University of Kerala

Discipline	STATISTICS				
Course Code	UK1DSCSTA109				
Course Title	DESCRIPTIVE STATISTICS AND PROBABILITY				
Type of Course	**DSC**				
Semester	I				
Academic Level	100 – 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5
Pre-requisites					

COURSE OUTCOMES

Up on Completion of the course, students should be able to:		Cognitive level	PSO addressed
CO1	Distinguish between the various data types	Understand	PSO-1, 2
CO2	Explain the concept of scaling and identify their significance in practical situations	Understand	PSO-1,2
CO3	Calculate the measures of Central tendency, dispersion, skewness and kurtosis	Apply	PSO-1,2,3,4
CO4	Explain the concepts of random experiments, sample space and different types of events	Understand	PSO-1,2
CO5	Calculate the probabilities of events using classical, statistical approaches.	Apply	PSO-1,2,3
CO6	Understand Axiomatic approach	Understand	PSO-1,2
CO7	Determine conditional probability and apply concepts of statistical independence and multiplication theorem	Apply	PSO-1,2,3
CO8	Use Bayes' theorem to evaluate posterior probabilities	Apply	PSO-1,2,3
CO9	Explain the concept of random variables	Understand	PSO-1,
CO10	Illustrate random variables and its probability distributions	Analyse	PSO-1,2,3

COURSE CONTENT

Module	Content	Hrs
I	**Descriptive Statistics**	**13**
	Descriptive Statistics: Data- Definition, types of data, types of scaling - nominal, ordinal, interval and ratio, Central Tendency- Concept and Measures, Dispersion – Concept & Measures of Dispersion, Raw and central Moments(first four moments and their relationship without proof), Skewness and Kurtosis (Concept and definition with problems only).	

II	**Introduction to Probability**	**12**
	Random experiments - Sample Space, Sample point; Events-algebra of events, equally likely, mutually exclusive and exhaustive events (Concept only). **Probability**: Statistical regularity, frequency definition, classical approaches (numerical problems), Axiomatic approach, theorems in probability (Concepts and statement of results, numerical problems), probability space.	
III	**Conditional probability**	**10**
	Conditional probability: multiplication theorem, independence of two and three events, compound probability, Bayes' theorem and its applications. (Concepts and statement of results, numerical problems).	
IV	**Random variables**	**10**
	Random variables – definition, discrete and continuous random variables, probability mass function and probability density function, distribution function. Expectation of random variables and its properties, moments, moment generating function and characteristic function.(No proofs needed)	
V	**Practicum**	**30**
	Practical based on Modules I to be done using **R package**	

PRACTICAL/LABWORK

List of Practical worksheet

1. Measures of Central tendency.
2. Measures of Dispersion
3. Skewness and Kurtosis

REFERENCES

1. Agarwal, B.L. (2006). Basic Statistics. 4th Edition, New Age international (P) Ltd., New Delhi.
2. Gupta S. P. (2004). Statistical Methods. Sultan Chand & Sons, New Delhi.
3. Gupta, S. C., and Kapoor, V. K. (1994). Fundamental of Mathematical Statistics. Sultan Chand & Sons, New Delhi.
4. Kenny J. F (1947). Mathematics of Statistics Part One. 2nd Edition, D. Van Nostard Company, New Delhi-1.
5. Kenny J. F & Keeping E. S (1964). Mathematics of Statistics –Part Two. 2nd Edition, D. Van Nostard Company, New Delhi-1.
6. Mukhopadhyay, P. (1996). Mathematical Statistics. New Central Book Agency (P) Ltd, Calcutta.

Name of the Course: DESCRIPTIVE STATISTICS AND PROBABILITY

Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	**CO**	**PO/PSO**	**Cognitive Level**	**Knowledge Category**	**Lecture (L)**	**Practical (P)**
CO 1	Distinguish between the various data types	PSO-1, 2 PO 1	Understand	F, C	L	
CO 2	Explain the concept of scaling and identify their significance in practical situations	PSO-1,2 PO 1,2	Understand	F,C	L	

CO 3	Calculate the measures of Central tendency, dispersion, skewness and kurtosis	PSO-1,2,3,4 PO 1,7	Apply	C,P	L	P
CO 4	Explain the concepts of random experiments, sample space and different types of events	PSO-1,2 PO 1,2	Understand	C	L	
CO 5	Calculate the probabilities of events using classical, statistical approaches.	PSO-1,2,3 PO 1,2	Apply	P ,C	L	
CO 6	Understand Axiomatic approach	PSO-1,2 PO 1,2	Understand	F,C	L	
CO 7	Determine conditional probability and apply concepts of statistical independence and multiplication theorem	PSO-1,2,3 PO 1,2	Apply	C,P	L	
CO 8	Use Bayes' theorem to evaluate posterior probabilities	PSO-1,2,3 PO 1,2	Apply	C,P	L	
CO 9	Explain the concept of random variables	PSO-1 PO 1,2	Understand	F,C	L	
CO 10	Illustrate random variables and its probability distributions	PSO-1,2,3 PO 1,2	Analyse	C,P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with POs :

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PO1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1	1	2				1							
CO 2	1	2				1	2				2	1	

CO 3	2	1	2	1		2						1	
CO 4	2	2				1	2						
CO 5	2	1	1			1	2						
CO 6	2	1				1	2						
CO 7	3	1	1			1	2						
CO 8	3	1	1			1	2						
CO 9	3					1	2						
CO 10	2	1	1			1	2						

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Internal Examination
- Practical Evaluation
- End Semester Examinations

Mapping of COs to Assessment Rubrics :

	Internal Exam	Quiz / Assignment Discussion / Seminar	Practical Evaluation	End Semester Exam
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6	✓	✓		✓
CO 7	✓	✓		✓
CO 8	✓	✓		✓
CO 9	✓	✓		✓
CO 10	✓	✓		✓

University of Kerala

Discipline	Mathematics				
Course Code	UK2DSCMAT100				
Course Title	Theory of equations, Differential Calculus and Geometry				
Type of Course	DSC				
Semester	II				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical	Total Hours per week
	4	3		2	5
Pre-requisites	1. Awareness on polynomials 2. Knowledge on the concepts of functions, differentiation and basic geometry				
Course Summary	This course includes theory of equations, differential calculus, polar co-ordinates and conic sections				

Detailed Syllabus

Module	Unit	Contents	Hrs
I		**Differential calculus I**	**9**
	1	Related Rates, Analysis of functions - Increasing, Decreasing and Concavity, Relative Extrema excluding analysis of polynomials, Relative Maxima and minima, first derivative test, second derivative test, geometric implications of multiplicity	
	Chapter2: Section 2.8 and Chapter 3: Section 3.1, 3.2 of Text[1]		
II		**Differential calculus II**	**9**
	2	Absolute maxima and minima (for finite closed intervals only), Applied maximum minimum problems (excluding application to economics), Mean value theorem, Rolle's Theorem	

Module	Unit	Contents	Hrs
	Chapter 3: Section 3.4, 3.5, 3.8 of Text[1]		
III	**Exponential and logarithmic function**		**9**
	3	Exponential and logarithmic function, L'Hôpilal's Rule, indeterminate forms.	
	Chapter 6: Section 6.1, 6.5 of Text[1]		
IV	**Parametric representation of curves**		**9**
	4	Parametric equation, Tangent lines to parametric curves, arc length of parametric curves, polar coordinate systems, relationship between polar and rectangular coordinates, graphs in polar coordinates (exclude symmetry tests), family of curves	
	Chapter 10: Section 10.1 10.2of Text[1]		
V	**Teacher designed module - suggested topics**		**9**
	For internal assessment examinations only.		
	5	The following topics are suggested: Introduction, General Properties, Solution of cubic Equations- Cardan's Method, Newtons Method, Descarte's rule, absolute maxima and minima on infinite intervals, absolute maxima and minima on open intervals, problems involving intervals that are not both finite and closed	
	These topics can be found in Chapter 1: Sections 1.1, 1.5 of Text [2], Chapter 3: Sections 3.4, 3.5 of Text [1]		

Topics for Practical sessions – 30 hours

1. Introducing the SAGEMATH interface, SAGE cell server; basic arithmetic involving operators $+, -, /$, exponentiation; functions like `sin, cos, tan,e,log, sqrt`, constant π
   Ref: P1, or section 2.3 of P2

2. Defining and using lists, dictionaries, sets, and accessing elements in lists and dictionaries
   Ref: section 5.1, 5.3, 5.4 of P3

3. Defining variables using `var`, defining polynomials, polynomial functions, evaluating them
   Ref: P3 or section 1.4 of P4

4. `diff` command to find derivatives of standard functions, polynomials, including higher order derivatives
   Ref: Section 3.1 of P4

5. Solving polynomial equations and equations involving standard functions
   Ref : Section 2.2 of P7

6. Sketching graphs of curves using `plot`
   Ref : Section 6.1 of P2

7. Finding maxima, minima using first and second derivative tests.
   Ref : Section 4.2 of P4

8. Finding points of inflection and sketching them
   Ref : Section 4.2 of P4

9. Mean value theorem – verification and demonstration via sketching the curve and tangent
   Ref : P9

10. Using `integrate` command to compute indefinite and definite integrals
    Ref : Section 3.3.4 of P2

11. Defining parametric functions, sketching the graphs
    Ref: P5, Section 6.1 of P2

12. Find arc length of parametric curves

13. Plotting in polar co-ordinates
    Ref: Section 3.3 of P7

14. Conversion between various co-ordinate systems

15. Finding the number of roots of a polynomial using Descartes' rule of signs

16. Solving cubic by Cardan's method

17. Finding approximate roots by Newton's method
    Ref : Section 4.4 of P4

18. Sketching family of circles, rose curves

Problems for the practical examination

1. Defining polynomials, polynomial functions, evaluating them

2. Solving polynomial equations and equations involving standard functions

3. Sketching graphs of curves using plot with various styling options (thickness, line style, color etc)

4. Finding maxima, minima using first and second derivative tests.

5. Finding points of inflection and sketching them

6. Mean value theorem verification, and sketching

7. Plotting in polar co-ordinates

8. Finding the number of roots of a polynomial using Descartes' rule of signs

9. Sketching family of circles

10. Finding approximate roots by Newton's method

A record should be maintained with atleast 7 problems from the above. Each problem in the record must have a description of the problem, algorithm (step by step procedure), commands used, input given and output obtained accordingly. For the ESE, from the list of above 10 problems, the student should be able to answer two selected (from the 7 available in the record) by the examiner.

Textbooks

1. H Anton, I Bivens, S Davis. Calculus, 10th Edition, John Wiley & Sons, 2012
2. B.S. Grewal, Higher Engineering Mathematics, 42nd Edition, Khanna Publishers, 2012.

References

1. Barnard and Child, Higher Algebra, Mac Millan, 2000.
2. Joel Hass, Maurice D. Weir, Thomas' Calculus Early Transcendentals, 12th Edition, Addison-Weseley Publishing Company, 2004.
3. T. K. Manicavachagom Pillay, T. Natarajan, K.S. Ganapathy, Algebra Volume I Ananda Book Depot, 1996.
4. J Stewart, Calculus with Early Transcendental Functions, 7th Edition, Cengage India Private Limited, 2004.
5. G B Thomas, R L Finney, Calculus, 9th Edition, Addison-Weseley Publishing Company, 2004.

Resources for practical sessions

P1. Sagemath documentation – Introductory Sage Tutorial https://doc.sagemath.org/html/en/prep/Intro-Tutorial.html

P2. Saskia Roos, Michael Jung, *An Introductory Course on Sage, Lecture Notes* https://www.math.uni-potsdam.de/fileadmin/user_upload/An_Introductory_Course_on_Sage.pdf

P3. Sagemath documentation – Symbolic variableshttps://doc.sagemath.org/html/en/reference/calculus/sage/calculus/var.html

P4. Tuan A. Le, Hieu D. Nguyen, SageMath Advice for calculus https://users.rowan.edu/~nguyen/sage/SageMathAdviceforCalculus.pdf

P5. Sagemath documentation – Parametric plots https://doc.sagemath.org/html/en/reference/plot3d/sage/plot/plot3d/parametric_plot3d.html#sage.plot.plot3d.parametric_plot3d.parametric_plot3d

P6. P. Zimmermann *et al*, Computational Mathematics with SageMath, https://www.sagemath.org/sagebook/english.html

P7. Gregory V. Bard, Sage for Undergraduates http://www.people.vcu.edu/~clarson/bard-sage-for-undergraduates-2014.pdf

P8. SageMath documentation – 3D Graphics https://doc.sagemath.org/html/en/reference/plot3d/index.html

P9. Ajit Kumar, One Variable Calculus with SageMath https://ajitmathsoft.wordpress.com/wp-content/uploads/2019/07/cal_onevar_sage.pdf

Course Outcomes

CO No.	Upon completion of the course the graduate will be able to	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L) Tutorial (T)	Practical (P)
CO 1	Describe algebraic techniques to solve polynomial equations and to identify conic sections	PSO2, PO1, PO2, 3, 4, 7, 8	U,E	F,P	L	
CO 2	Apply differentiation techniques to analyse extrema of functions and solving real life problems	PSO4, PO1, 2, 3, 4, 7, 8	U,An	F,P	L	
CO 3	Sketching parabola, ellipse and hyperbola, and relating polar and cartesian co-ordinates	PSO5, PO1, 2, 3, 7, 8	U,E	F,P	L	
CO 4	Analysing parametric representation of curves	PSO2, PO1, 2, 3, 4, 6, 7, 8	R,An	F,P	L	

(R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create)
(F-Factual, C-Conceptual, P-Procedural, M-Metacognitive)

Mapping of CO with PSOs and POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	2	2	1	1	3	3	2	1			1	2
CO2	2	2	2	3	2	1	3	2	2	1			1	2
CO3	2	2	2	2	3	1	3	2	3	1			2	1
CO4	2	3	2	2	2	1	3	2	2	1		1	1	1

(- -Nill, 1-Slightly/Low, 2-Moderate/Medium, 3-Substantial/High)

Assessment Rubrics

- Quiz/Assignment/Discussion/Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics

	Internal Examination	Assignment	Project Evaluation	End Semester Exam
CO1	✓	✓		✓
CO2	✓	✓		✓
CO3	✓	✓		✓
CO4	✓	✓		✓

UNIVERSITY OF KERALA

Re-accredited by NAAC with A++ GRADE

Jan. 13, 2025, 6:52 a.m.

Course Registration

College : **Christian College Chengannur (102)**
Year of admission : **Batch 2024**
Semester : **2**
Discipline : **FYUGP Mathematics (1037)**
Course : **UK2DSCMAT108 - Integral Calculus and Series**

Sl.No.	Name	Candidate Code	Course	Status
1	MEGHA T MURUGAN	213619390763	FYUGP Physics	ACTIVE
2	DEVIKA S PILLAI	361080016167	FYUGP Physics	ACTIVE
3	KRISHNAPRIYA. S	372690075331	FYUGP Physics	ACTIVE
4	DHYAAN C UJWAL	646838884305	FYUGP Physics	PENDING

UNIVERSITY OF KERALA

Re-accredited by NAAC with A++ GRADE

Jan. 13, 2025, 6:51 a.m.

Course Registration

College : **Christian College Chengannur (102)**
Year of admission : **Batch 2024**
Semester : **2**
Discipline : **FYUGP Mathematics (1037)**
Course : **UK2DSCMAT107 - Mathematics for Social Sciences - II**

Sl.No.	Name	Candidate Code	Course	Status
1	ADWAITH DEEPU	154486938944	FYUGP Physics	PENDING
2	AKASH BIJU	170819810464	FYUGP Physics	ACTIVE
3	ASWIN HAREESH	362605682996	FYUGP Physics	PENDING
4	MUHAMMAD ASIM T A	405052507445	FYUGP Chemistry	PENDING
5	VISHNU NADH M S	414507509758	FYUGP Commerce - Finance Stream	ACTIVE
6	ASHIK ALHAB	443866912375	FYUGP Physics	PENDING
7	SHIJIMOL V S	493903586800	FYUGP Chemistry	ACTIVE
8	RIYA WILSON	790108740647	FYUGP Chemistry	ACTIVE
9	ARUNIMA K A	824807833923	FYUGP Chemistry	ACTIVE
10	AKSHARA MURALY	865629034029	FYUGP Physics	ACTIVE

University of Kerala

Discipline	Mathematics				
Course Code	UK1DSCMAT100				
Course Title	Foundations of Mathematics				
Type of Course	DSC				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical	Total Hours per week
	4	4	-	-	4
Pre-requisites	1. Definition and preliminary results of matrices. 2. Understanding on methods to solve a system of simultaneous of equations. 3. Basic knowledge of various number system.				
Course Summary	This course includes set theory, determinants and matrices, number theory and solution of system of equations using matrices and number theory				

Detailed Syllabus

Module	Unit	Contents	Hrs
I		**Sets -Relations - Functions**	**12**
	1	Sets: Sets and Elements, Subsets, Venn Diagram, Set Operations. Relation: Product sets, Relations, Types of Relations, Equivalence Relations, Partial Ordering Relations Functions: Functions, One–to-One, Onto and Invertible Functions. (Chapter 1: Sections 1.2, 1.3, 1.4, Chapter 2: 2.2, 2.3, 2.6, 2.8, Chapter 3: 3.2, 3.3. of Text[2])	

Module	Unit	Contents	Hrs
II		**Matrices and Determinants**	**12**
	2	Definition, Properties of Determinants and problems, Special Matrices Review of Matrix operations and Related Matrices Rank of a matrix-Elementary transformation, Equivalent matrix , Elementary matrices, Normal form (Chapter 1: Section 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7.1 to 2.7.7 of Text[1])	
III		**Solution of system of equation**	**10**
	3	Solution of Linear system equation method Cramer's Rule, Matrix Inversion Method Consistency of linear system of equation, Rouche's Theorem (Statement only), System of homogeneous equation (Chapter 2: Sections 2.9, 2.9.1, 2.9.2, 2.10 of Text[1])	
IV		**Number Theory**	**26**
	4	Mathematical induction, The division algorithm, Pigeonhole principle, divisibility relations, inclusion-exclusion principle *(These topics can be found in Chapter 1 section 1.3, Chapter 2 sections 2.1, 2.5 of Text [3] . The topics from the subsection 'A Number-Theoretic Function' onwards are excluded for examination. But Theorem 2.12 and Lemma 2.25 to be discussed.)*	
	5	Prime and composite numbers, infinitude of primes, GCD, linear combination of integers, pairwise relatively prime integers, the Euclidean algorithm for finding GCD the fundamental theorem of arithmetic, canonical decomposition of an integer into prime factors, LCM. *(These topics can be found in Chapter 3 sections 3.1 to 3.4 of Text [3]. The subsections marked as optional, Theorems 3.1, 3.2, 3.3, 3.12, 3.14, and Lemma 3.2 are excluded for examination.)*	
	6	Congruences, Modular exponentiation. *These topics can be found in Chapter 4 sections 4.1 and 4.2 Text [3]. The subsections marked as optional and 'The monkey and coconut puzzle revisited' are excluded for examination.*	

Textbooks

1. B.S. Grewal, Higher Engineering Mathematics, 42nd Edition, Khanna Publishers, 2012

2. Seymour Lipschutz, Marc Lipson. Discrete Mathematics, 3rd Edition, Schaum's outline, 2007.

3. Thomas Koshy, Elementary Number Theory with Applications, 2nd Edition, Academic Press, 2007.

References

1. David M. Burton, Elementary Number Theory, Seventh Edition, McGraw-Hill, 2011.
2. Gilbert Strang, Introduction to Linear Algebra , 5th Edition, 2005.
3. G A Jones, J M Jones, Elementary Number Theory, Springer, 1998.
4. Lee W. Johnson, R Dean Riess, Jimmy T. Arnold, Introduction to Linear Algebra, Fifth Edition, Addison Wesley, 2019.
5. Seymour Lipschutz. Set Theory and Related Topics, 3rd Edition, Schaum's outline, 1998.

Course Outcomes

CO No.	Upon completion of the course the graduate will be able to	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L) Tutorial (T)	Practical (P)
CO 1	Describe the basic concept of set theory, determinants, Matrices and numbers	PSO1, PO1, 2, 4, 8	U	F,C	L	
CO 2	Solve system of linear equations using determinants, Matrices	PSO2, PO1, 2, 3, 4, 7, 8	Ap	P	L	
CO 3	Illustration of Mathematical Induction, Division Algorithm and Euclidean Algorithm	PSO1, PO1, 2, 3, 4, 6, 7, 8	U	F,C	L	
CO 4	Categorise functions based on the properties	PSO4, PO1	An	F,C	L	

(R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create)
(F-Factual, C-Conceptual, P-Procedural, M-Metacognitive)

Mapping of CO with PSOs and POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	1	1	2	2	2	1	3	1	1	2	2
CO2	2	3	2	2	1	1	2	3	1	2			1	2
CO3	3	2	2	1	1	1	3	2	1	3			1	1
CO4	2	2	1	3	1	1	3	1	1	1		1	1	1

(- -Nill, 1-Slightly/Low, 2-Moderate/Medium, 3-Substantial/High)

Assessment Rubrics

- Quiz/Assignment/Discussion/Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics

	Internal Examination	Assignment	Project Evaluation	End Semester Exam
CO1	✓	✓		✓
CO2	✓	✓		✓
CO3	✓	✓		✓
CO4	✓	✓		✓

University of Kerala

Discipline	Mathematics				
Course Code	UK1DSCMAT108				
Course Title	Differential Calculus				
Type of Course	DSC				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical	Total Hours per week
	4	4	-	-	4
Pre-requisites	Functions				
Course Summary	Brief review of calculus, Polynomial and elementary transcendental functions and their applications, derivatives, extremum problems, curve-sketching, approximations, Use of symbolic manipulation and graphics software in calculus.				

Detailed Syllabus

Module	Unit	Contents	Hrs
I		**Functions, limits and continuity**	**10**
	1	Families of functions, inverse functions, exponential and logarithmic functions, Computing limits of functions, limits at infinity, Continuity, Intermediate value theorem and applications, Continuity of various functions. Sections 0.3,0.4,0.5, 1.2, 1.3, 1.5, 1.6 of Text I	
II		**Introduction to derivatives**	**15**
	2	The derivative of a function, Algebra of derivatives, Derivatives of various functions, The chain rule. Sections 2.2, 2.3, 2.4 2.5, 2.6 (Proofs of theorems excluded)	

Module	Unit	Contents	Hrs
III	**Techniques of differentiation**		**15**
	3	Implicit differentiation, derivatives of logarithmic, exponential and inverse trigonometric functions, related rates and local linear approximation, L'Hopital rule. Sections 2.7, 2.8, 2.9, 6.1, 6.2(Integrals involving logarithmic functions excluded), 6.3,6.5	
IV	**Analysis of functions using derivatives**		**20**
	4	Increasing, decreasing and concavity, extremum problems, graphing polynomials, absolute maxima and minima, Rolle's theorem, Mean-value theorem Sections 3.1, 3.2, 3.4, 3.8	

Textbooks

1. H Anton, I Bivens, S Davis, *Calculus*, 10th Edition, John Wiley & Sons, 2012.

References

1. Joel Hass, Maurice D. Weir, *Thomas' Calculus Early Transcendentals*, 12th Edition, Addison-Weseley Publishing Company, 2004.
2. J Stewart, *Calculus with Early Transcendental Functions*, 7th Edition, Cengage India Private Limited, 2004.
3. G B Thomas, R L Finney, *Calculus*, 9th Edition, Addison-Weseley Publishing Company, 2004.

Course Outcomes

CO No.	Upon completion of the course the graduate will be able to	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L) Tutorial (T)	Assignment (As)
CO 1	Understand the basic concept of functions, limit, continuity and derivatives	PSO1,2, PO1	U	F,C	L,T	
CO 2	Analyse the properties of functions using derivatives	PSO2, PO3, 4	An	F	L,T	
CO 3	Apply deferentiation techniques to solve various problems	PSO1,3, PO2, 3	U,An	C	L,T	

(R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create)

(F-Factual, C-Conceptual, P-Procedural, M-Metacognitive)

Mapping of CO with PSOs and POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1					3							
CO2		2							1	3				
CO3	2		3					2	2					

(- -Nill, 1-Slightly/Low, 2-Moderate/Medium, 3-Substantial/High)

Assessment Rubrics

- Quiz/Assignment/Discussion/Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics

	Internal Examination	Assignment	Project Evaluation	End Semester Exam
CO1	✓	✓		✓
CO2	✓	✓		✓
CO3	✓	✓		
CO4	✓	✓		✓

University of Kerala

Discipline	Mathematics				
Course Code	UK1DSCMAT109				
Course Title	Mathematics for Social Science I				
Type of Course	DSC				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical	Total Hours per week
	4	4	-	-	4
Pre-requisites	Basic knowledge of Mathematics in Secondary level				
Course Summary	This course includes basic set theory, solutions of linear and quadratic equations, linear programming problems and functions				

Detailed Syllabus

Module	Unit	Contents	Hrs
I		**Theory of sets**	**15**
	1	Finite and infinite sets, set operations	
	2	Ordered pairs, Cartesian products, Relations	
	3	Functional Relations and Functions	
	Chapter 1: Sections 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.14, 1.15,1.16, 1.17		
II		**Linear Equations**	**15**
	4	Equations and identities -Linear and quadratic equations	
	5	Solution of equations, Solutions of quadratic equations, Solution of simultaneous equations	
	6	Applications	
	Chapter 3: Section 3.1.		
III		**Linear Programming**	**18**

University of Kerala

Discipline	Mathematics				
Course Code	UK1DSCMAT110				
Course Title	Matrices and Linear Equations				
Type of Course	DSC				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical	Total Hours per week
	4	4	-	-	4
Pre-requisites	Matrices				
Course Summary	This is a brief introductory course on matrices and system of linear equations				

Detailed Syllabus

Module	Unit	Contents	Hrs
I		**System of linear equations and matrices**	**10**
	1	Introduction to Systems of Linear Equations, Gaussian Elimination, Matrices and Matrix Operations, Inverses;Algebraic Properties of Matrices, [Section 1.1 to 1.4 of the Text]	
II		**Further properties of matrices**	**15**
	2	Elementary matrices and method for finding inverse, more on linear systems and invertible matrices, diagonal, triangular and symmetric matrices, matrix transformations [Section 1.5 to 1.8 of the Text]	
III		**Determinants**	**15**
	3	Determinants by cofactor expansion, evaluating determinants by row reduction, properties of determinants, Cramer's rule	

Module	Unit	Contents	Hrs
IV	**Euclidean vector spaces**		**20**
	4	Vectors in 2 space, 3 space and n-space, Norm, dot product, and distance in R^n, Orthogonality, the geometry of linear systems, cross product	

Textbook

1. H Anton, C Rorres. Elementary linear algebra, 11th Edition, John Wiley & Sons.

References

1. David Poole, Linear Algebra, a modern introduction, Brooks/Cole Cengage learning
2. Lee W.Johnson, R. Deanriess, Jimmy T. Arnold, Introduction to Linear Algebra, 5^{th} edition, Addison Wisely

Course Outcomes

CO No.	Upon completion of the course the graduate will be able to	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L) Tutorial (T)	Assignment (As)
CO 1	Understands system of linear equations	PSO1, 2, PO1	U	F,C	L,T	
CO 2	Perform various operations on matrices and determinants	PSO2, PO3, 4	An	F	L,T	
CO 3	Understand the concept of vectors in Euclidean spaces	PSO1, 3, PO2, 3	U,An	C	L,T	
CO 4	Apply matrices to solve system of linear equations	PSO1, 3	Ap	C	L,T	

(R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create)
(F-Factual, C-Conceptual, P-Procedural, M-Metacognitive)

Mapping of CO with PSOs and POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1					3							
CO2		2							1	3				
CO3	2		3					2	2					
CO4	2		3											

(- -Nill, 1-Slightly/Low, 2-Moderate/Medium, 3-Substantial/High)

Assessment Rubrics

- Quiz/Assignment/Discussion/Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics

	Internal Examination	Assignment	Project Evaluation	End Semester Exam
CO1	✓			
CO2	✓			
CO3	✓			
CO4	✓			✓

University of Kerala

Discipline	Mathematics				
Course Code	UK1MDCMAT100				
Course Title	Numerical Ability - I				
Type of Course	MDC				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours per week
	3	3			3
Pre-requisites	Basic Mathematical Operations				
Course Summary	This course is primarily meant for students who have not undergone a Mathematics course beyond their secondary school. The course is expected to improve the student's basic mathematical skills and to understand the mathematics used in their respective fields better.				

Detailed Syllabus

Module	Unit	Contents	Hrs
I		**HCF, LCM, Percentage and Average**	**11**
	1	Highest Common Factor, Methods of finding HCF, Least Common Multiple, Methods of finding LCM, Problems involving HCF and LCM. *(Chapter 2 of Text [1])*	
	2	Percentage, Problems involving percentage. *(Chapter 5 of Text [1])*	
	3	Average, Problems involving average. *(Chapter 6 of Text [1])*	
II		**Ratio and Proportion, Profit and Loss**	**12**
	4	Ratio, Types of Ratios, Proportion, Problems involving Ratio and Proportion. *(Chapter 7 of Text [1])*	

University of Kerala

Discipline	Mathematics				
Course Code	UK3DSCMAT200				
Course Title	Integral Calculus and Foundations of Vector Calculus				
Type of Course	DSC				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical	Total Hours per week
	4	4		1	5
Pre-requisites	1.Awareness of Differential Calculus and Integral Calculus				
	2. Knowledge of various co-ordinate systems in 2-dimension				
Course Summary	The course deal with identifying the applications of integration and vector valued functions				

Detailed Syllabus

Module	Unit	Contents	Hrs
I		**Integral Calculus I**	**15**
	1	Area between two curves, Volume by Slicing, Volume by cylindrical shells. Chapter 5: Section 5.1, 5.2, 5.3 of Text [1]	
II		**Integral Calculus II**	**15**
	2	Length of the plane curve Area of surface of revolution Work(done by constant force in the direction of motion only) Chapter 5: Section 5.4, 5.5, 5.6 of Text [1]	
III		**Vector Valued Functions I**	**15**
	3	Rectangular Coordinates In 3-Space; Spheres; Cylindrical Surfaces, Vectors, Dot Product; Projections, Cross Product, Parametric equations of lines, Planes in 3- space, Cylindrical and spherical Coordinates. Chapter 11: Section 11.1 to 11.6, 11.8 of Text [1]	

Module	Unit	Contents	Hrs
IV	**Vector Valued Functions II**		**15**
	4	Introduction To Vector-Valued Functions, Calculus Of Vector-Valued Functions, Change Of Parameter; Arc Length, Unit Tangent, Normal, And Binormal Vectors, Curvature, Motion Along A Curve. Chapter 12: Section 12.1 to 12.6 of Text [1]	
Practical	Practical sessions can be given using suitable software like sagemath (not meant for examination purpose)		**15**

Textbook

1. H Anton, I Bivens, S Davis. Calculus, 10th Edition, John Wiley & Sons, 2012.

References

1. Joel Hass, Maurice D. Weir, Thomas' Calculus Early Transcendentals, 12th Edition, Addison-Weseley Publishing Company, 2004.

2. J Stewart, Calculus with Early Transcendental Functions, 7th Edition, Cengage India Private Limited, 2008.

3. G B Thomas, R L Finney, Calculus, 9th Edition, Addison-Weseley Publishing Company, 2004.

Course Outcomes

CO No.	Upon completion of the course the graduate will be able to	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L) Tutorial (T)	Practical (P)
CO 1	Demonstrate applications of Integration	PSO3, PO1, 2, 3, 4, 5, 6, 7, 8	U,E	F,P	L	
CO 2	Computing area and volume using Integration	PSO2, PO1, 2, 3, 4, 5, 7, 8	U,An	F, P		
CO 3	Analysing geometry of curves and surfaces using Vector Calculus	PSO2, PO1, 2, 3, 4, 5, 6, 7, 8	U, E	F, P		
CO 4	Distinguish cylindrical and spherical co-ordinates	PSO4, PO1, 2, 3, 4, 5, 6, 7, 8	R, An	F, P		

(R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create)
(F-Factual, C-Conceptual, P-Procedural, M-Metacognitive)

Mapping of CO with PSOs and POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1			3				3	3	2	2	1	2	2	1
CO2		3					3	3	1	1	2		2	1
CO3		3					3	2	1	1	2		2	1
CO4				3			3	2	1	1	1	2	3	1

(- -Nill, 1-Slightly/Low, 2-Moderate/Medium, 3-Substantial/High)

Assessment Rubrics

- Quiz/Assignment/Discussion/Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics

	Internal Examination	Assignment	Project Evaluation	End Semester Exam
CO1		✓		
CO2	✓	✓		✓
CO3	✓	✓		✓
CO4	✓	✓		✓

University of Kerala

Discipline	Mathematics				
Course Code	UK3DSCMAT203				
Course Title	Numerical Analysis				
Type of Course	DSC				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours per week
	4	4	-	1	5
Pre-requisites	1. Differentiation 2. Integration				
Course Summary	This course enable the students to gain a thourough understanding of various numerical methods used for solving mathematical problems				

Detailed Syllabus

Module	Unit	Contents	Hrs
I		**Solution of Algebraic and Transcendental equations**	**15**
	1	Introduction, Bisection Method, Method of false position. Chapter 2: Section 2.1 to 2.3 of Text[1]	
	2	Iteration Method, Newton-Raphson method. Chapter 2: section 2.4 to 2.5 of Text[1]	
	3	Ramanujan's method, Secant method, Muller's method. Chapter 2: Section 2.6 to 2.8 of Text[1]	
II		**Interpolation**	**15**
	4	Finite differences. Chapter 3: Section 3.3	
	5	Newton's formulae for interpolation. Chapter 3: Section 3.6 of Text[1]	
	6	Interpolation with unevenly spaced points. Chapter 3: Section 3.9 of Text[1]	

Module	Unit	Contents	Hrs
	7	Divided differences and their properties. Chapter 3: Section 3.10 of Text[1]	
III	**Numerical Differentiation and Integration**		**15**
	8	Numerical differentiation. Chapter 6: Section 6.2 (excluding 6.2.1 and 6.2.2) of Text[1]	
	9	Maximum and Minimum values of a tabulated function. Chapter 6: Section 6.3 of Text[1]	
	10	Numerical integration Chapter 6: Section 6.4.1 to 6.4.4 of Text[1]	
IV	**Numerical Solution of Ordinary Differential equations**		**15**
	11	Solution by Taylor's series Chapter 8: Section 8.2 of Text[1]	
	12	Picard's method of Successive Approximations. Chapter 8: Section 8.3 of Text[1]	
	13	Euler's method Chapter 8: Section 8.4 of Text[1]	
	14	Runge- Kutta Methods.Chapter 8: Section 8.5 of Text[1]	
Practical	Practical sessions can be given using suitable software like sagemath (not meant for examination purpose)		**15**

Textbook

1. S.S. Sastry, *Introductory Methods of Numerical Analysis* , Fifth edition, PHI Learning Pvt. Ltd, 2012

References

1. A. C. Faul, *A Concise Introduction to Numerical Analysis* , CRC Press, 2016.
2. George A Anastassiou, Razvan A Mezei, *Numerical Analysis Using Sage*, Springer, 2015.
3. Richard L. Burden, J. Douglas Faires, *Numerical Analysis* , Ninth Edition, Cengage Learning, 2011.
4. Timo Heister, Leo G. Rebholz, Fei Xue, *Numerical Analysis An Introduction* , De Gruyter, 2019
5. Timothy Sauer, *Numerical Analysis*, Third Edition, Perason Education, 2018

E- resources

1. https://www.sagemath.org/help.html

Course Outcomes

CO No.	Upon completion of the course the graduate will be able to	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L) Tutorial (T)	Practical (P)
CO 1	Find the solution of algebraic and transcendental equation using numerical methods	PO 2, PSO1, 2,3	U, Ap	F,C	L	
CO 2	Apply numerical techniques to interpolate data points effectively	PO1, PSO1, 2,3	U, Ap	F,C	L	
CO 3	Apply numerical techniques for differentiation and integration	PO2, PSO1, 2,3	U, Ap	F,C	L	
CO 4	Find the solution of ordinary differential equations using numerical methods	PO2, PSO1, 2,3	U, Ap	F,C	L	

(R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create)
(F-Factual, C-Conceptual, P-Procedural, M-Metacognitive)

Mapping of CO with PSOs and POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2					3						
CO2	3	3	2				3							
CO3	3	3	2					3						
CO4	3	3	2					3						

(- -Nill, 1-Slightly/Low, 2-Moderate/Medium, 3-Substantial/High)

Assessment Rubrics

- Quiz/Assignment/Discussion/Seminar
- Midterm Exam

- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics

	Internal Examination	Assignment	Project Evaluation	End Semester Exam
CO1	✓	✓		
CO2	✓	✓		✓
CO3	✓	✓		✓
CO4	✓	✓		✓

University of Kerala

Discipline	Mathematics				
Course Code	UK3DSCMAT207				
Course Title	Applications of Integration, Special Functions and Fourier Series				
Type of Course	DSC				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical	Total Hours per week
	4	4	-	-	4
Pre-requisites	1. Integration 2. Differentiation				
Course Summary	This course provides applications of integration, beta and gamma functions and Fourier series				

Detailed Syllabus

Module	Unit	Contents	Hrs
I	**Application of Integration**		**18**
	1	Area Between Two Curves, Volumes by Slicing; Disks and Washers *(Chapter 5: Sections 5.1, 5.2 of Text [1])*	
	2	Volumes by Cylindrical Shells *(Chapter 5: Section 5.3 of Text 1)*	
	3	Length of a Plane Curve, Area of revolution *(Chapter 5: Sections 5.4, 5.5 of Text [1])*	
II	**Work, Moments and Centroids**		**12**
	4	Work *(Chapter 5: Section 5.6 of Text [1])*	
	5	Moments, Centers of Gravity, and Centroids *(Chapter 5: Section 5.7 of Text [1])*	
III	**The Beta and Gammma Functions**		**10**
	6	The Factorial Function, Definition of the Gamma Function; Recursion Relation *(Chapter 11: Sections 11.1, 11.2, 11.3 of Text [3])*	

Module	Unit	Contents	Hrs
	7	The Gamma Function of Negative Numbers, Formulas Involving Gamma Functions *(Chapter 11: Sections 11.4, 11.5 of Text [3])*	
	8	Beta Functions, Beta Functions in Terms of Gamma Functions *(Chapter 11: Sections 11.6, 11.7 of Text [3])*	
IV	**Fourier Series**		**20**
	9	Basic Examples, Euler Formulas (proof is not required), Convergence and Sum of a Fourier Series, *(Chapter 11: Section 11.1 of Text [2])*	
	10	Arbitrary Period, Even and Odd Functions, Half-Range Expansions: From Period 2π to any Period $p = 2l$ Simplifications: Even and Odd Functions, Half Range Expansions*(Chapter 11: Section 11.2 of Text [2])*	

Textbooks

1. H Anton, I Bivens, S Davis, *Calculus*, 10th Edition, John Wiley & Sons, 2012.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, 10th Edition, Wiley Publishers, 2018.
3. Mary L Boas, *Mathematical Methods in Physical Science*, 3rd Edition, 2006.

References

1. Joel Hass, Maurice D. Weir, *Thomas' Calculus Early Transcendentals*, 12th Edition, Addison-Weseley Publishing Company, 2004.
2. Peter V. O. Neil, *Advanced Engineering Mathematics*, Thompson Publications, 2007.
3. J Stewart, *Calculus with Early Transcendental Functions*, 7th Edition, Cengage India Private Limited, 2008
4. G B Thomas, R L Finney, *Calculus*, 9th Edition, Addison-Weseley Publishing Company, 2004.

E-resourses

1. https://www.geogebra.org/m/AzVR5uU7

Course Outcomes

CO No.	Upon completion of the course the graduate will be able to	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L) Tutorial (T)	Practical (P)
CO 1	Demonstrate various applications of integration	PSO 1, PO1, 6	U	F, C	L	
CO 2	Compute tangent lines to polar curves, arc length and area	PSO 2, 4, PO 6	Ap, An	P	L	
CO 3	Understand the concepts of factorial function, gamma function beta function and Fourier series	PSO 1, PO1, 6	U	F, C	L	
CO 4	Able to find Fourier series of different functions	PSO 3, 4, PO1, 2, 6	Ap, An	P	L	

(R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create)
(F-Factual, C-Conceptual, P-Procedural, M-Metacognitive)

Mapping of CO with PSOs and POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	-	-	-	-	-	1	-	-	-	-	2	-	-
CO2	-	2	-	3	-	-	-	-	-	-	-	2	-	-
CO3	3	-	-	-	-	-	2	-	-	-	-	1	-	-
CO4	-	-	3	3	-	-	2	1	-	-	-	2	-	-

(- -Nill, 1-Slightly/Low, 2-Moderate/Medium, 3-Substantial/High)

Assessment Rubrics

- Quiz/Assignment/Discussion/Seminar

- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics

	Internal Examination	Assignment	Project Evaluation	End Semester Exam
CO1	✓			✓
CO2	✓	✓		✓
CO3	✓			✓
CO4	✓	✓		✓

University of Kerala

Discipline	Mathematics				
Course Code	UK3DSEMAT200				
Course Title	Programming with LaTeX and Python				
Type of Course	DSE				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours per week
	4	3	0	2	5
Pre-requisites	1. Basic computer knowledge				
Course Summary	This course provides basic skill in LaTeX and python programming				

Detailed Syllabus

Module	Unit	Contents	Hrs
I		**Basics of Type setting using LaTeX**	**20**
	1	Simple typesetting, Fonts, Type size Typesetting Mathematics,	
	2	Single Equations (equation, equation*, split) Group of Equations (gather, gather*, align, align*, cases) Matrices and Determinants (matrix, pmatrix, bmatrix, vmatrix) Putting one over another (frac, dfrac, int, lim, sum, prod). Chapter 1: Sections 8.1, 8.3.1, 8.3.2, 8.4.2 and 8.4.4 of Text [3].	
	3	Basics of typesetting Theorems and amsthm package (Sections 9.1 to 9.2.1 of Text [1]). Do Exercise questions 4, 5, 6 and 7 of Chapter 9 of Text [2].	
II		**Tables, Figures and Presentation**	**20**
	4	Typesetting basic tables. Merge cells using $\backslash multicolumn$ (Chapter 7: Section 7.2 of Text [3], except the portion using $\backslash renewcommand$)	

Module	Unit	Contents	Hrs
	5	Inserting pictures using Graphicx package (Chapter 12: Section 12.1.1 to 12.1.3 of Text [1], except the portion on pstricks)	
	6	Creating Floating Figures (Chapter 11: Section 11.1.1 of Text [3])	
	7	Beamer Presentation, Thinking in terms of frames. Set up a Beamer document, Enhance a Beamer presentation. (Chapter 11: Sections 11.1 to 11.4 of Text [2], except the portion using pstricks)	
III	**The Essentials of Python**		**20**
	8	Absolute Basics - Lists, tuples and sets - Strings - Control Flow - Functions - Reading and writing files (Chapter 4, 5 (Sections 5.6, 5.8 need not be discussed), 6 (Section 6.5 to 6.9 need not be discussed),8, 9.1 to 9.5 (Section 9.3 need not be discussed) and 13.1 to 13.4 of Text [4])	
IV	**Working with numbers**		**15**
	9	Basic Mathematical Operations - Working with different kinds of numbers - Getting user input - Math Programmes - The Programming challenges mentioned in Chapter 1 of Text [1]	

Textbooks

1. Amit Saha, Doing Math with Python, No Starch Press, 2015.
2. Donald Binder and Martin Erickson, A student's guide to the study, practice and tools of modern mathematics, CRC Press, 2010.
3. E. Krishnan, The LaTeX Tutorial: A Primer, by The Tutorial Team, Indian TeX Users Group, Sayahna Foundation, http://www.sayahna.org, 2020.
4. Naomi Ceder, The Quick Python Book, Manning, 2018.

References

1. E Balagurusamy, Introduction to computing and problem solving using Python, Mc Graw Hill Education, 2017.
2. Dilip Datta, LaTeXin 24 Hours, A Practical Guide for Scientific Writing, Springer, 2017.
3. Hubert Partl, Irene Hyna and Elisabeth Schlegl, The Not So Short Introduction to LaTeX2ϵ, Tobias Oetiker, Version 6.4, 09 March 2021.
4. Kenneth A Lambert, Fundamentals of Python, First Programs, 2nd Edition, Cengage, 2019.

E- resources

1. https: //www.overleaf.com/learn/latex/Learn_LaTeX_in_30_minutes
2. https://www.python.org/

Course Outcomes

CO No.	Upon completion of the course the graduate will be able to	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L) Tutorial (T)	Practical (P)
CO 1	Understand the basics of LaTeX and python	PSO1, PO7	U	F,C	L	P
CO 2	Create documents and programs	PSO5, PO3	Ap,C	P	L	P
CO 3	Create good quality presentations	PSO5, PO3, 4	Ap, C	P	L	P
CO 4	Apply to the subject and get more insight to the mathematical concepts	PSO2	Ap	M	L	P

(R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create)
(F-Factual, C-Conceptual, P-Procedural, M-Metacognitive)

Mapping of CO with PSOs and POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1												3	
CO2					3				2					
CO3			-	-	3				3	3				
CO4		3												

(- -Nill, 1-Slightly/Low, 2-Moderate/Medium, 3-Substantial/High)

Assessment Rubrics

- Quiz/Assignment/Discussion/Seminar

- Midterm Exam
- Programming Assignments
- Final Exam (Theory and Practical)

Mapping of COs to Assessment Rubrics

	Internal Examination	Assignment	Project Evaluation	End Semester Exam
CO1	✓	✓		✓
CO2	✓	✓		✓
CO3	✓	✓		
CO4		✓		