



## 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	<ol style="list-style-type: none"> <li>1. Definition and preliminary results of matrices.</li> <li>2. Understanding on methods to solve a system of simultaneous of equations.</li> <li>3. Basic knowledge of various number system.</li> </ol>				
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
<b>I</b>		<b>Sets -Relations - Functions</b>	<b>12</b>
	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
<b>II</b>	<b>Matrices and Determinants</b>		<b>12</b>
	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])	
<b>III</b>	<b>Solution of system of equation</b>		<b>10</b>
	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])	
<b>IV</b>	<b>Number Theory</b>		<b>26</b>
	4	Mathematical induction, The division algorithm, Pigeonhole principle, divisibility relations, inclusion-exclusion principle ( <i>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.</i> )	
	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. ( <i>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.</i> )	
	6	Congruences, Modular exponentiation. <i>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.</i>	

## 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)