

V.J.T.I

T.Y.B.Tech (ExTc)

Sub: Digital communication system

Sem-V

Course Instructor

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Theory Evaluation Scheme

- Subject Credit - 3 lect. 3/week
- Theory ESE- 60 Marks
- TA - 20 Marks
- Mid Sem. Test - 20 marks
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- Total = 100 Marks
- TA-(Assignment+ Tutorial + group presentation)(tentative)

DCS Lab

- DCS Lab 2 p/week
- Credit – 1
- TA- 60
- ESE -40

Tentative schedule Odd Sem. 2020

- Term starts- 3rd August 2020
- Mid Sem. Test 21st sep – 25th sep 2020 (on-line/off line)
- Term end - 20th Nov 2020
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- End Sem. Exam 23rd Nov - 11th Dec 2020

Syllabus

- Modern Digital communication system (wired or wireless) it includes-
- Information Theory
- Digital Modulation and Demodulation Techniques
- Base Band Transmission and reception

Syllabus

- Pass Band transmission and reception
- Error correcting codes/channel coding
- (Encoding and decoding)
- Error probability calculation
- Spread spectrum techniques

References

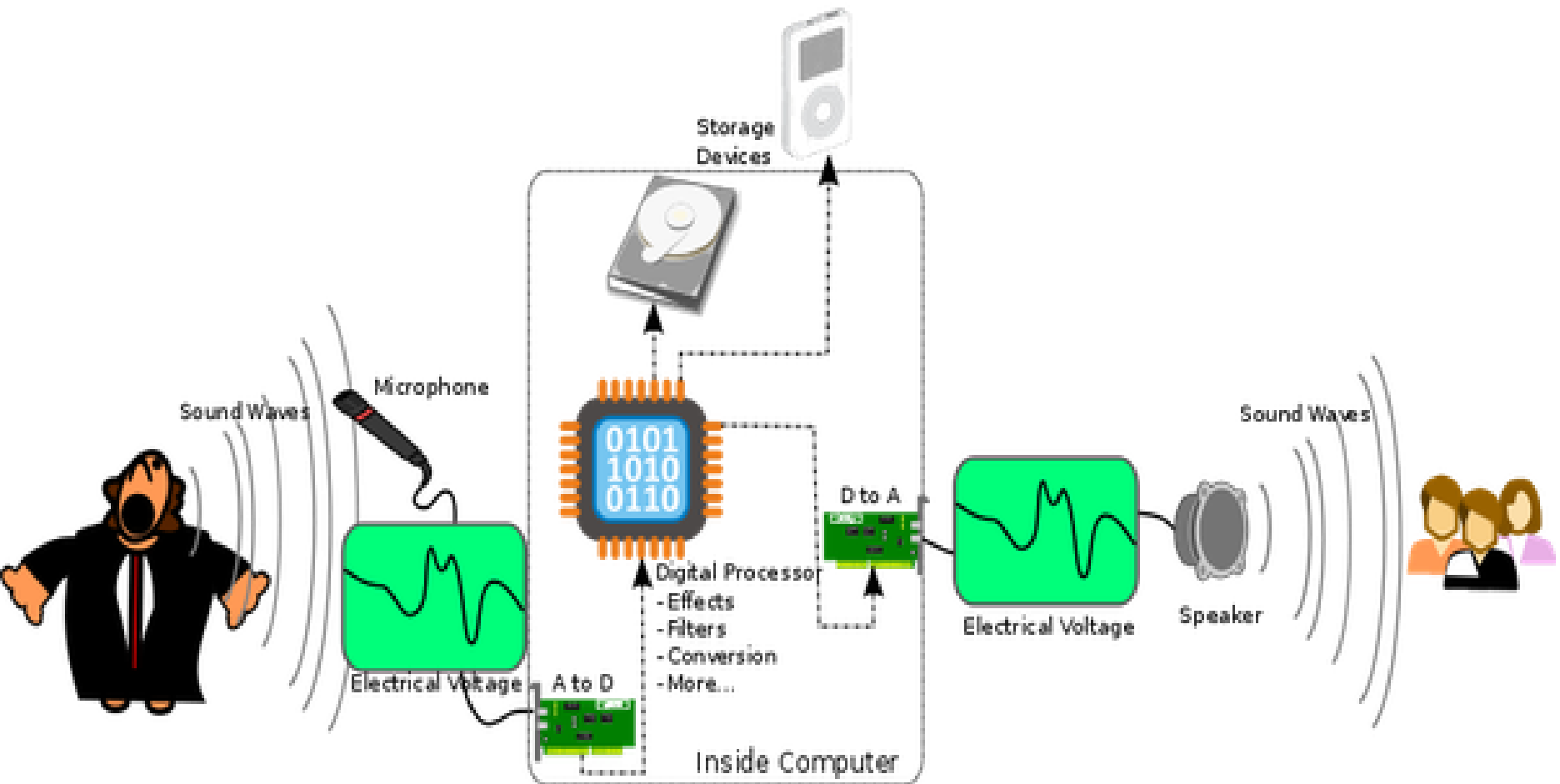
1. Principles of Communication System by Herbert Taub and Donald Schilling, 2nd Edition, Mc Graw-Hill publishing
2. Digital Communications by John Proakis, 4th edition
3. Communication Systems by Simon Haykin, 4th edition, JOHN WILEY & Sons INC.
4. DIGITAL COMMUNICATIONS and Fundamentals and Applications by BERNARD SKLAR, 2nd Edition, Prentice Hall P T R ,Upper Saddle River, New Jersey 07458
5. Analog and Digital communication by Sam Shanmugam

References...

6. Error Control Coding: Fundamentals and Applications by SHU LIN and DANIEL J COSTELLO, Jr., Pearson Prentice Hall, 1983 and 2004, Series in computer applications in Electrical Engineering
7. Error Control Systems for Digital Communication and Storage, Stephen B. Wicker
8. Principles of Digital Communication by Robert G. Gallager, May 4, 2007
9. Fundamentals of Error Correcting Codes by W. Cary Huffman and Vera Pless, Cambridge University Press
10. Theory and practice of Error Correcting Codes by R.E. Blahut

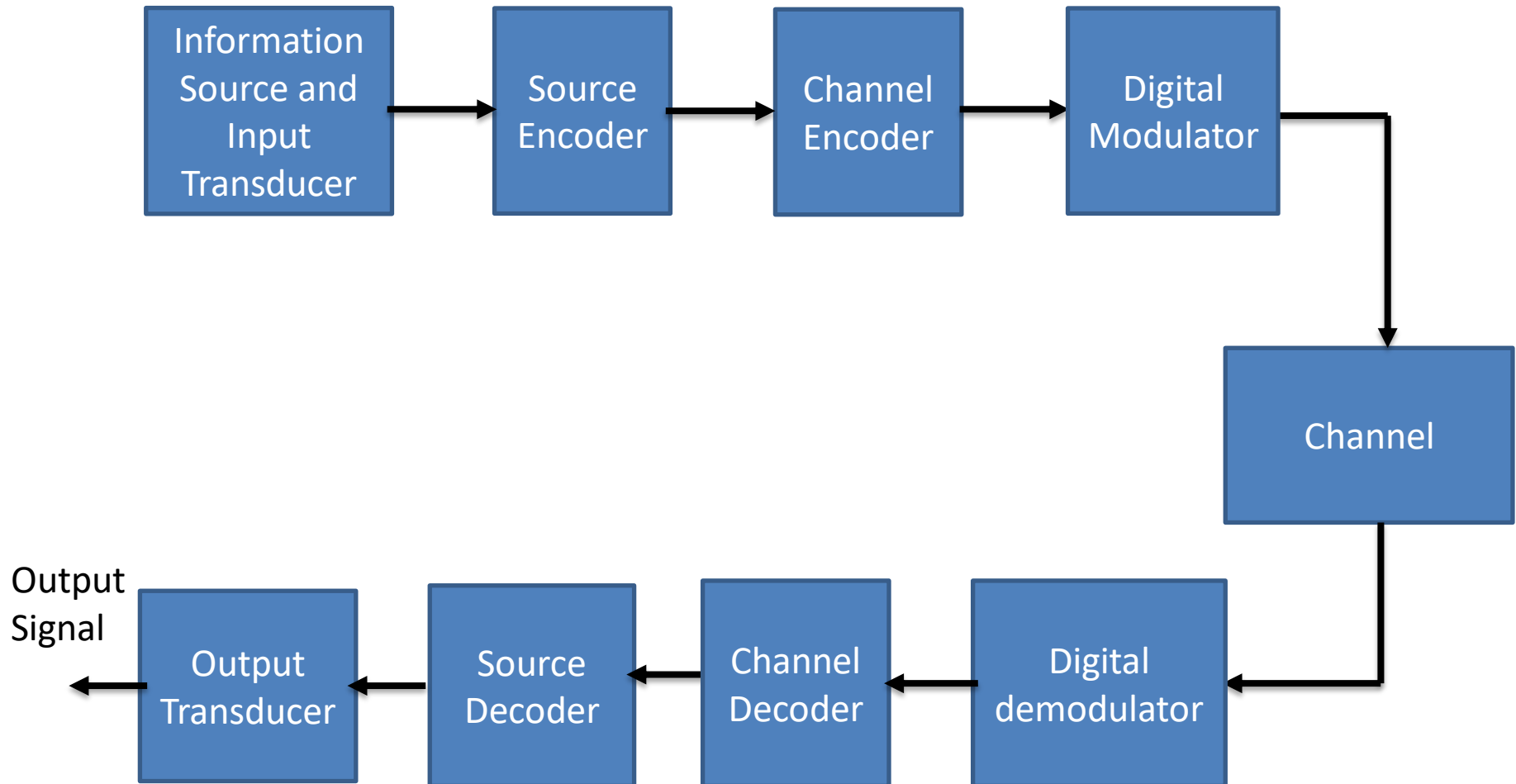
Basic Digital Communication System

- An analog source output may be converted into a digital form and the message can be transmitted via digital modulation and demodulated as a digital signal at the receiver



Modern Digital Communication System

- Fig1.1 Block diagram of a digital communication system



Digital communication System

- What is input transducers?
- What is Source encoder?
- What is source decoder?
- What is channel coding
- What is channel encoder ?
- What is channel decoder?
- What is need of channel coding?

Digital communication System

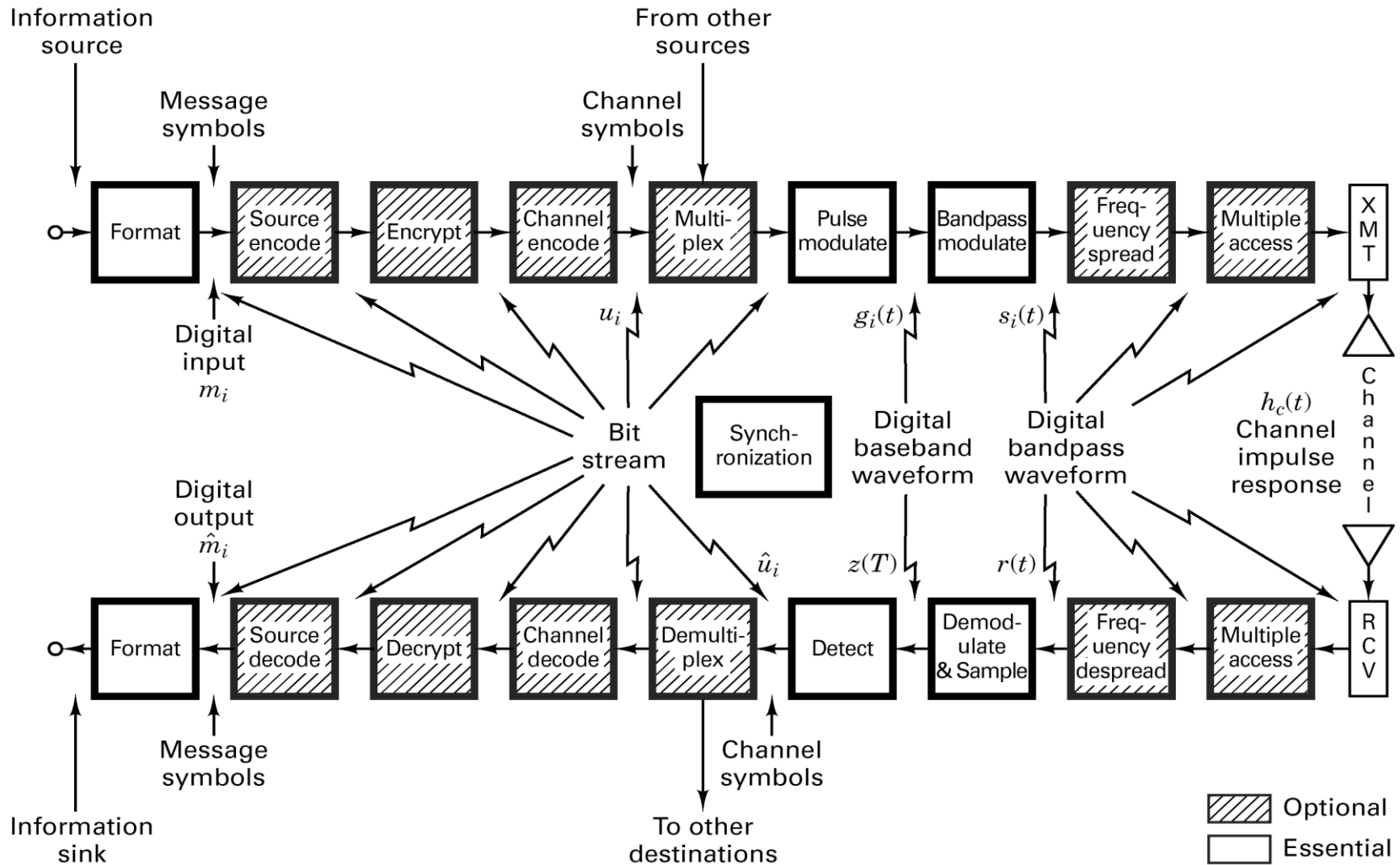


Figure 1.2 Block diagram of a typical digital communication system.

Analog modulation techniques

- What is Modulation?
- Why we need modulation?
- What are types of analog modulation?

Analog modulation Tech...

- Modulation is the process of superimposing a low frequency signal(modulating signal)(i.e. information or messages like audio, video or text) on high frequency signal(carrier signal) is called modulation
- For large coverage, to reduce length of Antena and avoid mixing signal with other channel
- Length of Antena is required is $\lambda/4$
- Amplitude, frequency and phase are basic analog modulation techniques

Digital modulation Techniques

- What is digital modulation?
- What are digital modulation techniques?
- Why digital modulation techniques?

Digital modulation/demodulation Techniques

- Information or message in the form digital is modulated by analog carrier signal and transmitted through channel
- Basic digital modulation and demodulation techniques includes
- BASK(Binary shift keying)
- BPSK(Binary phase shift keying)
- BFSK(Binary Frequency Shift keying)
- M-ary digital modulation techniques

Digital modulation/demodulation Techniques

- Digital modulation techniques are studied with respect to following parameters
- Bandwidth
- Power spectral density graph
- Constellation diagram
- Euclidean distance
- Probability of error

Digital modulation techniques

- Advantage of digital circuits are-
- The effect of distortion, noise, and interference is much less in **digital** signals as they are less affected.
- **Digital** circuits are easy to design and cheaper than **analog** circuits.
- The hardware implementation in **digital** circuits, is more flexible than **analog**.

Digital modulation/Demodulation Techniques

- Digital communication gives facilities like video conferencing
- It is easy to mix signals and data using digital techniques.
- **What are channel coding/error correcting codes techniques?**

Error correcting codes

- Error correcting codes are broadly classified as -
- Linear block codes and convolution codes
- ECC are represented by (n,k)
- Cyclic code (n, k)
- n is code length and k is message length
- $(k \text{ by } n)$ generator matrix is required to generate the code (encoding $C=m.G$)
- $(n-k \text{ by } n)$ parity check matrix is required to decode the message (channel decoder)

Error correcting codes

- For (n,k) Cyclic codes a generator polynomial of degree $(n-k)$ is required to construct a code(Encoding)
- The generator polynomial is a factor of $X^{n-1} + 1$ over $GF(2)=\{0,1\}$
- Codes can be systematic or non systematic

Error correcting codes

- Some of linear Error correcting codes are
- (n, k) Hamming code
- R-S code
- BCH code
- Turbo code
- LDPC code
- Polar code
- Cyclic code