BITS-Pilani, Hyderabad Campus
First Semester 2019-2020

Course Handout

Date:

19/07/2019

In addition to Part I (General Handout for all courses appended to the Timetable) this portion gives further specific details regarding the course.

Course Number : EEE G612 3 2 5
Course Title : Coding Theory & Practice
Course Coordinator : Dr. PRASHANT K WALI.

1. Course Description

Codes for data-compression: instantaneous codes; Kraft inequality; Mcmillan theorem; Huffman codes; codes for error-detection and correction; binary symmetric channel; channel capacity, Shannon's fundamental theorem; linear codes; Macwilliam's identity; Reed-muller codes; cyclic codes; BCH codes; codes for secrecy and security; private-key cryptosystems; affine codes; twisted codes; one-time-pads; public-key cryptosystems based on large primes and discrete logarithms.

2. Scope and Objective of the Course:

The course covers source coding, channel coding & encryption. The former deals with error correction in noisy channel, and the latter deals with secrecy of communication. Channel coding, which constitutes the major portion of the course, will introduce a number of important classes of error-detecting and error-correcting codes and their decoding. Finally the course will give an introduction to encryption & decryption of data for secret communications.

3. Text Books:

Information theory, Coding and Cryptography, Ranjan Bose, Tata McGraw Hill, 2nd ed, 2003.

4. Reference Books:

1. Error Control Coding-Fundamentals and Applications, Shu Lin and Daniel Costello, Prentice Hall
2. Element of Information Theory, Thomas M Cover, John Wiley & Sons, 2004

5. Course Plan / Schedule:

Sl	Learning objectives	Topics to be covered	Chapte	No.

. #			r No.	of lectures
1.	Introduction	Introduction to the course & Coding		1
2.	To introduce the concept of Uncertainty, Entropy	Data compression, Entropy	TB:Ch. 1 Ref:Ch. 2	3
3.	To introduce the concepts of coding and decoding	Unique and instantaneous codes, Kraft's inequality	TB:Ch. 1 Ref:Ch. 5	3
4.	To introduce Universal Source coding	Huffman, Shannon-Fano-Elias, Arithmetic, L-z, Run Length Coding	TB:Ch.1	4
5.	To introduce optimal codes	Rate distortion theorem, Optimal code length	TB:Ch. 1 Ref:Ch. 13	2
6.	To introduce the concept of channel capacity and coding	Channel models, channel capacity, Shannon limit	TB:Ch. 2	2
7.	To introduce the concept of error correcting codes	Linear block codes, generator & parity check matrix	TB:Ch. 3	4
8.	To introduce the concept of syndrome and decoding through syndrome	Syndrome decoding of linear codes	TB:Ch. 3	2
9.	To study cyclic codes, their encoding & decoding	Cyclic codes	TB:Ch. 4	3
10.	To study certain well known linear codes	Well-known block codes ; Golay code, CRC codes	TB:Ch. 4	3
11.	To introduce the important class of BCH codes	BCH codes, Reed-Solomon codes	TB:Ch.5	3
12	To introduce the important class of Convolutional coder & decoder	Convolutional codes, Viterbi decoding, turbo codes	TB:Ch. 6	6
13.	To introduce the concept of data encryption and decryption	Models, goals and early cipher systems	TB:Ch.8	3
14	To introduce Public Key Cryptosystems	Public Key Crypto systems and some examples	TB:Ch. 8	3
		Total no. of classes planned		**42**

6. Evaluation Scheme:

Component	Duration	Weightage	Marks	Date & Time	Remarks
Midsem	90 mts.	16.66%	50	3/10 , 11:00 – 12:30 pm	Closed Book
Surprise quize		13.33%	40	To be decided in Class	Closed Book
Laboratory Component		20%	60	2 Hr Lab Session per week + 2Hr End semester Practical Exam	Open Book
Term Project		20%	60	Weekly interaction + End semester Project presentation	Open Book
Comprehensive	3 Hrs	30%	90	09/12 AN	Closed Book
Totals		**100%**	**300**		

7. Chamber Consultation Hour: To be announced in Class

8. Make-up Policy: Make-up will be given on extremely genuine grounds only. Prior application should be made for seeking the make-up examination.

9. Notices: Notices, if any, concerning the course will be put up on CMS only

Instructor-in-Charge
EEE G612