and https://matplotlib.org/stable/tutorials/
3. Computational Physics, Darren Walker, 1st Edn, Scientific International Pvt. Ltd (2015).
4. Elementary Numerical Analysis, K. E. Atkinson, 3rd Edn, 2007, Wiley India Edition.
5. An Introduction to Computational Physics, T. Pang, Cambridge University Press (2010).
6. Introduction to Numerical Analysis, S. S. Sastry, 5th Edn., 2012, PHI Learning Pvt. Ltd.

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Physics
Value Added Course (VAC)
Introduction to Space Technology (Semester III/IV)

Paper Code: 24VAC0322T
30 Hrs (2 Hrs /week)
Credits: 2
Time: 2 Hrs

External Marks: 35
Internal Marks: 15
Total Marks: 50

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Unit-I

Basics of Launch Vehicle Design and Missile: Introduction to launch facilities, launch vehicle assembly, integration and launch readiness, Fundamentals of mission trajectory design Coordinate reference frames, space flight mechanics, satellite orbits, Kepler's laws; lunar and interplanetary missions. Attitude dynamics, Attitude parameterization: direction cosine matrix, Euler axis, Euler angles; attitude rates; attitude determination; Euler equations of motion and attitude dynamics.

Unit-II

Space Technology and laws: Fundamentals of Digital Image Processing, Fundamentals of Photogrammetry, Cartography, space materials processing; Global Navigation Satellite System (GNSS), Introduction to the need and overview of Space Laws and its interface with International Conventions and Treaties, Introduction and Basic Principles of International Laws, Indian Space Bill and Space policy 2022, Space-enabled Communication and Services Regulation, Space tourism.

Course Outcomes (CO)
After completing this course, the student will be able to:

CO1. Discuss concepts of launch vehicle design and missiles.
CO2. Determine various parameters required for mission trajectory design and launch.
CO3. Explain Space technology concepts and laws.

Reference Books:

1. Joseph, G., Fundamentals of Remote Sensing, Universities Press, 2003
2. Fleeman, E. L., Missile Design and System Engineering, AIAA Education Series, 2012
3. Noton, M., Spacecraft Navigation and Guidance, Springer 1998
4. Farrell, J. A., Aided Navigation: GPS with High Rate Sensor, McGraw-Hill 2008.

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Physics
Discipline Specific Course (DSC)
Waves and Optics (Semester IV)

Paper Code: 24PHY0401T
45 Hrs (3 Hrs /week)
Credits: 3
Time: 2.5 Hrs

External Marks: 50
Internal Marks: 20
Total Marks: 70

Note: The examiner is required to set seven questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to this, six more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt four questions in all selecting one from each unit in addition to the compulsory Question No.1. All questions carry equal marks. 20% numerical problems are to be set and use of scientific calculator (nonprogrammable) is allowed.

Unit-I

Simple Harmonic Oscillations (SHM): Differential equation of SHM and its solution. Simple pendulum and compound pendulum, Superposition of Collinear Harmonic oscillations: Linearity and Superposition Principle, Superposition of two collinear oscillations having (1) equal frequencies and
(2) Different frequencies (Beats); Superposition of N Collinear Harmonic Oscillations with (1) equal phase differences and (2) equal frequency differences.

Unit-II

Interference of light waves: Intensity distribution in Young's experiment, Examples of interference by division of amplitude: interference in thin films and wedges, Newton's rings, Diffraction: Fresnel diffraction- analytical and graphical solutions for diffraction from Single and multiple slits, Resolution of optical systems, Grating and its application
Polarization: Different states of polarization, double refraction, Huygens' construction for uniaxial crystals, polaroids and their uses. Production and analysis of plane, circularly and elliptically polarized light by retardation plates and rotary polarization and optical activity, Fresnel's explanation of optical activity: Biquartz and half shade polarimeter.

Unit-III

Lasers: Basic concept of stimulated emission, amplification and population inversion; Main components of lasers: (i) Active Medium (ii) Pumping (iii) Optical Resonator; Einstein's 'A' and 'B' coefficients and their relationship; Properties of laser beam: Monochromaticity, Directionality, Intensity, Coherence (Spatial & Temporal coherence); Energy levels, Excitation mechanism and Applications of Gas laser (He-Ne), Solid-state laser (Ruby) and semiconductor laser.

Reference Books:

1. The Physics of Vibrations and Waves, H. J. Pain, 2013, John Wiley and Sons.
2. Optics, AjoyGhatak, 2008, Tata McGraw Hill
3. Optics, Hetch,2008, Pearson
4. Fundamentals of Photonics, SPIE, Opens Source

Chairperson
Department of Physics
Guru Jambheshwar University
..., Hisar-125001

Waves and Optics Lab

Paper Code: 24PHY0401P
30 Hrs (2 Hrs /week)
Credit: 1
Time: 3 Hrs

External Marks: 20
Internal Marks: 10
Total Marks: 30

Practical

1. To determine the frequency of an electric tuning fork by Melde's experiment.
2. To determine refractive index of the Material of a prism using sodium source.
3. To determine the dispersive power of the material of a prism using mercury source.
4. To determine wavelength of sodium light using Newton's Rings.
5. To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film.
6. To determine wavelength of laser using plane diffraction grating.
7. To determine wavelength of spectral lines of Hg source using plane diffraction grating.
8. To determine dispersive power and resolving power of a plane diffraction grating.
9. To find the polarization angle of laser light using polarizer and analyzer.
10. To verify Malus law of polarization
11. Measurement of focal length of Mirrors and Lenses

Note: The list of experiments may vary. Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination. Students are required to get minimum pass marks separately as per university rules in theory and practical components of the course.

Course Outcomes (CO)

After completing this course, the students will be able to:

CO1. Understand the simple harmonic motion, superposition principles and superposition of N-harmonic waves with equal phase and frequencies.
CO2. Understand concept of interference and its types, polarization and about polarimeter.
CO3. Develop an understanding about Laser, components and properties.
CO4. Understanding the basic working of gas laser, solid state laser and their applications.
CO5. Learn to present observations, results analysis and different concepts related to experiments of light and laser.

Reference Books

1. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Ed., 2011, KitabMahal
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
4. A Laboratory Manual of Physics for undergraduate classes, D. P. Khandelwal,1985, Vani Pub.

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Physics
Minor Course (MIC-4) (VOC)
Electronics Circuits (Semester IV)

Paper Code: 24VOC0428T
30 Hrs (2 Hrs /week)
Credits: 2
Time: 2 Hrs

External Marks: 35
Internal Marks: 15
Total Marks: 50

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Unit-I

DC Circuits: Role and importance of circuits in Electronics, Concept of fields, charge, current, voltage, energy and their interrelationships. Electrical circuit elements (R, L and C), voltage and current sources (ideal & controlled), series and parallel circuits, Network reduction: voltage and current division Kirchhoff current and voltage laws with their applications (Nodal and Mesh Analysis), Superposition theorem, Thevenin and Norton Theorems.

Unit-II

AC Circuits: Representation of sinusoidal waveforms, average, peak and rms values, complex representation of impedance, phasor representation, complex power, real power, reactive power, apparent power, power factor and Energy, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel),Resonance; Introduction to three- phase circuits.

Electronics Circuits Lab

Paper Code: 24VOC0428P
60 Hrs (4 Hrs /week)
Credit: 2
Time: 3 Hrs

External Marks: 35
Internal Marks: 15
Total Marks: 50

Practical

1. To study the characteristics of a series RC Circuit.
2. To determine an unknown Low Resistance using Potentiometer.
3. To determine an unknown Low Resistance using Carey Foster's Bridge.
4. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
5. Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances, and (e) Checking electrical fuses.
6. Study functioning of Cathode ray oscilloscope.
7. Study of depletion capacitance of diode and its variation with reverse bias.
8. To design circuits for OR, AND, NOT, NAND and NOR logic gates and verify their truth tables.
9. To Study I-V characteristics of PN Junction diode.

Note: The list of experiments may vary. Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination. Students are required to get minimum pass marks separately as per university rules in theory and practical components of the course.

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Course Outcomes (CO)

After completing this course, the students will be able to:
CO1. Understand the types of dc circuits, circuit elements and theorems.
CO2. Know about the working of ac circuits, phasor and about the phase circuits etc.
CO3. Perform the experiments related to the dc and ac circuits.

Reference Books:

1. Physics of Semiconductor Devices, S. M. Sze, Willey Publisher.
2. Integrated Electronics, Jacob Millman and C C Halkias, TATA McGraw-Hill Edition.
3. A text book in Electrical Technology- B L Theraja – S Chand & Co.
4. Basic Electronics and Linear Circuits, N N Bhargava, McGraw-Hill Edition.
5. Modern Electronic Instrumentation & Measurement Tech., Helfrick & Cooper, 1990, PHI Learning.

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