Integral University, Lucknow

Effective from Session: 2023-24								
Course Code	B030301T/ MT228	**Title of the Course**	Algebra & Mathematical Methods	**L**	**T**	**P**	**C**
Year	Second	**Semester**	Third				
Pre-Requisite	Knowledge of Sets, Relations and Integrations	**Co-requisite**	None	**6**	**0**	**0**	**6**
Course Objectives	The objective of the course is to develop the skills to apply the basic knowledge of Abstract Algebra, Integral Transform and Fourier Series. The course will further develop understanding the concepts of Jacobians, Functionals and their applications. The topics introduced will serve as basic tools for specialized studies in science field. After successfully completion of course, the student will able to explore subject knowledge into their respective dimensions.						

Course Outcomes

CO1	Students will be able to explain the fundamental concept of Group and its well behaved subsets.
CO2	Students will be able to describe fundamental properties of Ring, Integral Domain and their properties.
CO3	Students will be able to learn function of two variables, Jacobians and their related properties which enable them to check the validity of different kind of transformation from one co-ordinate system to other.
CO4	Develop an understanding of Laplace Transforms, Fourier Series and its applications.
CO5	Students will be able to understand functional, strong and weak variations and their applications.

Unit No.	Content of Unit	Contact Hrs.	Mapped CO
I	Equivalence relations and partitions, Congruence modulo n, Definition of a group with examples and simple properties, Subgroups, Generators of a group, Cyclic groups.	**12**	1
II	Permutation groups, Even and odd permutations, The alternating group, Cayley's theorem, Direct products, Coset decomposition, Lagrange's theorem and its consequences, Fermat and Euler theorems.	**11**	1
III	Normal subgroups, Quotient groups, Homomorphism and isomorphism, Fundamental theorem of group homomorphism, Theorems on isomorphism.	**11**	1
IV	Rings, Subrings, Integral domains and fields, Characteristic of a ring, Ideal and quotient rings, Ring homomorphism, Field of quotient of an integral domain.	**11**	2
V	Limit and Continuity of functions of two variables, Differentiation of function of two variables, Necessary and sufficient condition for differentiability of functions two variables, Schwarz's and Young theorem, Taylor's theorem for functions of two variables with examples, Maxima and minima for functions of two variables, Lagrange multiplier method, Jacobians.	**12**	3
VI	Existence theorems for Laplace transforms, Linearity of Laplace transform and their properties, Laplace transform of the derivatives and integrals of a function, Convolution theorem, inverse Laplace transforms, Solution of the differential equations using Laplace transforms.	**11**	4
VII	Fourier series, Fourier expansion of piecewise monotonic functions, Half and full range expansions, Fourier transforms (finite and infinite), Fourier integral.	**11**	4
VIII	Calculus of variations-Variational problems with fixed boundaries- Euler's equation for functionals containing first order derivative and one independent variable, Extremals, Functionals dependent on higher order derivatives, Functionals dependent on more than one independent variable, Variational problems in parametric form.	**11**	5

Reference Books: Part-A

1.	J.B. Fraleigh, A first course in Abstract Algebra, Addison-weley.
2.	I. N. Herstein, Topics in Algebra, John Wiley & Sons.
3.	Suggested digital plateform: NPTEL/SWAYAM/MOOCS.

Reference Books: Part-B

1.	T.M. Apostal, Mathematical Analysis, Person.
2.	G.F. Simmons, Differential Equations with Application and Historical Notes, Tata -McGrawHill
3.	Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
4.	Suggested digital plateform: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	1	1	-	1	1	2	3	2	3	2	3
CO2	1	-	-	-	-	1	3	2	1	1	2	2
CO3	2	-	1	1	-	-	2	1	3	2	3	1
CO4	2	-	-	-	-	-	1	2	1	1	1	1
CO5	3	1	1	1	-	2	3	2	2	2	1	2

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

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2024 - 25							
Course Code	B030302T/MT242	**Title of the Course**	Theory of real function	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	5	1	0	6
Pre-Requisite	10+2 Mathematics.	**Co-requisite**	None.				
Course Objectives	The course is aimed to develop the skills in mathematics which is necessary for grooming them into successful graduate. The topics introduced will serve as basic tools for specialized studies in science field.						

Course Outcomes	
CO1	Able to calculate limits of function and understand their application.
CO2	Able to understand the theorems on the limits.
CO3	Able to understand about continuous functions.
CO4	Able to apply the theorems on continuity.
CO5	Able to understand about differentiability of functions.
CO6	Able to understand the theorems on stability.
CO7	Able to apply Cauchy's Mean value Theorem, Maclaurin series and Taylor's Theorem.
CO8	Able to understand application of Cauchy's Mean value Theorem, Taylor's Theorem and Maclaurin series.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Unit I	Limit of a function, Sequential criteria of limits, Divergence criteria, Statements of limit theorems & their applications.	10	1
2	Unit II	Statements of the theorems of one sided limits, Infinite Limits and Limits at infinity and statements of the related theorems.	10	1
3	Unit III	Continuous functions and sequential criterion of continuity and discontinuity. Algebra of continuous functions (Statement only) & their application to problems, Continuity on an interval.	10	2
4	Unit IV	Intermediate value theorem, Location Root Theorem, Preservation of interval theorem. Uniform Continuity, Statement of Non Uniformity criteria, Uniform continuity Theorem.	10	2
5	Unit V	Differentiability of a function at a point and in an interval, Caratheodory's theorem, Algebra of differentiable functions (Statement only) and their applications. Relative Extrema, Interior Extremum Theorem.	15	3
6	Unit VI	Rolle's Theorem, Mean value Theorem, Intermediate value property of derivatives, Darboux's Theorem, Application of mean value theorem to inequalities.	15	3
7	Unit VII	Cauchy's Mean Value Theorem, Taylor's Theorem with Lagrange's form of reminder and Cauchy's form of reminder.	15	4
8	Unit VIII	Application of Taylor's theorem to convex function. Taylor's and Maclaurin series and their applications to simple problems.	15	5

Reference Books:
1. Introduction to Real Analysis, 3rd Ed by Bartle 2007.
2. Advanced Calculus by Lynn Harold Loomis, Shlomo Zvi Sternberg, 2014.
3. Calculus of One Variable, M. Thamban Nair · 2022.

e-Learning Source:
https://www.youtube.com/watch?v=8MBTdqIucP4
https://archive.nptel.ac.in/courses/111/104/111104144/
https://www.youtube.com/watch?v=GpQT248AeL4
https://www.youtube.com/watch?v=oURQqtguZh4

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

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

IntegralUniversity,Lucknow

Effective from Session: 2023-24							
Course Code	I030302V/MT234	**Title of the Course**	Introduction to R	**L**	**T**	**P**	**C**
Year	Second	**Semester**	Third	2	0	2	3
Pre-Requisite	Basic usage of a Windows PC or a Mac	**Co-requisite**					
Course Objectives	To make the students understand the basic concept and application of R software used for statistical analysis and better computing abilities.						

Course Outcomes	
CO1	Students will be able to understand the Introduction to R-language and using different operator in R.
CO2	Students will be able to understand the naming an object in R, creating and operating different functions in R
CO3	Students will be able to understand the character vectors, matrices, arrays, data frame and programming fundamentals in R
CO4	Students will be able to understand graphics in R
CO5	Students will be able to understand the descriptive statistics and summary of the data.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction	Introduction to R-Language, What is R?, Creating a Vector in R-c(), Arithmetic Operations on Vectors , Concept of Recycling	8	1
2	Data Entry	Naming an Object in R, The Functions; Seq() and Rep(),Logical Operators- TRUE(1), FALSE(0), Missing Values- NA	7	2
3	Character Vector	Character Vector- "," and Paste Function, Factor Vector and Ordering of Vectors, Matrices and Arrays.	7	3
4	Programming Fundamentals	Data Frame, Creating functions in R. Programming Fundamentals: Logical operators, conditional statements (if, else, else if statements in R), While loops, For loops, repeat loops.	8	3
5	Graphics	Graphics with R, Dot Chart, Pie Chart, Histogram (Hist()), Scatter Plot (Plot()) and Curve().	8	4
6	Descriptive Statistics	Obtaining Descriptive Statistics from R, Defining New Functions, Defining a Function for Standard Error of Mean, Descriptive Statistics of a Data Vector-describe(), Extension of describe() function for Data Frame	7	5

Reference Books:

1. Sandeep Rakshit, R for Beginner's, McGraw Hill Education-2017

2. Tilman M. Davies: The book of R, A first course in programming in Statistics, William Pollock, No starch Press, Inc

3. Gareth James, An Introduction to Statistical Learning with Application of R, Springer. 2022

4. Mark Gardener, Beginning R: The Statistical Programming Language, Wiley.

5. S. G. Purohit, Statistics Using R, Second Edition, Narosa.

e-Learning Source:

1. https://nptel.ac.in/courses/111104146
2. https://www.digimat.in/nptel/courses/video/111104100/L01.html
3. https://nptel.ac.in/courses/111104147
4. https://www.youtube.com/watch?v=nx-H2xog2d4
5. https://nptel.ac.in/courses/111104100

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					1	2	3	3	3	3	2
CO2	2					1	3	3	3	2	2	3
CO3	3					2	3	3	2	3	3	3
CO4	2					2	3	3	2	2	3	2
CO5	3					1	3	2	1	3	2	1

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

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Effective from Session: 2023-24							
Course Code	B030401T/MT229	**Title of the Course**	Differential Equations & Mechanics	**L**	**T**	**P**	**C**
Year	Second	**Semester**	Fourth				
Pre-Requisite	Knowledge of Vector Algebra and Integrations	**Co-requisite**	None	**6**	**0**	**0**	**6**
Course Objectives	The purpose of this undergraduate course is to impart basic and key knowledge of analytical solution of ordinary and partial differential equations in closed and infinite series form. The course will further help students to understanding and analysis of motion of a particle in three dimensions under different frame of references. The content of course has various applications. After successfully completion of course, the student will able explore subject into their respective dimensions.					

Course Outcomes	
CO1	The students will learn various methods of solving ordinary differential equations of second order and their qualitative applications. They also study some special functions obtained from these equations.
CO2	Students will be able to learn the origin and solution of first order partial differential equations.
CO3	Students will be able to find the solution of second and higher order partial differential equations and their classifications.
CO4	Students will be able to understand forces in three dimensions and their equilibrium. They also study virtual work and develop the ability to know about catenary.
CO5	The students will learn about the motion in two and three dimensions in various mediums. They also understand Kepler's law of motion related to earth rotation.

Unit No.	Content of Unit	Contact Hrs.	Mapped CO
I	Second order linear differential equations with constant and variable coefficients: Use of a known solution to find another, normal form, method of undetermined coefficient, variation of parameters,	12	1
II	Series solutions of differential equations, Power series method, Bessel, Legendre and Hypergeometric functions and their properties, recurrence and generating relations.	11	1
III	Origin of first order partial differential equation, Partial differential equations of the first order and degree one, Lagrange's solution, Partial differential equation of first order and degree greater than one, Charpit's method of solution, Surfaces orthogonal to the given system of surfaces.	11	2
IV	Origin of second order PDE, Solution of partial differential equations of the second and higher order with constant coefficients, Classification of linear partial differential equations of second order, Solution of second order partial differential equations with variable coefficients, Monge's method of solution.	11	3
V	Frame of reference, work energy principle, Forces in three dimensions, Poinsot's central axis, Wrenches, Null lines and planes.	12	4
VI	Virtual work, Stable and Unstable equilibrium, Catenary, Catenary of uniform strength.	11	4
VII	Velocities and accelerations along radial and transverse directions and along tangential and normal directions, Simple Harmonic motion, Motion under other law of forces. Elastic strings, Motion in resisting medium, Constrained motion, Motion on smooth and rough plane curves.	11	5
VIII	Motion of particles of varying mass, Rocket motion, Central orbit, Kepler's laws of motion, Motion of particle in three dimensions, Rotating frame of reference, Rotating earth, Acceleration in terms of different coordinates systems.	11	5

Suggested Readings(Part-A Differential Equations):

1. G.F. Simmons, Differential Equations with Application and Historical Notes, Tata –McGrawHill.
2. B. Rai, D.P. Choudhary & H. J. Freedman, A Course of Ordinary Differential Equations, Narosa
3. Ian N. Snedden, Elements of Partial Differential Equations, Dover Publication
4. L.E. Elsgolts, Differential Equation and Calculus of Variations, University Press of the Pacific.
5. Suggested digital plateform:NPTEL/SWAYAM/MOOCs

Suggested Readings(Part-B Mechanics):

1. R.C. Hibbeler, Engineering Mechanics-Statics, Prentics Hall Publishers
2. R.C. Hibbeler, Engineering Mechanics-Dynamics, Prentics Hall Publishers
3. A. Nelson, Engineering Mechanics Statics and Dynamics, Tata McGraw Hill
4. J.L. Synge & B.A. Griffith, Principles of Mechanics, Tata McGraw Hill
5. Suggested digital plateform:NPTEL/SWAYAM/MOOCs

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

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

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2023-24								
Course Code	B060101T/MT232	Title of the Course	Testing of Hypothesis & Applied Statistics	L	T	P	C	
Year	Second	Semester	Fourth	4	0	0	4	
Pre-Requisite		Co-requisite						
Course Objectives		**To introduce the concepts of the parametric tests of various measures and interpret the result to predict the future events**						

	Course Outcomes
CO1	Knowledge of the terms like null and alternative hypotheses, two-tailed and one- tailed alternative hypotheses, significant and insignificant, level of significance and confidence, p value etc.
CO2	Ability to understand the concept of MP, UMP and UMPU tests
CO3	Ability to understand under what situations one would conduct the small sampleand large sample tests (in case of one sample and two sample tests) and familiarity with different aspects of Applied Statistics and their use in real lifesituations.
CO4	Ability to understand the concept of Time series along with its different component & the concept of Index numbers and their applications along with different types ofIndex numbers. Familiarity with various demographic methods and different measures of mortalityand fertility & understand the concept of life table and its construction.
CO5	Knowledge to understand the concept of statistical quality control and differentcontrol charts for variables and attributes.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Statistical Hypothesis	Statistical Hypothesis (Simple and Composite), Testing of hypothesis. Type –I and Type – II errors, Significance level, p-values.	8	1
2	Tests for Statistical Hypothesis	Power of a test, Definitions of Most Powerful (MP), Uniformly Most Powerful (UMP) and Uniformly Most Powerful Unbiased (UMPU) tests.	8	2
3	Large Sample Tests	Test of significance: Large sample tests for (Attributes and Variables) proportions and means (i) for one sample (ii) for two samples Correlation coefficient in case of (a) $p=p_0$ (b) $p_1=p_2$,	8	3
4	Small Sample Test	Small sample test based on t, f and chi-squaredistributions.	6	3
5	Time Series	Introduction & Definition of Time Series, its different components, illustrations, additive and multiplicative models. Determination of trend by free hand curve, semi average method, moving average method, method of least squares, Analysis of Seasonal Component by Simple average method, Ratio to moving Average Ratio to Trend, Link relative method.	8	4
6	Index Number	Index number: definition, application of index number, price relative and quantity or volume relatives, link and chain relative, problem involved in computation of index number, use of averages, simple aggregative and weighted average method. Laspeyre's, Paasche's and Fisher's index number, time and factor reversal tests of index numbers, consumer price index.	7	4
7	Vital Statistics	Vital Statistics: Measurement of Fertility– Crude birth rate, general fertility rate, age-specific birth rate, total fertility rate, gross reproduction rate, net reproduction rate, standardized death rates Complete life table, its main features and construction.	8	4
8	Statistical Control Charts	Introduction to Statistical Quality Control, Process control, tools of statistical quality control, +3σ control limits, Principle underlying the construction of control charts. Control charts for variables, 'X' and 'R' charts, construction and interpretation, Control charts for attributes 'p' and 'c' charts, construction and interpretation	7	5

Reference Books:

1.	Ferund, J.E.: Mathematical Statistics, Prentice Hall of India.
2.	Freedman, D., Pisani, R. and Purves, R. : Statistics. 4th Edition. Norton & Comp.
3.	Goon, A.M., Gupta, M.K. & Dasgupta, B.: Fundamentals of Statistics, Vol. I,Kolkata, The World Press.
4.	Gupta, S.C. and Kapoor, V. K.: Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
5.	Hogg, R.V., McKean, J.W. & Craig, A.T.; Introduction to Mathematical Statistics, Pearson.
6.	Croxton F.E., Cowden D.J. and Klein, S.: Applied General Statistics, Prentice Hall of India Pvt. Ltd.
7.	Gupta, S.C. and Kapoor, V.K.: Fundamentals of Applied Statistics, SultanChand and Sons.
8.	Montgomery D.C.: Introduction to Statistical Quality Control, Wiley IndiaPvt. Ltd.

e-Learning Source:	

Suggestive digital platforms web link/platform: NPTEL/SWAYAM/MOOCS
www.ustat.toronto.edu
ecoursesonline.iaasri.res.in

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

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

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	B030402T / MT243	**Title of the Course**	Riemann Integral and series of functions	**L**	**T**	**P**	**C**
Year	Second	**Semester**	IV				
Pre-Requisite		**Co-requisite**	None	**5**	**1**	**0**	**6**
Course Objectives	This course is designed to develop a deeper understanding of fundamental concepts in mathematical analysis, with a particular focus on integration, series, and their applications. The key objectives of the course include Comprehending Riemann Integration, Exploring the Convergence of Functions and Series, Understanding Fourier Series, Mastering Power Series and Special Functions, Applying Mathematical Tools to Solve Problems.						

Course Outcomes	
CO1	Students will be able to deep understand of Riemann integration and its properties, including integrability conditions and the Fundamental Theorem of Integral Calculus.
CO2	students will be able to explore power series, focusing on radius of convergence, differentiation, and integration of series.
CO3	Students will be able to apply key theorems related to continuity, differentiability, and integrability of limit functions, along with the Cauchy criterion and Weierstrass M-Test.
CO4	Students will master the concepts of power series, focusing on convergence, differentiation, and integration, along with advanced theorems such as Abel's and Weierstrass approximation.

Unit No.	Content of Unit	Contact Hrs.	Mapped CO
I	**Riemann Integration:** Inequalities of upper and lower sums, Darbaux integration and Darbaux theorem, Riemann conditions of integrability, Riemann sum and definition of Riemann integral through Riemann sums, Equivalence of two definitions of Riemann integrals.	11	1
II	**Riemann Integrability and Properties:** Riemann integrability of monotone and continuous functions, Properties of the Riemann integral, Definition and integrability of piecewise continuous and monotone functions.	11	1
III	**Theorems of Riemann Integration:** Fundamental theorem of Integral Calculus, Intermediate Value theorem for integrals, Improper integrals and test for convergence.	10	2
IV	**Special Functions and Their Convergence:** Beta functions, Gamma functions, Convergence of Beta and Gamma functions, Properties of Beta and Gamma functions.	10	2
V	**Sequence of Functions and Convergence:** Pointwise and uniform convergence of a sequence of functions, Theorems on continuity, derivability, and integrability of the limit function of a sequence of functions, Series of functions.	11	3
VI	**Uniform Convergence Theorems:** Theorems on the continuity and derivability of the sum function of a series of functions, Cauchy criterion for uniform convergence, Weierstrass M-Test.	10	3
VII	**Fourier Series:** Definitions of Fourier coefficients and series, Riemann-Lebesgue Lemma, Bessel's inequality, Parseval's identity, Dirichlet's condition	11	4
VIII	**Power Series and Advanced Theorems:** Radius of convergence of power series, Cauchy-Hadamard theorem, Differentiation and integration of power series, Abel's theorem, Weierstrass approximation theorem	11	4

Reference Books: Part-A
1. **K. A. Ross**, *Elementary Analysis, The Theory of Calculus*, Undergraduate Texts in Mathematics, Springer (SIE), Indian reprint, 2004.
2. **R. G. Bartle and D. R. Sherbert**, *Introduction to Real Analysis*, 3rd Ed., John Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2002.
3. **C. G. Denlinger**, *Elements of Real Analysis*, Jones & Bartlett (Student Edition), 2011.
4. **S. Goldberg**, *Calculus and Mathematical Analysis*.
5. **S. Narayan**, *Integral Calculus*.
6. **T. Apostol**, *Calculus I, II*.

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	1	1	-	3	3	2	2	2	2
CO2	3	1	2	1	1	-	3	3	2	2	2	2
CO3	3	1	2	1	1	-	3	3	3	2	2	2
CO4	3	1	2	1	1	-	3	3	3	2	2	2

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

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2023-24								
Course Code	I030402V/MT235	**Title of the Course**	Introduction to SPSS	**L**	**T**	**P**	**C**	
Year	Second	**Semester**	Fourth	2	0	2	3	
Pre-Requisite	Basic usage of a Windows PC or a Mac	**Co-requisite**						
Course Objectives	To make the students understand the Statistical Package for Social Sciences (SPSS) software to perform statistics program gives a large amount of basic statistical functionality; some include frequencies, cross-tabulation, bivariate statistics, etc.							

Course Outcomes	
CO1	Students will be able to understand the Basic Statistics: Meaning and Definition and Introduction of primary and secondary source of data and method of their collection.
CO2	Students will be able to understand the Basic of SPSS, entry data file, opening menu and dialogue boxes, creating data file and entering data.
CO3	Students will be able to understand the construction of different graphs in SPSS.
CO4	Students will be able to understand to find the descriptive measures (Univariate and Bivariate) by SPSS.
CO5	Students will be able to understand the hypothesis testing by SPSS.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction	Basic Statistics: Meaning and definitions of Statistics, data and variables, quantitative and qualitative variables, Scales of Measurements (Nominal, Ordinal, Interval & Ratio), primary and secondary sources of data, methods of data collection, classification of data.	7	1
2	Data Entry	Introduction to SPSS, working with data file, SPSS windows, Menu & Dialogue boxes, creating data file and entering data, defining the variables, modifying data file & import file.	8	2
3	Graphs	Construction of graphs by SPSS: Bar diagram, Histogram, frequency curve, Ogive curve, Pie chart and Box plot.	7	3
4	Univariate Measures	Descriptive (Univariate) measures by SPSS: Mean, Median, Mode & Partition values. Dispersion and its measures: Range, Quartiles deviation, Standard deviation & Variance. Measures of Skewness & Kurtosis	7	4
5	Bivariate Measures	Descriptive (Bivariate) measures by SPSS: Correlation & Scatter diagram, Karl Pearson's Coefficient of correlation, Spearman's Coefficient of Rank correlation, Regression equations and regression coefficients, Coefficient of determination.	8	4
6	Hypothesis Testing	Hypothesis testing by SPSS: Hypothesis, Null & Alternative hypothesis, Level of significance, Confidence level and Degrees of freedom, Normality test, testing of hypothesis based on t-test, Chi-square test, Analysis of variance (ANOVA), Reliability test (Cronbach's alpha), Non parametric test.	8	5

Reference Books:
1. John MacInnes, An Introduction to Secondary Data Analysis with IBM SPSS Statistics, Sage 2017
2. Marija Norusis, The SPSS Guide to Data Analysis, 1991.
3. Stephen A. Sweet, and Karen Grace-Martin, Data Analysis with SPSS: A First Course in Applied Statistics, 4th Edition, Pearson. 2012
4. Pallant, Julie SPSS Survival Manual, 4th Ed, McGraw-Hill, 2010.
5. Cronk, Brian, How to Use SPSS: A Step-By-Step Guide to Analysis and Interpretation, 5th Ed. 2008

e-Learning Source:
1. https://www.youtube.com/watch?v=ZpwZS3XnEZA
2. https://nptel.ac.in/courses/110107113
3. https://www.youtube.com/watch?v=_zFBUfZEBWQ
4. https://www.youtube.com/watch?v=-UF2k0PTw5w
5. https://www.youtube.com/watch?v=6rgwgwv8qdA

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					1	2	3	3	3	3	2
CO2	2					1	3	3	3	2	2	3
CO3	3					2	3	3	2	3	3	3
CO4	2					1	3	3	2	2	3	2
CO5	3					2	3	2	1	3	2	1

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

Name & Sign of Program Coordinator	**Sign & Seal of HoD**