SEMESTER S6

FUNDAMENTALS OF CRYPTOGRAPHY

(Common to CS/CM/CR/AM/AD)

Course Code	PECST637	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. To develop a foundational understanding of mathematical concepts in cryptography,
2. To gain comprehensive knowledge of cryptographic methods.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Introduction to Number Theory - Divisibility and The Division Algorithm, The Euclidean Algorithm, Modular Arithmetic : The Modulus, Properties of Congruences, Modular Arithmetic Operations, The Extended Euclidean Algorithm, Primitive Roots, Existence of Primitive Roots for Primes, Fermat's Theorem, Euler's Totient Function, Euler's Theorem, Testing for Primality : Miller–Rabin Algorithm, A Deterministic Primality Algorithm, Discrete Logarithms, Chinese Remainder Theorem.	10
2	Security Attacks; Security Services; Security Mechanisms; Fundamental Security Design Principles; Cryptography - Symmetric Cipher Model, Substitution Techniques, Transposition techniques; Traditional Block Cipher Structure.	8
3	The Data Encryption Standard - DES Encryption & Decryption, Avalanche Effect, Strength of DES; Advanced Encryption Standard - AES Structure; Stream Ciphers; RC4; Principles of Public-Key Cryptosystems - Public-Key Cryptosystems, Applications for Public-Key Cryptosystems,	10

	Requirements for Public-Key Cryptography, The RSA Algorithm, Description of the Algorithm; Diffie–Hellman Key Exchange..	
4	Cryptographic Hash Functions - Applications of Cryptographic Hash Functions, Secure Hash Algorithm (SHA), SHA-3; MAC; MD5; Digital Signatures.; Key Management and Distribution - Symmetric Key Distribution; X.509 certificates; PKI.	**8**

Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
● 2 Questions from each module. ● Total of 8 Questions, each carrying 3 marks **(8x3 =24 marks)**	● Each question carries 9 marks. ● Two questions will be given from each module, out of which 1 question should be answered. ● Each question can have a maximum of 3 subdivisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Apply number theory concepts in data security	**K3**
CO2	Explain the cryptographic concepts and apply the classical encryption methods for data confidentiality	**K3**
CO3	Describe the symmetric and asymmetric ciphers used for information security	**K2**
CO4	Explain the algorithms used for authentication and integrity	**K2**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2								2
CO2	3	3	3	2								2
CO3	3	3	3									2
CO4	3	3	3									2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Cryptography & Network Security: Principles and practice	William Stallings	Pearson	7/e, 2017

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Cryptography & Network Security	Behrouz A. Forouzan	McGraw Hill	3/E, 2007
2	Security in Computing	Charles P. Pfleeger, Shari L. Pfleeger, Jonathan Margulies	Prentice Hall	5/e, 2015
3	A Classical Introduction to Cryptography: Applications for Communications Security	S. Vaudenay	Springer	1/e, 2009
4	Introduction to Cryptography: Principles and Applications	H. Delfs, H. Knebl	Springer-Verlag	1/E, 2002

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://archive.nptel.ac.in/courses/111/101/111101137/
2	https://nptel/courses/video/106105031/L17.html
3	https://onlinecourses.nptel.ac.in/noc22_cs90/preview