

Integral University, Lucknow Department of Mathematics & Statistics

Study & Evaluation Scheme of UG & PG Program with Statistics, Mathematics & Physics as per NEP 2020 w.e.f. Session 2022-23

Certificate in Science (Statistics, Mathematics, Physics)

Year: First / Semester: First (Odd Semester)

		,			Period	ls/ Per	week	Continu	ious Asse	ssment						At	tribut	es			
\$ S. N.	Course Code	Course Title	Theory / Practical	Course Type	Lectur e (L)			Test	Feacher Assessm nt (TA)		End Semeste r Examin ation (ESE)	Subject Total	Total Credit Points	hero bil	pr cric	00,01	Gend er	Envir onme nt & Sustai nabili ty		iomal	Dovolonment
1	B030101T/ MT136	Differential Calculus & Integral Calculus	Theory		3	1	0	15	10	25	75	100	04	✓		√					9 accessments
2	B010101T/ PY113	Mathematical Physics & Newtonian Mechanics	Theory		3	1	0	15	10	25	75	100	04	✓							3 SECURE ALTHOUGH AND ADMINISTRATION OF THE PROPERTY OF THE PR
3	B060101T/ MT139	Descriptive Statistics (Univariate) & Theory of Probability	Theory	Core Major	3	1	0	15	10	25	75	100	04	✓		✓				✓	10 ROOCES 12 REPORTE NEONITES 12 REPORTE COO
4	B030102P/ MT137	Practical using Mathematica /MATLAB	Practical	(Compulsory)	0	0	4	15	10	25	75	100	02	✓		✓					9 NOVERT IMPUREM
5	B010102P/ PY114	Mechanical Properties of Matter	Practical		0	0	4	15	10	25	75	100	02	✓		✓					3 SECURE ASIN
6	B060102P/ MT140	Descriptive Data Analysis Lab (Univariate	Practical		0	0	4	15	10	25	75	100	02	✓		√				√	10 MDGGD MEDIATES
7	I030103V/ MT143	Introduction to LaTeX	Theory+ Practical	Vocational	2	0	2	1	-	-	100	100	03	✓		>					9 ADDISTINATIONS
8	8 Z010101T Food Nutrition and Hygiene		Theory	Co-curricular (Compulsory)	2	0	0	15	10	25	75	100	02	✓	√	√		✓	√	√	3 SECURACION ANTINELES PARA PARA PARA PARA PARA PARA PARA PAR
			TOTAL	13	3	14	105	70	175	625	800	23									



Effectiv	e from Session	: 2022-23											
Course	Code	B030101T/MT136	Title of the Course	Differential Calculus & Integral Calculus	L	T	P	C					
Year		First	Semester	First	4	0	0	4					
Pre-Rec	quisite	10+2 with Mathematics	Co-requisite										
Course	Objectives		The purpose of this undergraduate course is to impart details and key knowledge of Differential Calculus & Integral Calculus. After successfully completion of course, the student will able to explore subject into their respective dimensions.										
			Course Outcome	es									
CO1	The students will be able to know about Indian Ancient Mathematics and Mathematicians. The students also will be able to know about sequences and their convergences/divergences.												
CO2	theorem e.g.	Borel's theorem, boundedness	theorem, Bolzano's theorem, Lagrange and Cauchy Mean	of function of single variable. Also, they will be not in, Intermediate value theorem, extreme value a value theorems, Leibnitz theorem, Maclaurin's	theo	rem, I	Oarb o	ux's					
CO3		will be able to find about Tange ves in Cartesian and Polar form	, ,	Curvature, Envelops and evolutes. They will be	able	o trace	;						
CO4													
The students will be able to solve/find Vector Differentiation, Gradient, Divergence and Curl, Normal on a surface, Directional Derivative, Vector Integration, Theorems of Gauss, Green, Stokes and related problems.													

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1		Indian Ancient Mathematics and Mathematicians: Aryabhatt, Brahmagupt, Mahavir Acharya, Varahmihir, Bhaskaracharaya, Madhavan, Parmeshvaran, Baudhayana Definition of a sequence, theorems on limits of sequences, bounded and monotonic sequences, Cauchy's convergence criterion, Cauchy sequence, limit superior and limit inferior of a sequence, subsequence, Series of non-negative terms, convergence and divergence, Comparison tests, Cauchy's integral test, Ratio tests, Root test, Raabe's logarithmic test, de Morgan and Bertrand's tests, alternating series, Leibnitz's theorem, absolute and conditional convergence.	9	1
2		Limit, continuity and differentiability of function of single variable, Cauchy's definition, Heine's definition, equivalence of definition of Cauchy and Heine, Uniform continuity, Borel'stheorem, boundedness theorem, Bolzano's theorem, Intermediate value theorem, extreme valuetheorem, Darboux's intermediate value theorem for derivatives, Chain rule, indeterminate forms.	7	2
3		Rolle's theorem, Lagrange and Cauchy Mean value theorems, mean value theorems of higher order, Taylor's theorem with various forms of remainders, Successive differentiation, Leibnitz theorem, Maclaurin's and Taylor's series, Partial differentiation, Euler's theorem on homogeneous function.	7	2
4		Tangent and normals, Asymptotes, Curvature, Envelops and evolutes, Tests for concavity and convexity, Points of inflexion, Multiple points, Parametric representation of curves and tracing of parametric curves, Tracing of curves in Cartesian and Polar forms.	7	3
5		Definite integrals as limit of the sum, Riemann integral, Integrability of continuous and monotonic functions, Fundamental theorem of integral calculus, Mean value theorems of integral calculus, Differentiation under the sign of Integration.	9	4
6		Improper integrals, their classification and convergence, Comparison test, μ-test, Abel's test, Dirichlet's test, quotient test, Beta and Gamma functions.	7	4
7		Rectification, Volumes and Surfaces of Solid of revolution, Pappus theorem, Multiple integrals, change of order of double integration, Dirichlet's theorem, Liouville's theorem for multiple integrals.	7	5
8		Vector Differentiation, Gradient, Divergence and Curl, Normal on a surface, Directional Derivative, Vector Integration, Theorems of Gauss, Green, Stokes and related problems.	7	5

Reference Books:

- R.G. Bartle & D.R. Sherbert, Introduction to Real Analysis, John Wiley & Sons
- T.M. Apostal, Calculus Vol. I, John Wiley & Sons Inc.
- S. Balachandra Rao & C. K. Shantha, Differential Calculus, New Age Publication.
- H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.
- G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007.
- Bhartiya Mathematicians, Sharda Sanskrit Sansthan, Varanasi.
- T.M. Apostal, Calculus Vol. II, John Wiley Publication
- Shanti Narayan & Dr. P.K. Mittal, Integral Calculus, S.Chand
- e-Learning Source:
- Suggestive digital platforms web link/platform: NPTEL/SWAYAM/MOOCS

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	3						2	3	3	3	3	2			
CO2	3						3	3	3	2	2	3			
CO3	3						3	3	2	3	3	3			
CO4	3						3	3	2	2	3	2			
CO5	3						1	2	1	3	2	1			

Name & Sign of Program Coordinator	Sign & Seal of HoD



DEPARTMENT OF PHYSICS INTEGRAL UNIVERSITY, LUCKNOW

Syllabus for UG Program as per NEP-2020

1. Name of the Department: Physics	1 •											
2. Programme: Certificate in Scie	ence (Physics, Mathematics &	Electronics)	Year: First Semester: First			rst						
3. Subject: Physics			4. Pre-requisite (if any): 10+2 with Physics									
5. Course Code: B010101T/PY113			6. Course Title: Mathematical Physics and Newtonian Mechanics									
7. Type of Course	Major (✔)	Mine	inor () Vocational ()				Co-curricular ()					
8. Credits: 4 9. Total Number of Lectures (L), Tutorials (T), Practicals (P): L: 4 T: 0 P: 0												
10. Course Objectives: This course ai	0. Course Objectives: This course aims to give students the competence in the methods and techniques of mathematical physics and Newtonian Mechanics. At the end of the course											

the students are expected to have hands on experience in modeling, implementation and calculation of physical quantities of relevance.

11. Course Outcomes (CO):A	fter the successful course completion, learners will develo	p following attributes:
Course Outcome (CO)		Attributes
(())	Recognize the difference between types of scalars and v and curl.	ectors, pseudo-scalars and understand the physical interpretation of gradient, divergence
	Comprehend the difference and connection between diffe (Levi Civita) tensors.	rent coordinate systems and know the meaning of 4-vectors, Kronecker delta and Epsilon
CO3	Study the origin of pseudo forces in rotating frame and stu	ndy the response of the classical systems to external forces and their elastic deformation.
CO4	Understand the dynamics of planetary motion and the wor	king of Global Positioning System (GPS).
CO5	Comprehend the different features of Simple Harmonic M	lotion (SHM) and wave propagation.
N	Max. Marks: 25+75 = 100	Min. Passing Marks:

12. Total Number of Lectures: 60 hours

Unit-1 Number of Lectures = 7Title of the Unit: Vector Algebra Mapped CO: 1

Coordinate rotation, reflection and inversion as the basis for defining scalars, vectors, pseudo-scalars and pseudo-vectors (include physical examples). Component form in 2D and 3D. Geometrical and physical interpretation of addition, subtraction, dot product, wedge product, cross product and triple product of vectors. Position, separation and displacement vectors.

Number of Lectures = 8 Title of the Unit: Vector Calculus Mapped CO: 1

Geometrical and physical interpretation of vector differentiation, Gradient, Divergence and Curl and their significance. Vector integration, Line, Surface (flux) and Volume integrals of vector fields. Gradient theorem, Gauss-divergence theorem, Stoke-curl theorem, Greens theorem and Helmholtz theorem (statement only). Introduction to Dirac delta function.

Number of Lectures = 8 **Title of the Unit: Coordinate Systems** Mapped CO: 2

2D and 3D Cartesian, Spherical and Cylindrical coordinate systems, basis vectors, transformation equations. Expressions for displacement vector, arc length, area element, volume element, gradient, divergence and curl in different coordinate systems. Components of velocity and acceleration in different coordinate systems. Examples of non-inertial coordinate system and pseudo-acceleration.

Unit-4 Number of Lectures = 7 **Title of the Unit: Introduction to Tensors** Mapped CO: 2

Principle of invariance of physical laws w.r.t. different coordinate systems as the basis for defining tensors. Coordinate transformations for general spaces of nD, contravariant, covariant and mixed tensors and their ranks, 4-vectors. Index notation and summation convention. Symmetric and skew-symmetric tensors. Invariant tensors, Kronecker delta and Epsilon (Levi Civita) tensors. Examples of tensors in physics.

Unit-5 Number of Lectures = 8 Title of the Unit: Dynamics of a System of Particles

Mapped CO: 3

Review of historical development of mechanics up to Newton. Background, statement and critical analysis of Newton's axioms of motion. Dynamics of a system of particles, centre of mass motion, and conservation laws and their deductions. Rotating frames of reference, general derivation of origin of pseudo forces (Euler, Coriolis and centrifugal) in rotating frame, and effects of Coriolis force.

Number of Lectures = 8 Title of the Unit: Dynamics of a Rigid Body Unit-6

Mapped CO: 3

Angular momentum, Torque, Rotational energy and the inertia tensor. Rotational inertia for simple bodies (ring, disk, rod, solid and hollow sphere, solid and hollow cylinder, rectangular lamina). The combined translational and rotational motion of a rigid body on horizontal and inclined planes. Elasticity, relations between elastic constants, bending of beam and torsion of cylinder

Unit-7 Number of Lectures = 7 Title of the Unit: Motion of Planets and Satellites Mapped CO: 4

Two particle central force problem, reduced mass, relative and centre of mass motion. Newton's law of gravitation, gravitational field and gravitational potential. Kepler's laws of planetary motion and their deductions. Motions of geo-synchronous and geo-stationary satellites and basic idea of Global Positioning System (GPS)

Number of Lectures = 7 **Title of the Unit: Wave Motion**

Differential equation of simple harmonic motion and its solution, use of complex notation, damped and forced oscillations, Quality factor. Composition of simple harmonic motion, Lissajous figures. Differential equation of wave motion. Plane progressive waves in fluid media, reflection of waves and phase change, pressure and energy distribution. Principle of superposition of waves, stationary waves, phase and group velocity.

13. CO-PO and PSO mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	-	-	-	-	-	1	2	-	1	-	-
CO2	3	-		-	-	-	2	3	-	1	-	-
CO3	3	-	-	-	-	-	3	3	-	2	-	-
CO4	3	-	-	-	-	-	3	3	-	3	-	-
CO5	3	-	-	-	-	-	3	3	-	3	-	-

3 Strong contribution, 2 Average contribution, 1 Low contribution

14. Suggested Readings:

- Units 1-4 1. Murray Spiegel, Seymour Lipschutz, Dennis Spellman, "Schaum's Outline Series: Vector Analysis", McGraw Hill, 2017, 2e
- 2. A.W. Joshi, "Matrices and Tensors in Physics", New Age International Private Limited, 1995, 3e

Units 5-8

- l. Charles Kittel, Walter D. Knight, Malvin A. Ruderman, Carl A. Helmholz, Burton J. Moyer, "Mechanics (In SI Units): Berkeley Physics Course Vol 1", McGraw Hill, 2017, 2e
- 2. Richard P. Feynman, Robert B. Leighton, Matthew Sands, "The Feynman Lectures on Physics Vol. 1", Pearson Education Limited, 2012
- Hugh D. Young and Roger A. Freedman, "Sears and Zemansky's University Physics with Modern Physics", Pearson Education Limited, 2017, 14e D.S. Mathur, P.S. Hemne, "Mechanics", S. Chand Publishing, 1981, 3e

- 1. MIT Open Learning Massachusetts Institute of Technology, https://openlearning.mit.edu/
- National Programme on Technology Enhanced Learning (NPTEL), https://www.youtube.com/user/nptelhrd
- Uttar Pradesh Higher Education Digital Library, http://heecontent.upsdc.gov.in/SearchContent.aspx
- Swayam Prabha DTH Channel, https://www.swayamprabha.gov.in/index.php/program/current_he/8



Effective from Session: 2022	Effective from Session: 2022-23											
Course Code	B060101T/ MT139	Title of the Course	Descriptive Statistics (Univariate) & Theory of Probability	L	T	P	С					
Year	First	Semester First					4					
Pre-Requisite	10+2 with Mathematics	Co- requisite										
Course Objectives	3		uce the basic elements of descriptive statistics including grillity and probability distributions.	raphics	s and al	so						

	Course Outcomes									
CO1	Ability to represent/summarize the data/information using appropriate Graphical methods including Bar chart, histograms and									
	pie chart and also to draw inferences from these graphs.									
CO2	of the data and draw meaningful conclusions regarding behavior of the data.									
CO3	Acquire the knowledge to identify the situation to apply appropriate measure of dispersion as per the nature and need of the data and draw meaningful conclusions regarding heterogeneity of the data.									
CO4	Ability to apply basic probability principles to solve real life problems.									
CO5	Ability to understand the concept of random variable (discrete and continuous), concept of probability mass/density									
	function.									

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1		Introduction to Statistics, Meaning of Statistics, Importance and Scope of Statistics, Concept of Statistical population and sample, Attributes and Variables (Discrete and Continuous), Different types of scales – Nominal, Ordinal, Interval and Ratio, Methods for collecting primary and secondary data; questionnaire and schedule.	6	1
2		Presentation of data: Classification and Tabulation, Frequency and Cumulative frequency distributions. Graphical representations: Bar chart, Histogram, Frequency polygon and Pie chart. Central tendency and its measures: Mean, Median, Mode, Geometric mean and Harmonic mean, properties, Merits and Demerits.	8	2
3		Dispersion and its measures: Range, quartile deviation, mean deviation, standard deviation, variance and their coefficients; properties, Merits and Demerits.	8	3
4		Moments and Factorial moments, Shephard's correction for moments, Measures of Skewness and Kurtosis and their significance, Measures based on quartiles.	8	3
5		Random experiment, Trial, Sample point and Sample space, Events, Operations of events and concept of equally likely, Mutually exclusive and Exhaustive events. Definition of Probability: Classical, Relative frequency and Axiomatic approaches.	8	4
6		Discrete Probability Space, Properties of Probability under Set Theory Approach, Independence of Events, Conditional Probability, Total and Compound Probability theorems, Bayes theorem and its Applications.	8	4
7		Random Variables: Discrete and Continuous, Probability Mass Function (pmf) and Probability density function (pdf), Cumulative distribution function (cdf)	8	4
8		Joint distribution of two random variables, Marginal and Conditional distributions, Independence of random variables. Expectation of a random variable and its properties, Conditional expectation and related problems	8	5

Reference Books:

- 1. Goon, A.M., Gupta, M.K. and Das gupta, B.; Fundamental of Statistics, Vol I & II World Press, Kolkata
- 2. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics (10th ed.), Sultan Chand and Sons.
- 3. Miller, I. and Miller, M.: John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
- 4. Meyer, P.: Introductory Probability and Statistical Applications (2nd ed.), New Delhi, Oxford & IBH Publishing Co. Pvt. Ltd
- 5. Mukhopadhyay, P.: Mathematical Statistics, New Central Book Agency Pvt. Ltd.
- 6. Rohatgi, V.K. and Saleh, A.E.: An introduction to Probability Theory and Mathematical Statistics, Wiley Eastern

e-Learning Source:

Suggestive digital platforms web link/platform: NPTEL/SWAYAM/MOOCS

				Course	Articulatio	n Matrix: (Map	oping of COs wi	th POs and P	PSOs)			
PO- PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO4
CO1	3						3	3	2	3	2	3
CO2	3						1	3	3	2	2	3
CO3	3						3	3	3	3	2	2
CO4	3						1	3	2	2	3	3
CO5	3						1	3	3	3	3	2

Name & Sign of Program Coordinator	Sign & Seal of HoD



Effective from Session	Effective from Session: 2022-23									
Course Code	B030102P/MT137	Title of the Course	Practical Using Mathematica/MATLAB	L	T	P	С			
Year	First	Semester	First	0	0	4	2			
Pre-Requisite	10+2 with Mathematics	Co-requisite								
Course Objectives			the different graph and solve the different fathematica /MATLAB /Maple /Scilab/Ma			ations b	у			

	Course Outcomes
CO1	The students will be able to plot the different graphs of the functions: ax, [x], x^{2n} , $x = e^x$, $x^2 + 1 = e^x$, $1 - x^2 = e^x$, $x = \log 10(x)$, $\cos(x) = x$, $\sin(x) = x$, $\cos(y) = \cos(x)$, $\sin(y) = \sin(x)$ etc. Also they will be able to plot the graphs of polynomial of degree 2,3, 4 and 5, and their first and second derivatives and tracing of conic in Cartesian coordinates.
CO2	After completion of this course student would be able to know the convergence of sequences through plotting, verify Bolzano-Weierstrass theorem through plotting the sequence, Cauchy's root test by plotting n^{th} roots and Ratio test by plotting the ratio of n^{th} and $(n + 1)^{th}$ term.
CO3	Student would be able to plot Complex numbers and their representations, Operations like addition, substraction, Multiplication, Division, Modulus and Graphical representation of polar form.
CO4	Student would be able to perform following task of matrix as Addition, Multiplication, Inverse, Transpose, Determinant, Rank, Eigenvectors, Eigen values, Characteristic equation and verification of the Cayley-Hamilton theorem, Solving the systems of linear equations.
CO5	The students will be able to know about study the convergence/divergence of infinite series by plotting their sequences of partial sum.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
		Plotting the graphs of the following functions: (i) ax, [x] (greatest integer function), x^{2n} ; $n \in \mathbb{N}$, x^{2n-1} ; $n \in \mathbb{N}$, x^{2n-1} ; $n \in \mathbb{N}$, x^{2n-1} ; $x \in \mathbb{N}$; $x \in \mathbb{N}$, x^{2n-1} ; $x \in \mathbb{N}$; x		
1		$ \mathbf{ax} + \mathbf{b} , \mathbf{c} \pm \mathbf{ax} + \mathbf{b} , \mathbf{sin} (, \mathbf{xsin} (, \mathbf{for} , \mathbf{e^{ax+b}}, \mathbf{log}(\mathbf{ax} + \mathbf{b}) \mathbf{sin}(\mathbf{ax} + \mathbf{b}), \cos(\mathbf{ax} + \mathbf{b}), \sin(\mathbf{ax} + \mathbf{b}) , \cos(\mathbf{ax} + \mathbf{b}) ,$ (ii) Observe and discuss the effect of changes in the real constants \mathbf{a} and \mathbf{b} on the graphs	4	1
2	By plotting the graph find the solution of the equations $x = e^x$, $x^2 + 1 = e^x$, $1 - x^2 = e^x$, $1 - $			
3		Plotting the graphs of polynomial of degree 2,3, 4 and 5, and their first and second derivatives.	4	1
4		Sketching parametric curves, e.g., Trochoid, Cycloid, Epicycloid and Hypocycloid etc.	4	1
5		Tracing of conic in Cartesian coordinates.	4	1
6		Graph of circular and hyperbolic functions.	4	1
7		Obtaining surface of revolution of curves	4	1
8		Complex numbers and their representations, Operations like addition, Multiplication, Division, Modulus. Graphical representation of polar form.	4	3
9		Find numbers between two real numbers and plotting of finite and infinite subset of R.	4	3
10		Matrix Operations: Addition, Multiplication, Inverse, Transpose, Determinant, Rank, Eigen vectors, Eigen values, Characteristic equation and verification of the Cayley-Hamilton theorem, Solving the systems of linear equations.	4	4
11		Study the convergence of sequences through plotting.	4	5
12		Verify Bolzano-Weierstras's theorem through plotting of sequences and hence identify convergent subsequences from the plot.	4	2
13	_	Study the convergence/divergence of infinite series by plotting their sequences of partial sum.	4	5
14		Cauchy's root test by plotting <i>n</i> -th roots.	4	5
15		Ratio test by plotting the ratio of n -th and $(n + 1)$ -th term.	4	5

Reference Books

1. Suggested Readings: A Guide to MATLAB®: For Beginners and Experienced Users 3rd Edition, Kindle Edition by Brian R. Hunt

e-Learning Source:

Teaching Calculus with MATLAB - MATLAB & Simulink (mathworks.com)

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)											
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3						2	3	2	3	3	3
CO2	3						3	3	3	2	2	2
CO3	3						3	3	3	2	3	3
CO4	3						3	3	3	3	3	3
CO5	3						2	3	2	3	2	2

1- Low Correlation; 2- Moderate	Correlation; 3- Substantial Correlation
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N a Ci ab C	
Name & Sign of Program Coordinator	Sign & Seal of HoD



DEPARTMENT OF PHYSICS INTEGRAL UNIVERSITY, LUCKNOW

Syllabus for UG & PG Program as per NEP-2020

Syllabus for UG & PG Program as per NEP-2020													
1. Name of the Department: Physics 2. Programme: Certificate in Science (Physics, Mathematics & Electronics) Year: First Semester: First													
		in Science (Physics, M	[athematics	& Electron		Year:				ester: First		
3. Subject:							4. Pre	-requisite ((if any): 10 +2	2 with Physic	S		
5. Course 0	Code: B010102P	P/PY114					6. Co	urse Title:	Mechanical	Properties of	f Matter		
7. Type of	Course		Major	(√)		Minor	:()		Vocati	onal ()	Co-	curricular ()	
8. Credits:		I	<u>J</u>		9. Total	Number	of Le	ctures (L).		, Practicals (I		.: 0 T: 0 P: 4	
		e purpose of	this underg	raduate cou								ferent experiments	
	ts theoretical cou		uns unacre	,ruddate est	150 15 to 1111p	ur prue		iio wieage, i		·	o un ough on	orom onportmonts	
11. Course	11. Course Outcomes (CO): After the successful course completion, learners will develop following attributes:												
	Course Outcome (CO) Attributes												
	CO1	Understand	d the Mome	ent of Inertia	a and find th	e MI of a	an irre	egular body	7.				
	CO2				gid materials		<u> </u>	garar coay	•				
	CO3				d viscosity								
	CO4				nd understan		nomio	a and arous	itation				
	CO5												
	CU3				neasuring di	mension	s or a	given obje		(in Dossin - N	Manisa.		
10 E 4 T	Nih 6 7	Max. Marks	s: 45+75 =	100					N.	Iin. Passing M	iarks:		
	Number of Lec	ctures: 60h			alasta W W	-	• ,	T			1 37	1.00 1.01	
Expe	eriment No.	12.5	0.1	~	**Lai	b Experi	ıment	List				pped CO: 1, 2, 3,4	
	1.		f inertia of									Mapped CO: 1	
	2.				body by ine							Mapped CO: 1	
	3.				method (Bar							Mapped CO: 2	
	4.				method (sp	here / dis	sc / M	axwell's no	eedle)			Mapped CO: 2	
	5.			bending of l								Mapped CO: 2	
	6.	Young's m	nodulus and	l Poisson's r	atio by Sear	le's met	hod					Mapped CO: 2	
	7.	Poisson's 1	ratio of rub	ber by rubbe	er tubing							Mapped CO: 2	
	8.	Surface ter	nsion of wa	ter by capill	ary rise met	hod						Mapped CO: 3	
	9.			ter by Jaege								Mapped CO: 3	
	10.				y Poiseuille	's metho	od					Mapped CO: 3	
	11.				r pendulum							Mapped CO: 4	
	12.			ns by Sonor								Mapped CO: 4	
	13.		a building b									Mapped CO: 5	
	14.	Study the v	waveform o	f an electric	ally maintai	ned tuni	ng for	k / alternat	ing current so	ource with the		Mapped CO: 4	
		of cathode	ray oscillo		ino Vieteral I	I oh E-	20 m²	ont I fat / I	inle				
	1	Т	1 1		ine Virtual		perime	ent List / I	AIIK			Mannad CO. 1	
	1.				of a fly whee	21						Mapped CO: 1	
	2.			in different	iiquids.							Mapped CO: 4	
	3.		f inertia of									Mapped CO: 1	
	4.		second law	of motion.								Mapped CO: 4	
	5.	Ballistic pe										Mapped CO: 4	
	6.	Collision b										Mapped CO: 2	
						Mapped CO: 4							
							Mapped CO: 2						
13. CO-PO and PSO mapping													
COs	PO1	PO2	PO3	PO4	PO5	PO	6	PO7	PSO1	PSO2	PSO3	PSO4	
CO1	2							3	3			3	
CO2	2							3	3			3	
CO3	3							2	3			3	
CO4	2	İ						3	3			3	
CO5	3							2	3		2	3	
	<u>. </u>		3 Str	ong contrib	ution, 2 Ave	rage con	tributi	ion . 1 Low	contribution	!	1	<u> </u>	
14.0	3 Strong contribution, 2 Average contribution, 1 Low contribution												

14. Suggested Readings:

- 1. B.L. Worsnop, H.T. Flint, "Advanced Practical Physics for Students", Methuen & Co., Ltd., London, 1962, 9e
- 2. S. Panigrahi, B. Mallick, "Engineering Practical Physics", Cengage Learning India Pvt. Ltd., 2015, 1e
- 3. R.K. Agrawal, G. Jain, R. Sharma, "Practical Physics", Krishna Prakashan Media (Pvt.) Ltd., Meerut, 2019
- 4. S.L. Gupta, V. Kumar, "Practical Physics", Pragati Prakashan, Meerut, 2014, 2e

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

Effective from Session: 2022-23								
Course Code	B060102P/MT140	Title of the Course	Descriptive Data Analysis Lab (Bivariate)	L	T	P	C	
Year	First	Semester First 0 0 4						
Pre-Requisite	10+2 with Mathematics	Co-requisite						
Course Objectives	The objective of this co	The objective of this course is to introduce the basic elements of descriptive statistics including graphics.						

	Course Outcomes						
CO1	Ability to represent/summarize the data/information using appropriate Graphical methods including Bar chart, histograms and pie chart and						
	also to draw inferences from these graphs						
CO2	Ability to represent/summarize the data/information using appropriate Graphical methods including Bar chart, histograms and pie chart						
	and also to draw inferences from these graphs						
CO3	Ability to represent/summarize the data/information using appropriate Graphical methods including Bar chart, histograms and pie chart and						
	also to draw inferences from these graphs						
CO4	Ability to measure dispersion of data and define their significance.						
CO5	Ability to measure dispersion of data and define their significance.						

Experiment No.	Title of the Experiment	Content of Experiment	Contact Hrs.	Mapped CO
1		Problems based on graphical representation of data by Histogram, Frequency polygons.	4	2
2		Problems based on graphical representation of data by frequency curves and Ogive curve	4	1
3		Problems based on calculation of Measures of Central Tendency.	4	2
4		Problems based on calculation of Measures of Central Tendency.	4	3
5		Problems based on calculation of Measures of Central Tendency.	4	2
6		Problems based on calculation of Measures of Central Tendency.	4	3
7		Problems based on calculation of Measures of Central Tendency.	4	4

Reference Books:

Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics (10th ed.), Sultan Chand and Sons.

e-Learning Source:

Suggestive digital platforms web link/platform: NPTEL/SWAYAM/MOOCS

		Course Articulation Matrix: (Mapping of COs with POs and PSOs)										
PO- PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3						3	3	3	3	3	3
CO2	3						2	3	2	3	3	2
CO3	3						3	3	2	2	2	1
CO4	3						2	3	2	2	3	2
CO5	3						2	3	3	3	3	3

Name & Sign of Program Coordinator	Sign & Seal of HoD



U V/										
Effectiv	e from Session	: 2022-23								
Course Code		MT143/ I030103V	Title of the Course	Introduction to LaTeX	L	T	P	C		
Year		First	Semester	First	2	0	2	3		
Pre-Requisite		Basic usage of a Windows PC or a Mac	usage of a Windows PC or a Co-requisite							
Course	Course Objectives The course aims to teach the basic features. By attending the course students should acquire all necessary skills to be able to prepare a moderate scientific paper and a short mathematical presentation using LaTeX.									
			Course Outcomes							
CO1	Introduction	of LaTeX, Basic commands of LaTeX,	understanding of different types of	fonts.						
CO2	Create section	nal units, texts alignment, tiles, mini pag	ges, foot notes, new paragraph.							
CO3	Create and interpret the page layout, page style, running header, page numbering.									
CO4	Find and interpret the listing texts, numbered listing, unnumbered listing, nesting, Tabbing texts.									
CO5	Find and interpret the table environment, adjusting column width in tables, table wrapped by texts, footnotes in tables.									
CO6	Find and inte	rpret the command and environments of	f inserting simple figure, side by sid	le figures, figures drawing.						

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction	LaTeX, LaTeX input file, compilation, LaTeX syntax; commands, environment, packages, keyboard characters, Font selection; Text – mode fonts, Math – mode fonts, Emphasized fonts, coloured fonts.	9	1
2	Formatting Texts	Sectional units, labelling and referring numbered items, texts alignment, quoted texts, new lines and paragraph; filling blank spaces, preventing lines break, increasing depth of sectional units, titles, multiple columns, mini pages, foot notes, marginal notes.	7	2
3	Page Layout and Style	Page layout; standard page layout, formatting page layout, increasing the height of a page, page style, running header and footer, page breaking and adjustment, page numbering.	7	2
4	Listing and Tabbing Texts	Listing Texts; numbered listing, unnumbered listing, nesting, Tabbing texts; Adjusting column width, Adjusting alignment of column	7	3
5	Table Preparation	Table through tabular environment, tabular environment, vertical positioning, side ways texts, adjusting column width in tables, marging rows and columns, table wrapped by texts, table with colour background, nested tables, side by side tables, side ways table, long table, footnotes in tables.	9	5
6	Figure Insertion	Command and environments, inserting simple figure, side by side figures, sub – numbering a group of figures, figure wrapped by texts, rotated figures, mathematical notations in figures, figures in table, figures in multi – column documents, figures drawing; circle, circular arcs, straight lines, vector curves and oval boxes, texts in figures, compound figures.	7	6

Reference Books:

- 1. Stefen Kottwitz, LaTeX Beginner's Guide, Packt Publishing, Birmingum (2011).
- 2. H. Kopka and P. W. Daly, A Guide to LaTeX, Addison Wesley Publishing.
- 3. Dilip Dutta: LaTeX in 24 Hours, Springer.

e-Learning Source:

- https://www.overleaf.com/learn/latex/Free_online_introduction_to_LaTeX_(part_1) https://spoken-tutorial.org/tutorial-search/?search_foss=LaTeX&search_language=English https://swayam.gov.in/explorer?searchText=LaTeX

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)											
PO- PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3						2	3	3	3	3	2
CO2	3						3	3	3	2	2	3
CO3	3						3	3	2	3	3	3
CO4	3						3	3	2	2	3	2
CO5	3						1	2	1	3	2	1
CO6	3						1	2	1	3	2	1

Name & Sign of Program Coordinator	Sign & Seal of HoD



Integral University, Lucknow Department of Mathematics & Statistics

Study & Evaluation Scheme of UG & PG Program with Statistics, Mathematics & Physics as per NEP 2020 w.e.f. Session 2022-23

Certificate in Science (Statistics, Mathematics, Physics)

Year: First / Semester: Second (Even Semester)

					Perio	ds/ Per	week	Continu	ious Asse	essment						A	ttribut	es			
S. N.	Course Code	Course Title	Theory / Practical	Course Type		Futori al (T)		Test	Γeacher Assessm nt (TA)		End Semeste r Examin ation (ESE)	Subject	Creatt	ovabil	prene	Devel	Gend er Equal	nt & Suctai	Huma n Value	Profes sional Ethics	United Nations Sustainable Development Goals (SDGs)
1	B030201T/ MT138	Matrices and Differential Equations & Geometry	Theory		4	2	0	15	10	25	75	100	06	√		√					9 SECURITION
2	B010201T/ PY115	Thermal Physics & Semiconductor Devices	Theory		3	1	0	15	10	25	75	100	04	√							11 MENORALIZE
3	B060201T/ MT141	Descriptive Statistics (Bivariate) & Probability Distributions	Theory	Core Major (Compulsory)	3	1	0	15	10	25	75	100	04	√		√				√	10 MERICES 12 MENNING CHROMOTON MENNINGER
4	B010202P/ PY116	Thermal Properties of Matter & Electronic Circuits	Practical		0	0	4	15	10	25	75	100	02	√							11 MENORALIES
5	B060202P/ MT142	Descriptive Data Analysis Lab (Bivariate)	Practical		0	0	4	15	10	25	75	100	02	1		1				✓	10 models A September 10 models 10 mode
6	B150101T/EVS1 25	Basics of Environmental Sciences	Theory	Minor	3	1	0	15	10	25	75	100	04	1	√	√		√	✓	✓	4 DISCIPINATION OF THE PROPERTY OF THE PROPERT
7	I030202V/ MT144	LaTeX – Scientific Writing	Theory+ Practical	Vocational	2	0	2	ı	-	ı	100	100	03	√		✓					9 монтинения
8	Z020201	First Aid and Health	Theory	Co-curricular (Compulsory)	2	0	0	15	10	25	75	100	02	√	✓	√		√	✓	√	3 SECONDANIA
				TOTAL	17	5	10	105	70	175	625	800	27								



Effective from Session: 2	Effective from Session: 2022-23									
Course Code	B030201T/MT138	Title of the Course	Matrices and Differential Equations & Geometry	L	Т	P	C			
Year	First	Semester	Second	6	0	0	6			
Pre-Requisite	10+2 with Mathematics	Co-requisite								
Course Objectives	The purpose of this undergraduate course is to impart details and key knowledge of Matrices and Differential Equations & Geometry. After successfully completion of course, the student will able to explore subject into their respective dimensions.									

	Course Outcomes
CO1	The students will be able to define types of Matrices, Rank of a Matrix, System of linear homogeneous and non-homogeneous equations, Theorems on consistency of a system of linear equations. Also, students will be able to find Eigen values, Eigen vectors, Cayley-Hamilton
	theorem, real and imaginary parts, Exponential and Logarithmic functions Inverse trigonometric and hyperbolic functions.
CO2	The student will be able to learn and visualize the fundamental ideas about formation of differential equations, Geometrical meaning of a differential equation
CO3	The students will be to learn and visualize first order higher degree equations solvable for x, y, p, Clairaut's equation and singular solutions, orthogonal trajectories, Linear differential equation of order greater than one with constant coefficients.
CO4	On successful completion of the course students have gained knowledge about to trace of conics, Confocal conics, Polar equation of conics and its properties, Three-Dimensional Coordinates system.
CO5	The student will be able to describe Sphere, Cone and Cylinder, Central conicoid, Paraboloids, lines, Confocal conicoid, Reduction of second degree equations.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1		Types of Matrices, Elementary operations on Matrices, Rank of a Matrix, Echelon form of a Matrix, Normal form of a Matrix, Inverse of a Matrix by elementary operations, System of linear homogeneous and non-homogeneous equations, Theorems on consistency of a system of linear equations.	12	1
2		Eigen values, Eigen vectors and characteristic equation of a matrix, Cayley-Hamilton theorem and its use in finding inverse of a matrix, Complex functions and separation into real and imaginary parts, Exponential and Logarithmic functions Inverse trigonometric and hyperbolic functions.	11	1
3		Formation of differential equations, Geometrical meaning of a differential equation, Equation of first order and first degree, Equation in which the variables are separable, Homogeneous equations, Exact differential equations and equations reducible to the exact form, Linear equations.	11	2
4		First order higher degree equations solvable for x, y, p, Clairaut's equation and singular solutions, orthogonal trajectories, Linear differential equation of order greater than one with constant coefficients, Cauchy- Euler form.	11	3
5		General equation of second degree, System of conics, Tracing of conics, Confocal conics, Polar equation of conics and its properties.	12	4
6		Three-Dimensional Coordinates, Projection and Direction Cosine, Plane (Cartesian and vector form), Straight line in three dimension (Cartesian and vector form).	11	4
7		Sphere, Cone and Cylinder.	11	5
8		Central conicoid, Paraboloids, Plane section of conicoid, Generating lines, Confocal conicoid, Reduction of second degree equations.	11	5

Reference Books:

- 1. Stephen H. Friedberg, A.J Insel & L.E. Spence, Linear Algebra, Person
- 2.B. Rai, D.P. Choudhary & H. J. Freedman, A Course in Differential Equations, Narosa
- 3.D.A. Murray, Introductory Course in Differential Equations, Orient Longman
- 4 Robert J.T Bell, Elementary Treatise on Coordinate Geometry of three dimensions, Macmillan India Ltd.
- 5. P.R. Vittal, Analytical Geometry 2d & 3D, Pearson.
- 6. S.L. Loney, The Elements of Coordinate Geometry, McMillan and Company, London.
- 7. R.J.T. Bill, Elementary Treatise on Coordinate Geometry of Three Dimensions, McMillan India Ltd., 1994.

e-Learning Source:

Suggestive digital platforms web links/platform: NPTEL/SWAYAM/MOOCS

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)											
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3						2	3	3	2	3	3
CO2	3						3	3	2	3	3	2
CO3	3						3	2	2	3	3	2
CO4	3						3	3	3	2	3	3
CO5	3						2	3	2	2	2	3

1- Low Correlation; 2- Moderate	Correlation; 3- Substantial Correlation
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Name & Sign of Program Coordinator	Sign & Seal of HoD



DEPARTMENT OF PHYSICS INTEGRAL UNIVERSITY, LUCKNOW

Syllabus for UG & PG Program as per NEP-2020

1. Name of the Department: Phy	. Name of the Department: Physics											
2. Programme: Certificate in	Science (Physics, Mathematics	& Electronics)	Year: First Semester: Sec			: Second						
3. Subject: Physics			4. Pre-requisite (if any): 10+2 with Physics									
5. Course Code: B010201T/PY 1	115		6. Course Title: Thermal Physics and Semiconductor Devices									
7. Type of Course	Major (✓)	Mino	r () Vocational ()			Co-curricular ()						
8. Credits: 4		9. Total Number of	er of Lectures (L), Tutorials (T), Practicals (P): L: 4 T: 0 P: 0									
10. Course Objectives: The obj	ective of this undergraduate course i	s to impart the kno	wledge of basic	and advance concepts of th	ermodyna	mics, circuit fundamer	tals and					

11. Course Outcomes (CO):

basic electronics.

After the successful course completion, learners will develop following attributes:

Course Outcome (CO)		Attributes						
CO1	Recognize the difference between reversible and irreversible	processes and understand the physical significance of thermodynamical potentials.						
CO2	Comprehend the kinetic model of gases w.r.t. various gas lav	WS.						
CO3	CO3 Study the implementations and limitations of fundamental radiation laws.							
CO4	Understand the utility of AC bridges and recognize the basic	components of electronic devices.						
CO5	Design simple electronic circuits and understand the applicate	tions of various electronic instruments.						
	Max. Marks: 25+75 = 100	Min. Passing Marks:						

12. Total Number of Lectures: 60h

 Unit-1
 Number of Lectures = 08
 Title of the Unit: 0th & 1st Law of Thermodynamics
 Mapped CO: 1

 State functions and terminology of thermodynamics. Zeroth law and temperature. First law, internal energy, heat and work done. Work done in various thermodynamical processes. Enthalpy, relation between CP and CV. Carnot's engine, efficiency and Carnot's theorem. Efficiency of internal combustion engines (Otto and diesel).

Unit-2 Number of Lectures = 08 Title of the Unit: 2nd & 3rd Law of Thermodynamics Mapped CO: 1

Different statements of second law, Clausius inequality, entropy and its physical significance. Entropy changes in various thermodynamical processes. Third law of thermodynamics and unattainability of absolute zero. Thermodynamical potentials, Maxwell's relations, conditions for feasibility of a process and equilibrium of a system. Clausius-Clapeyron equation, Joule-Thompson effect.

Unit-3 Number of Lectures = 07 Title of the Unit: Kinetic Theory of Gases

Kinetic model and deduction of gas laws. Derivation of Maxwell's law of distribution of velocities and its experimental verification. Degrees of freedom, law of equipartition

Mapped CO: 4

of energy (no derivation) and its application to specific heat of gases (mono, di and poly atomic).

Unit-4 Number of Lectures = 07 Title of the Unit: Theory of Radiation Mapped CO: 3

Blackbody radiation, spectral distribution, concept of energy density and pressure of radiation. Derivation of Planck's law, deduction of Wien's distribution law, Rayleigh-Jeans law, Stefan-Boltzmann law and Wien's displacement law from Planck's law.

Unit-5 Number of Lectures = 07 Title of the Unit: DC & AC Circuits Mapped CO: 4

Growth and decay of currents in RL circuit. Charging and discharging of capacitor in RC, LC and RCL circuits. Network Analysis - Superposition, Reciprocity, Thevenin's and Norton's theorems. AC Bridges - measurement of inductance (Maxwell's, Owen's and Anderson's bridges) and measurement of capacitance (Schering's, Wein's and de Sauty's bridges).

Unit-6 Number of Lectures = 08 Title of the Unit: Semiconductors & Diodes

P and N type semiconductors, qualitative idea of Fermi level. Formation of depletion layer in PN junction diode, field & potential at the depletion layer. Qualitative idea of current flow mechanism in forward & reverse biased diode. Diode fabrication. PN junction diode and its characteristics, static and dynamic resistance. Principle, structure, characteristics and applications of Zener, Tunnel, Light Emitting, Point Contact and Photo diodes. Half and Full wave rectifiers, calculation of ripple factor, rectification efficiency and voltage regulation. Basic idea about filter circuits and voltage regulated power supply.

Unit-7 Number of Lectures = 07 Title of the Unit: Transistors Mapped CO: 4, s

Bipolar Junction PNP and NPN transistors. Study of CB, CE & CC configurations w.r.t. active, cutoff & saturation regions; characteristics; current, voltage & power gains; transistor currents & relations between them. Idea of base width modulation, base spreading resistance & transition time. DC Load Line analysis and Q-point stabilisation. Voltage Divider Bias circuit for CE amplifier. Qualitative discussion of RC coupled amplifier (frequency response not included).

Unit-8 Number of Lectures = 08 Title of the Unit: Electronic Instrumentation Mapped CO: 5

Multimeter: Principles of measurement of dc voltage, dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance. Cathode Ray Oscilloscope: Block diagram of basic CRO. Construction of CRT, electron gun, electrostatic focusing and acceleration (no mathematical treatment). Front panel controls, special features of dual trace CRO, specifications of a CRO and their significance. Applications of CRO to study the waveform and measurement of voltage, current, frequency & phase difference.

13. CO-PO and PSO mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	3		2			2	3	3		1				
CO2	3						3	3		1				
CO3	3		2			2	3	3		1				
CO4	3		1				3	3		2				
CO5	3		2				3	3		2				

3 Strong contribution, 2 Average contribution, 1 Low contribution

14. Suggested Readings:

- M.W. Zemansky, R. Dittman, "Heat and Thermodynamics", McGraw Hill, 1997, 7e
- 2. F.W. Sears, G.L. Salinger, "Thermodynamics, Kinetic theory & Statistical thermodynamics", Narosa Publishing House, 1998
- 3. Enrico Fermi, "Thermodynamics", Dover Publications, 1956
- 4. S. Garg, R. Bansal, C. Ghosh, "Thermal Physics", McGraw Hill, 2012, 2e
- 5. Meghnad Saha, B.N. Srivastava, "A Treatise on Heat", Indian Press, 1973, 5e
- 6. R.L. Boylestad, L. Nashelsky, "Electronic Devices and Circuit Theory", Prentice-Hall of India Pvt. Ltd., 2015, 11e
- 7. J. Millman, C.C. Halkias, Satyabrata Jit, "Electronic Devices and Circuits", McGraw Hill, 2015, 4e
- 8. B.G. Streetman, S.K. Banerjee, "Solid State Electronic Devices", Pearson Education India, 2015, 7e
- 9. J.D. Ryder, "Electronic Fundamentals and Applications", Prentice-Hall of India Private Limited, 1975, 5e

 10. A Sudhakar S.S. Palli, "Circuits and Networks: Analysis and Synthesis" McGraw Hill, 2015, 5e
- A. Sudhakar, S.S. Palli, "Circuits and Networks: Analysis and Synthesis", McGraw Hill, 2015, 5e
 S.L. Gupta, V. Kumar, "Hand Book of Electronics", Pragati Prakashan, Meerut, 2016, 43e

- 1. Swayam Government of India, https://swayam.gov.in/explorer?category=Physics
- 2. National Programme on Technology Enhanced Learning (NPTEL), https://nptel.ac.in/course.html
- 3. Coursera, https://www.coursera.org/browse/physical-science-and-engineering/physics-and-astronomy
- 4. edX, https://www.edx.org/course/subject/physics
- 5. MIT Open Course Ware Massachusetts Institute of Technology, https://ocw.mit.edu/courses/physics/



Effective from Session: 20	Effective from Session: 2022-23											
Course Code	B060201T/ MT141	Title of the Course	Descriptive Statistics (Bivariate) & Probability Distributions	L	T	P	C					
Year	First	Semester	Second	4	0	0	4					
Pre-Requisite	10+2 with Mathematics											
Course Objectives	The objective of this course is to develop an understanding of descriptive statistics and to introduce the basic elements of											

	Course Outcomes									
CO1	Knowledge of the method of least squares for curve fitting to theoretically describe experimental data with a function or									
	equation and to find the parameters associated with the model.									
CO2	Knowledge of the concepts of correlation and linear regression.									
CO3	Knowledge of the concept of regression analysis and attributes									
CO4	Knowledge of discrete distributions. Discuss appropriate distribution negative binomial, Poisson, etc. with their properties and									
	application of discrete distribution models to solve problems.									
CO5	Knowledge of continuous distributions. Discuss the appropriate distribution (i.e. uniform, exponential, normal, etc.) with									
	their properties and application of continuous distribution models to solve problems.									

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1		Bivariate data, Principles of least squares, Most plausible values, Meaning of curve fitting, Fitting of straight line, parabola, logarithmic, power curves and other simple forms by method of least squares.	6	1
2		Bivariate frequency table, Correlation, Types of relationships, Scatter diagram, Karl-Pearson's Correlation Coefficient and its properties. Spearman's Rank correlation and its coefficient.	8	2
3		Regression analysis through both types of regression equations for X and Y variables, Regression coefficients and its properties, coefficient of determination.	8	3
4		Attributes: Notion and Terminology, Contingency table, Class frequencies and Ultimate class frequencies, Consistency, Association of Attributes, Independence, Measures of association for 2X2 table, Chi-square, Karl Pearson's Coefficient of Association.	8	3
5		Discrete Probability Distributions: Binomial distribution, Poisson distribution, Hyper-geometric, Geometric and Negative Binomial distributions, fitting of Binomial, Poisson distributions.	8	4
6		Continuous Probability Distributions: Normal distribution and its properties, Standard Normal variate, Normal distribution as limiting case of Binomial distribution, fitting of Normal distribution Exponential, Uniform, Gamma, Beta distributions.	8	4
7		Moments, Moment generating function (m.g.f) & their properties, Characteristic function, Uniqueness and inversion theorems (without proof) along with applications Continuity theorem for m.g.f. (without proof).	8	5
8		Chebyshev's inequality, Weak law of large numbers for a sequence of independently and identically distributed random variables and their applications (Statement Only). Order Statistics: Discrete & D	8	5

Reference Books:

- 1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
- 2. Hanagal, D. D.: Introduction to Applied Statistics: A Non-Calculus Based Approach. Narosa Publishing Comp. New Delhi.
- 3. Miller, I. and Miller, M.: John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
- 4. Mood, A.M. Gray bill, F.A. and Boes, D.C.: Introduction to the Theory of Statistics, 3rd Edn., Tata McGraw-Hill Pub. Co. Ltd.
- 5. Weather burn, C.E.: A First Course in Mathematical Statistics, the English Lang. Book Society and Cambridge Univ. Press.
- 6. Mukhopadhyay, P.: Mathematical Statistics, New Central Book Agency Pvt. Ltd.
- 7. Rohatgi, V.K. and Saleh, A.E.: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern

e-Learning Source:

Suggestive digital platforms web link/platform: NPTEL/SWAYAM/MOOCS

		Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO- PSO	O PO1 PO2 PO3 PO4 PO5		PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5						
CO															
CO1	3						3	3	3	2	3	3			
CO2	3						1	3	3	3	3	2			
CO3	3	3			2	3	3	2	2	3					
CO4	3			2	3	2	2	3	3						
CO5	33						3	3	3	3	3	3			

1-]	Low C	Correl	ation; :	2- M	loderate	Correlati	ion; 3-	Substantial	Correlation
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Name & Sign of Program Coordinator	Sign & Seal of HoD



DEPARTMENT OF PHYSICS INTEGRAL UNIVERSITY, LUCKNOW Stillabus for U.G. & D.G. Program of par NED 2020

Syllabus for UG & PG Program as per NEP-2020																	
1. Name of the I	Departme	·		•													
		ate in Science (Physics, Mathematic	es & Electronics)	Year: First		Semester: Sec	cond										
3. Subject: Phys	sics			4. Pre-requisite	e (if any): 10+2 with Pl	nysics and Ma	athematics										
5. Course Code:	B010202)2P/PY116		6. Course Title	e: Thermal Properties	of Matter & I	Electronic Ci	rcuits									
7. Type of Cours		Major (✓)	Minor		Vocational ()		Co-curricular										
8. Credits: 2			9. Total Number	of Lectures (L),	Tutorials (T), Practicals	s (P):	L: 0 T:	0 P: 4									
10. The purpose its theoretical cou		ndergraduate course is to impart prac	tical knowledge of	f the electronics	and thermal physics thr	ough different	experiments	related to									
11. Course Outo	11. Course Outcomes (CO): After the successful course completion, learners will develop following attributes:																
After the success			following attribute	es: Attribute	S												
		Experimental physics has the most s	striking impact on			are used to stu	ıdy and deterr	mine the									
CO1		thermal properties. Experimental physics has the most s					_										
CO2		electronic properties.				are used to stu	idy and deteri	mine the									
CO3		Measurement precision and perfection	on is achieved thro	ough Lab Experi	ments.												
CO4		Online Virtual Lab Experiments give	e an insight in sim	ulation technique	-												
10 m ()))		Max. Marks: 25+75 = 100			Min. Passi	ing Marks:											
12. Total Num		Lectures: 60h	T - 1. T				M1 CC	. 1 2 2 4									
Experiment No.		ai ant Environtant of Heat has Collandas	Lab Experime				Mapped CC Mapped C										
2.		nical Equivalent of Heat by Callender eient of thermal conductivity of coppe					Mapped C										
3.		eient of thermal conductivity of rubbe		ratus			Mapped C										
4.		cient of thermal conductivity of a bad		and Charlton's	disc mathod		Mapped C										
5.		of Stefan's constant	conductor by Lee	and Charlton's C	iisc memod		Mapped C										
6.		ation of Stefan's law					Mapped C										
7.		on of thermo-emf across two junction	ns of a thermocoup	le with temperat	ture		Mapped C										
8.		rature coefficient of resistance by Pla					Mapped C										
9.	Chargin	ng and discharging in RC and RCL ci	ircuits				Mapped C	CO: 2, 3									
10.	A.C. Br	ridges: Various experiments based on	n measurement of I	L and C			Mapped C	CO: 2, 3									
11.	Resonar	nce in series and parallel RCL circuit	t				Mapped C										
12.		teristics of PN Junction, Zener, Tunne					Mapped C										
13.		teristics of a transistor (PNP and NPN		CC configuration	Mapped C												
14.		ave & full wave rectifiers and Filter c	eircuits		Mapped C												
15.		ulated and Regulated power supply	'II (CD C)				Mapped C										
16.	Various	s measurements with Cathode Ray Os			T :1.		Mapped C	20: 2, 3									
1	Lloot tro		ne Virtual Lab Ex	xperiment List/	Link		Mannad C	0.1.2.4									
1. 2.		ansfer by radiation ansfer by conduction					Mapped Co										
3.		ansfer by conduction					Mapped Co										
4.		ldy of phase change					Mapped Co										
5.		oody radiation: Determination of Stefa	an's constant				Mapped Co										
6.		n's law of cooling					Mapped Co										
7.		isc apparatus					Mapped Co										
8.		o-couple: Seebeck effects					Mapped Co										
9.		arisation with resistor					Mapped Co	O: 2, 3, 4									
10.		arisation with capacitor				Mapped Co	O: 2, 3, 4										
11.		arisation with inductor					Mapped Co										
12.	Ohm's I				Mapped Co												
13.		ferentiator and integrator					Mapped Co										
14.		racteristics of a diode					Mapped Co	O: 2, 3, 4									
15.		Full wave rectification					Mapped Co	0: 2, 3, 4									
16.		tative rectification					Mapped Co										
17. 18.		Diode voltage regulator mmon emitter characteristics					Mapped Co										
19.		mmon base characteristics					Mapped Co										
40.	Diddies	on by t CE amplifie					20. Studies on BJT CE amplifier Mapped CO: 2, 3, 4										

13. CO-PO and PSO mapping													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4		
CO1	2						3	3			3		
CO2	2						3	3			3		
CO3	3						2	3			2		
CO4	2						3	2			2		

3 Strong contribution, 2 Average contribution, 1 Low contribution

14. Suggested Readings:

- 1. B. L. Worsnop, H. T. Flint, "Advanced Practical Physics for Students", Methuen & Co., Ltd., London, 1962, 9e
- 2. S.Panigrahi, B.Mallick, "Engineering Practical Physics", Cengage Learning India Pvt.Ltd., 2015, 1e
- 3. R.L.Boylestad, L.Nashelsky, "Electronic Devices and Circuit Theory", Prentice-Hall of India Pvt. Ltd., 2015, 11e
- 4. A.Sudhakar, S.S.Palli, "Circuits and Networks: Analysis and Synthesis", McGrawHill, 2015, 5e

- 1. Virtual Labs at Amrita Vishwa Vidyapeetham, https://vlab.amrita.edu/?sub=1&brch=194
- 2. Virtual Labs an initiative of MHRD Govt. of India, http://vlabs.iitkgp.ac.in/be/#
- 3. Digital Platforms/Web Links of other virtual labs may be suggested/added to this list by individual Universities.

Effective from Session: 2022	Effective from Session: 2022-23									
Course Code	B060202P/MT142	Title of the Course	Descriptive Data Analysis Lab (Bivariate)		Т	P	С			
Year	First	Semester	Semester Second 0 0							
Pre-Requisite	10+2 with Mathematics	Co-requisite	Co-requisite							
Course Objectives	· ·	The objective of this course is to develop an understanding of basics of descriptive statistics and apply basic probability principles to solve real life problems.								

	Course Outcomes								
CO1	Ability to deal with the problems based on fitting of curves by Method of least squares e.g., fitting of straight line, second								
	degree polynomial, etc.								
CO2	Ability to deal with problems based on determination of Correlation coefficient – grouped and ungrouped data.								
CO3	Ability to deal with the problems based on determination of Rank correlation.								
CO4	Ability to deal with problems based on determination of Regression lines.								
CO5	Ability to fit Binomial and Poisson distribution for given data.								

Experiment No.	Title of the Experiment	Content of Experiment	Contact Hrs.	Mapped CO
1		Problems based on fitting of curves by Method of least squares e.g. fitting of straight line. second degree polynomial, power curve, exponential curve etc.	4	2
2		Problems based on determination of Correlation coefficient of grouped data.	4	1
3		Problems based on determination of Correlation coefficient of ungrouped data.	4	2
4		Problems based on determination of Rank correlation.	4	3
5		Problems based on determination of Regression lines	4	2
6		Fitting of Binomial distribution.	4	3
7		Fitting of Poisson distribution.	4	4

Reference Books:

Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics (10th ed.), Sultan Chand and Sons.

e-Learning Source:

Suggestive digital platforms web link/platform: NPTEL/SWAYAM/MOOCS

		Course Articulation Matrix: (Mapping of COs with POs and PSOs)										
PO- PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3						3	3	3	3	3	2
CO2	3						2	3	2	2	3	3
CO3	3						3	3	3	3	3	2
CO4	3						3	3	3	2	3	2
CO5	3						3	3	3	3	3	2

Name & Sign of Program Coordinator	Sign & Seal of HoD



Course	Code	B150101T/ES125	Title of the Course	Basics of Environmental Science	LT		P	С	
Year	Couc	First	Semester	Second Second	3 1		0	4	
Pre-Re	quisite	10+2 with Physics, Chemistry & (Mathematics/ Biology)	Co-requisite						
Course	Objectives	This course provides students with its relation with the environment.		f concept of environment and the relat	ion betwe	en hu	ıman a	nd	
			Course Outcomes						
CO1		out origin of life and related theories.							
CO2									
CO3				d the relationship between human and					
CO4				derstand the current scenario of enviro			dation		
CO5	Learn the significant environment.	nce and importance of environmental	management and have the	he practical knowledge about the affect	cted areas	of			
Unit No.								ped)	
1	Evolution	Origin of life and speciation, Darwi Selection; Biochemical basis of orig	8		CO	1			
2	Concept of Environment	Definition, Principles and Scope of segments; Moral and Aesthetic Natu of the subject; for Public Awareness	8		CO2	2			
3	Environmental	Goals of environmental education; I Environmental Justice, Individual C Primary, Secondary level.	6		CO	3			
4	Man and Environment:	Man-Environment relationships; Im transportation, mining, urbanization Conservation Issues, Modern conce	, industrialization); Env	ironmental Degradation and	8		CO	3	
5	Sustainable development	Concept and Significance of sustain development, Over-view of SDG (S			6		CO ²	4	
6	Current Environmental Issues	Ill effects of fireworks and environr human health, Deforestation and its Environment.		8		CO ²	4		
7	Environmental Management	Significance of Environment Managareas, Environmental ethics: Role of conservation, Communication and purpose management.	8		CO:	5			
8	Field Survey	Assessment of impacts of anthropogenic activities in the surrounding environment; Evaluation of the consequences rising from agricultural and commercial logging practices to preserve environment, case study, Reclamation and monitoring of the affected area by developmental activities: case study.							
Referer	nce Books:	-							

Effective from Session: 2022-2023

- 1. Environmental Science by William P. Cunningham and Mary Ann Cunningham; McGraw-Hill Publications.
- 2. Environmental Science: Earth as a Living Planet by Botkin and Keller; JOHN WILEY & SONS, INC
- 3. A text Book of Environment Studies, Asthana, D. K. and Asthana, M. 2006, S. Chand & Co.
- 4. Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p

e-Learning Source:

- 1. Environmental Science, Dr. Y. K. Singh, https://www.hzu.edu.in/bed/E%20V%20S.pdf
- 2. Textbook for Environmental Studies, Erach Bharucha, https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf
- 3. Fundamentals of Environmental Studies, https://www.jkcprl.ac.in/download/11567250727.pdf

		Course Articulation Matrix: (Mapping of COs with POs and PSOs)										
PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO	101	102	103	104	103	100	107	1301	1302	1303	1304	1303
CO1	3	2						2	2			
CO2	3	3						3	2			
CO3	2	2						2	3			
CO4	3	3						2	2			
CO5	2	1						3	2			

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator Sign & Seal of HoD



Effective	Effective from Session: 2022-23									
Course	Code	MT144/ I030202V	Title of the Course	LaTeX – Scientific Writing	L	T	P	С		
Year		First	Semester	Second	2	0	2	3		
Pre-Req	quisite	Basic knowledge of LaTeX	Co-requisite							
Course Objectives The course aims to teach the basic features. By attending the course students should acquire all necessary skills to be prepare a moderate scientific paper and a short mathematical presentation using LaTeX.								e to		
	Course Outcomes									
CO1		terpret the mathematical notations, matl		xpressions.						
CO2	Create and int	terpret the bibliography, citing bibliogra	aphic, BIBTEX, natbib package.							
CO3	Create and interpret the list of Contents and Index, rules, dots, hyperlinking, watermarking.									
CO4	Create and interpret the letter writing, article preparation, preparation of book, report writing.									
CO5	CO5 Create and interpret frames in presentation, presentation structure, environments in Beamer class.									
CO6	Understand a	nd interpret the Error messages, remova	al of errors, warning messages, tips	for debugging						

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO		
1	Equation Writing	Basic mathematical notations and delimiters, mathematical operators, mathematical expressions, simple equations, equation numbering, array equations, left aligning, sub – numbering, texts and blank spaces, splitting an equation, vector and matrix, overlining and underlining, stacking terms, side by side equations.	9	1		
2	Bibliograph y	Preparation of bibliography, citing bibliographic reference, bibliography with the BIBTEX program, BIBTEX compatible reference database, standard bibliography styles, natbib package, multiple bibliography.				
3	List of Contents and Index	Lists of contents; Information to the list of contents, formatting list of contents, multiple list of contents, making index, rotated items, rules, dots, hyperlinking, current date and time, highlighted texts, verbatime, watermarking, logo in header and footer, paragraph in different forms.	7	2		
4	Letter, Article, Books and Report	Letter writing, Article preparation, list of authors, title and abstract, left aligned title, article in multiple columns, section wise numbering, dividing an article, template of a book, preparation of book, dividing a book into parts, report writing.	8	3		
5	Slide Preparation	8	5			
6	Error and Warning Messages	Error messages, removal of errors, warning messages, error without any message, tips for debugging, commonly generated errors, errors due to packages, errors in equation environment.	6	6		

Reference Books:

- 1. Stefen Kottwitz, LaTeX Beginner's Guide, Packt Publishing, Birmingum (2011).
- 2. H. Kopka and P. W. Daly, A Guide to LaTeX, Addison Wesley Publishing.
- 3. Dilip Dutta: LaTeX in 24 Hours, Springer.

e-Learning Source:

- https://www.overleaf.com/learn/latex/Free online introduction to LaTeX (part 1)
- https://spoken-tutorial.org/tutorial-search/?search_foss=LaTeX&search_language=English_https://swayam.gov.in/explorer?searchText=LaTeX 2.

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)											
PO- PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3						2	3	3	3	3	2
CO2	3						3	3	3	2	2	3
CO3	3						3	3	2	3	3	3
CO4	3						3	3	2	2	3	2
CO5	3						1	2	1	3	2	1
CO6	3						1	2	1	3	2	1

Name & Sign of Program Coordinator	Sign & Seal of HoD