BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus

Instruction Division
First Semester, 2016-2017
Course Handout (Part II)

Date: 02.08.2016

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

Course No   : EEE G612
Course Title   : **Coding Theory & Practice**
Instructor-in-charge : **KARUNESH K GUPTA**

1. Course Description: 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.

2. Text Books:

Information theory, Coding and Cryptography, Ranjan Bose, Tata McGraw Hill, 2010.

Reference Books:
1. Element of Information Theory, Thomas M Cover, John Wiley & Sons, 2004
2. Error Control Coding, Shu Lin & Daniel J. Costello Jr., Pearson, 2011

3. Course Plan:

Lecture No.	Learning Objectives	Topics to be covered	Reference to Text Book
1	To give a general introduction to coding	General Introduction	Notes
Source & Channel Coding			
2 - 3	To introduce the concept of Uncertainty, Entropy	Data compression, Entropy	Ch. 1 Ch. 2 of ref 1
4 - 5	To introduce the concepts of coding and decoding	Unique and instantaneous codes, Kraft's inequality	Ch. 5 of ref 1
6 - 10	To introduce Universal Source coding	Huffman, Shannon-Fano-Elias, Arithmetic, L-z, Run Length Coding, JPEG	Ch.1
11	To introduce optimal	Rate distortion theorem,	Ch. 1

	codes	Optimal code length	Ch. 10 of ref 1
12 - 13	To introduce the concept of channel capacity and coding	Channel models, channel capacity, Shannon limit	Ch. 2
14 - 16	To introduce the concept of error correcting codes	Linear block codes, generator & parity check matrix	Ch. 3
17 - 18	To introduce the concept of syndrome and decoding through syndrome	Syndrome decoding of linear codes	Ch. 3
19	To study LDPC codes	Low density parity check codes	Ch. 3
20 - 21	To study Galois Field	Finite Algebra, Galois Field, and basic properties, block code over a Finite field	Ch. 4
22 - 23	To study cyclic codes, their encoding & decoding	Cyclic codes	Ch. 4
24 - 25	To study certain well known linear codes	Well-known block codes ; Golay code, CRC codes	Ch. 4
26 - 28	To introduce the important class of BCH codes	BCH codes, Reed-Solomon codes	Ch.5
29 - 35	To introduce the important class of Convolutional coder & decoder	Convolutional codes, Viterby decoding, turbo codes	Ch. 6
Encryption & Decryption			
36 - 37	To introduce the concept of data encryption and decryption	Models, goals and early cipher systems	Ch.8
38 - 40	To introduce Public Key Cryptosystems	Public Key Crypto systems and some examples	Ch. 8

4. Evaluation Scheme:

Evaluation Component	Duration	Weightage	Date, Time	Remarks
Mid-semester Test	90 Minutes	25%		CB
Lab Assignment / Project * / Term paper		40%	To be announced in class	OB

presentations				
Comprehensive Examination	3 Hours	35%		Partly open book

* Individual project/ Term paper on the topic of your choosing, subject to approval of the instructor.

5. Chamber Consultation Hour: To be announced in the class.

6. Notices: Notices concerning the course will be put up on the EEE notice board only.

Instructor-in-Charge
EEE G612