# Lecture 5

#### Review

- Strong Encryption Algorithm
  - Confusion
  - Diffusion

Symmetric Block Encryption

## Block cipher

- the most commonly used symmetric encryption algorithms
- input: fixed-size blocks (Typically 64, 128 bit blocks), output: equal size blocks
- provide secrecy and/or authentication services
- Data Encryption Standard (DES), triple DES (3DES), and the Advanced Encryption Standard (AES)s
- Usually employ Feistel structure



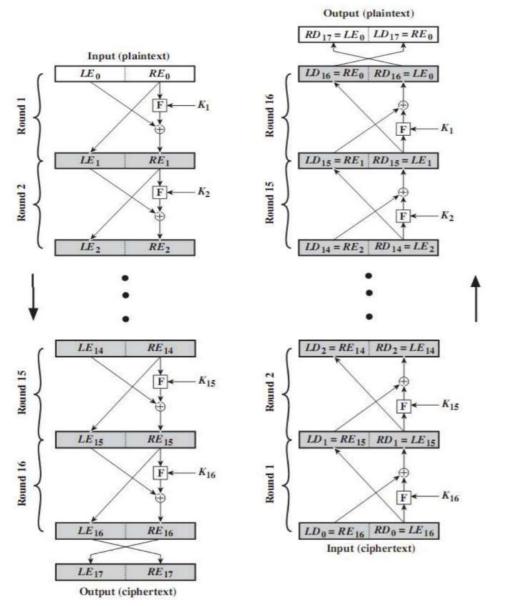
#### Feistel Cipher Structure

- most symmetric block ciphers are based on a Feistel Cipher Structure
- based on the two primitive cryptographic operations
  - substitution (S-box)
  - permutation (P-box)
- provide confusion and diffusion of message

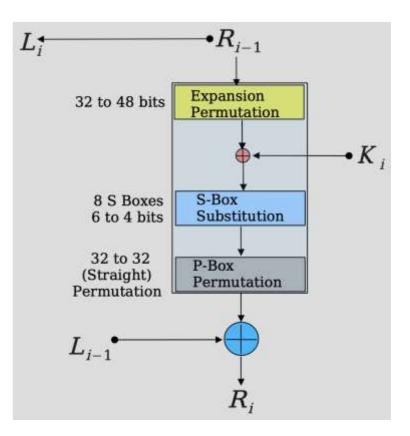
### Feistel Cipher Structure

- Horst Feistel devised the feistel cipher in the 1973
  - based on concept of invertible product cipher
- partitions input block into two halves
  - process through multiple rounds which
    - perform a substitution on left data half
    - based on round function of right half & subkey
    - then have permutation swapping halves
- implements Shannon's substitution-permutation network concept

# Feistel Encryption and Decryption



 $Encryption \\ L_{i} = R_{i-1} \\ R_{i} = L_{i-1} \oplus F(R_{i-1}, K_{i})$ 



# DES encryption

- 64 bits plaintext
- 56 bits effective key length

