Course Outcome(s)	Describe network security services and mechanisms. Symmetrical and Asymmetrical cryptography. Data integrity, Authentication, Digital Signatures. Various network security applications, IPSec, Firewall, IDS, Web security, Email security, and Malicious software etc.

Syllabus:
Divisibility and Euclidean algorithm, congruence, applications to

factoring. Finite fields, Legendre symbol and quadratic reciprocity,

Jacobi symbol.

Cryptosystems, diagraph transformations and enciphering matrices, RSA Cryptosystem.

Primality and Factoring, Pseudo primes, Carmichael number, Primality tests, Strong Pseudo primes, Monte Carlo method, Fermat factorization, Factor base, Implication for RSA, Continued fraction method.

Elliptic curves - basic facts, Elliptic curves over R;C;Q, finite fields. Hasse's theorem (statement), Weil's conjectures (statement), Elliptic curve cryptosystems, Elliptic curve factorization - Lenstra's method.

Text books:
1. Neal Koblitz, A Course in Number Theory and Cryptography, Graduate Texts in Mathematics, Springer, 1987.
2. Jeffrey Ho_stein, Jill Pipher and J.H. Silverman, An Introduction to Mathematical Cryptography, Springer, 1st Edition, 2010.

References:
1. Rosen M. and Ireland K., A Classical Introduction to Number Theory, Graduate Texts in Mathematics, Springer, 1982.
2. David Bressoud, Factorization and Primality Testing, Undergraduate Texts in Mathematics, Springer, 1989.

Code:MAT5005: Differential Geometry Prerequisites Multivariable calculus, Basics of linear algebra, Topology	L	T	P	Credit
	3	2	0	4

Course Category	Elective
Course Type	Theory
Course Objective	The aim of the course is to provide knowledge of the geometry of curves and surfaces. The course introduces the fundamentals of differential geometry primarily by focusing on the theory of curves and surfaces in three space. The theory of curves studies global properties of curves. The theory of surfaces introduces the fundamental quadratic forms of a surface, intrinsic and extrinsic geometry of surfaces, and the Gauss-Bonnet theorem.
Course Outcome(s)	After completing this course, students should be able to: Understand the basis of notions of the local theory of space curves, and the local theory of surfaces; understand the fundamental theorem for plane curves and of space curves; recognize whether a given curve (resp. surface) is regular or not; compute the curvature and torsion of a regular curve; understand the idea of orientable /non-orientable surfaces; understand the normal curvature of a surface, its connection with the first and second fundamental form and Euler's theorem ; able to find all geodesic curves of the surface; evaluate the principal curvatures, the mean curvature and Gauss curvature of a given surface; able to find the fundamental forms of surfaces.

Syllabus:

Curves in Euclidean space: Curves in R3, Tangent vectors, Differential derivations, Principal normal and binomial vectors, Curvature and torsion, Formulae of Frenet.

Surfaces in R^3: Surfaces, Charts, Smooth functions, Tangent space, Vector fields, Differential forms, Regular Surfaces, The second fundamental form, Geodesies, Weingarten map, Curvatures of surfaces, Orientation of surfaces.

Differentiable manifolds, differentiable maps and tangent spaces, regular values and Sards theorem, vector fields, submersions and immersions.

Text books:

1. Gray A., Modern Differential Geometry of Curves and Surfaces, CRC Press, 1993. 2. Victor Guillemin and Alan Pollack, Differential Topology, Orient Blackswan, 2017.

References:

1. Christian Bar, Elementary Differential Geometry, Cambridge University Press, 2010. 2. Sebastin Montiel and Antonio Ros, Curves and Surfaces, American Mathematical Society,

2009.
3. do Carmo M. P., Differential Geometry of curves and surfaces, Prentice-Hall,
1976. 4. O'Neill B., Elementary Differential Geometry, Academic press, 1996.
5. Kumaresan S., A course in differential geometry and Lie groups, Texts and Readings in Mathematics, Hindustan Book Agency, New Delhi, 2002.
6. Andrew H. Wallace, Differential Topology: First Steps, Dover, 2006.

Code:MAT5006: Dynamical Systems Prerequisites: Real Analysis, Ordinary Differential Equations	L	T	P	Credit
	3	2	0	4

Course Category	Elective
Course Type	Theory
Course Objective	To introduce the concept of linear and nonlinear dynamical systems 2. To learn the basic ideas and methods associated with dynamical systems, like, evolution of system, fixed points, periodic points, attractors, bifurcation process and stability of the systems 3. To understand the nonlinearity in nature and study of the nonlinear models in engineering and its dynamics
Course Outcome(s)	Learn the general theory of linear ordinary differential equations, including matrix exponential solutions for constant coefficient equations; Learn the basic local existence and uniqueness theory for ordinary differential equations; Learn basic ideas in differential dynamical systems, including stability of orbits, omega limit sets, Lyapunov functions, and invariant sets; Understand the statements of the stable and center manifold theorems; Learn some basic ideas in chaotic dynamics and bifurcation of vector fields