# Introduction and Course Plan

Dr. Odelu Vanga

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Indian Institute of Information Technology Sri City

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August 6, 2024

# Course Details

| | | |
|---|---|---|
| Course | : | Institute Elective |
| Title | : | Cryptography |
| Instructor | : | Dr. Odelu Vanga |

Textbook:

- **Cryptography and Network Security**, Behrouz A Forouzan, Debdeep Mukhopadhyay, McGraw-Hill Education, 2011.
- **Cryptography: Theory and Practice** by Douglas Stinson, 3/e, 2006.

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References:

- "Cryptography and Network Security: Principles and Practice", William Stallings, 6th Edition, Pearson Education, 2014.
- "A course in number theory and cryptography", Neal Koblitz, Second Edition, Springer.
- "Handbook of Applied Cryptography", Alfred J. Menezes, Paul C. van Oorschot, and Scott A. Vanstone, CRC Press.
- "Blockchain Technology Overview", D. Yaga, P. Mell, N. Roby, and K. Scarfone, NISTIR 8202.
- Classroom Lecture Notes

# Evaluation Scheme - Tentative

| Component | Duration | Weightage(%) | Date & Time | Nature of Component |
|---|---|---|---|---|
| Term-I Exam | – | 15% | – | Closed Book |
| Term-II Exam | – | 15% | – | Closed Book |
| End-Sem Exam | – | 30% | – | Closed Book |
| Scheduled Quizzes | – | 20% | – | Closed Book |
| Term Project | – | 20% | – | Open Book |

Note:

- Scheduled Quizzes: Best two of Three

# Evaluation Scheme

## Term Project Details

- Submit one page report, includes title and tentative plan of work on/before Term-I.

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- Final project report should submit with experimental results before on/before End Exams.

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- Final project report should submit with experimental results before on/before End Exams.
- I will announce project viva dates based on available time slots.

# Make-ups and Notices

## Make-up policy

- No Make-ups for Term Project.
- Makeup for other components is granted on prior permissions as per institute policy.

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## Consultation and Notices

- Doubt clarification hours - Contact in Google classroom
- Notices/announcements regarding the course will be displayed in Google Classroom

# Course Syllabus

# Overview of Course Structure

M1: **Number Theory Basics**
Modular arithmetic, Primes, Euclidean Algorithm, Chinese Remainder Theorem.

M2: **Shannon's Theory**
Perfect Secrecy, Entropy, Security analysis of Classical ciphers.

M3: **Symmetric Key Cryptography**
DES, Finite Fields, AES, Security Analysis.

M4: **Public Key Cryptography**
RSA, ElGamal, Elliptic Curve Cryptography.

M5: **Digital Signatures**
Hash functions, Digital Signature Algorithm, ElGamal Digital Signature.

M6: **Applications**
Key Distribution, Diffie-Hellman Kay Exchange, Key Management in Distributed Systems.

# History

# Historical perspective

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- **“Secret writing”**
  - 1900 B.C. – non-standard methods
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  - 1900 B.C. – non-standard methods
  - Julius Caesar
- **Modern theory starts around the U.S. Civil War (1861-1865)**
  - Playfair
- **Extensive use of code books**
  - Telegrams and commercial codes
  - Vernam cipher

World War-I (lasted in 1914 - 1918)

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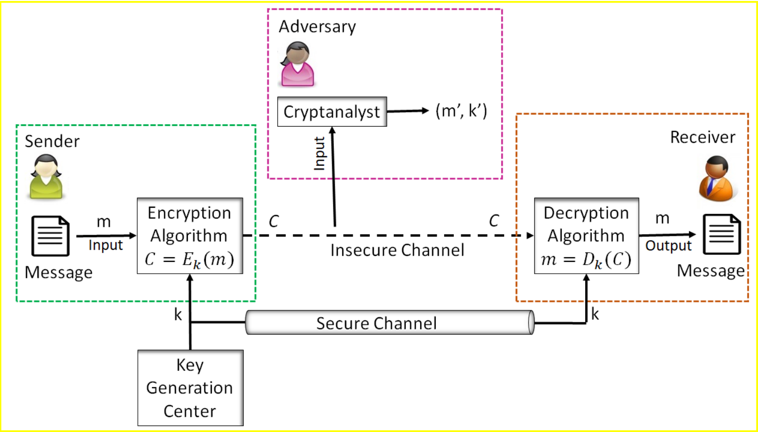
Hash Functions

  - First design of cryptographic hash function proposed in 1970s
  - More proposals emerged in the 1980s

# Introduction to cryptography

# Conventional Message Communication



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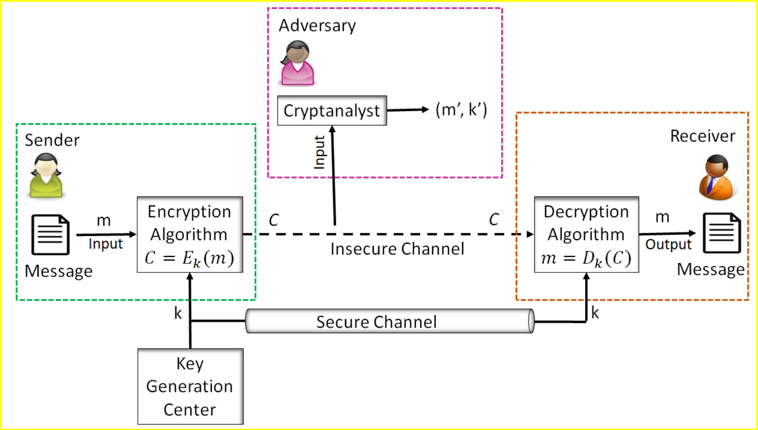
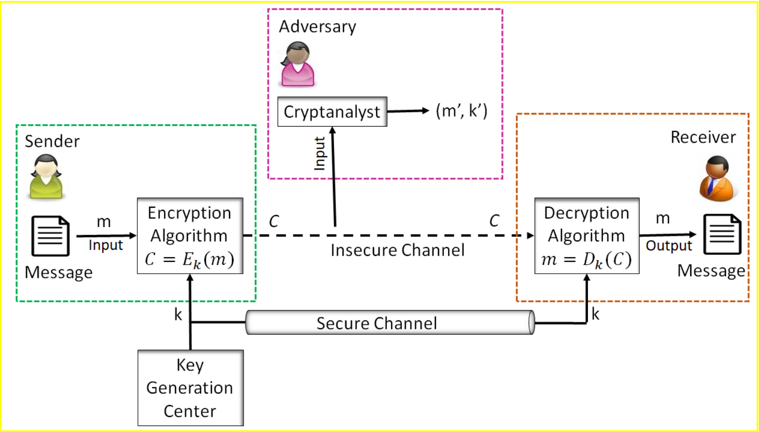



## Primary Goals:

- **Confidentiality**

# Conventional Message Communication

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- **Integrity**

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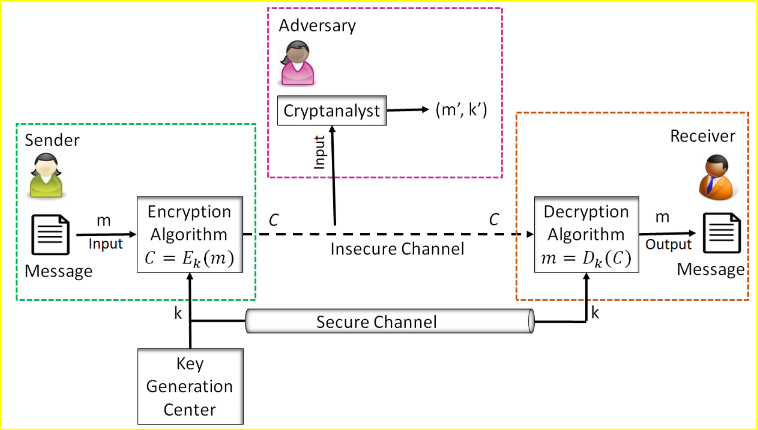


**Primary Goals:**

- **Confidentiality**
- **Integrity**
- **Authentication**

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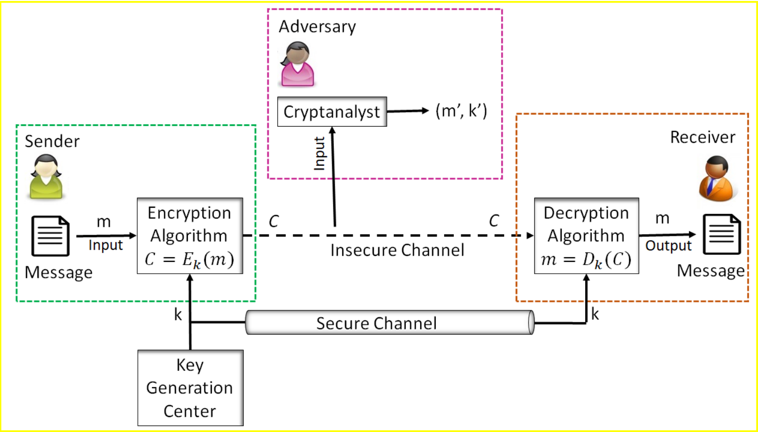


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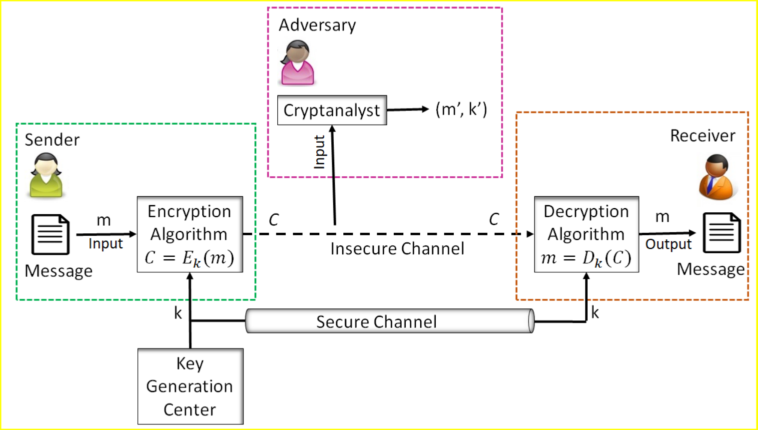


**Primary Goals:**

- **Confidentiality**
- **Integrity**
- **Authentication**
- **Non-repudiation**

### Unconditional security

- Given unlimited computational power, it is not possible to break the cipher

# Security Notions

## Unconditional security

- Given unlimited computational power, it is not possible to break the cipher

## Computational security

- Given limited computing resources, breaking cipher is not possible (e.g., time needed for calculations is greater than age of universe)

Thank You