المرحلة: الرابعة

عدد الساعات الاسبوعية			اسم المادة	
عدد الوحدات	م	ع	ن	باللغة الانكليزية	باللغة العربية
6	4	2	2	**Information Theory & Coding**	نظرية المعلومات والترميز

Weeks	Syllabus
1st	Review of related probability and statistics related topics.
2nd	Definition of random variable, definition of Alphabet, definition of joint probability.
3rd	Conditional probabilities and Bayes rule .Independence of two random variables .Venn's diagram.
4th	Model of information transmission system. Common sense definition of information .Logarithmic measure of information. Self-information.
5th	Definition of information for noisy channel .Posteriori probabilities. Average mutual information for noisy channel.
6th	Shannon representation diagram of information source. Parameters of discrete channel.

7th	Average information (entropy) of a discrete and continuous source, maximum source entropy. Source efficiency.
8th	Entropy for continuous uniform distribution source. Entropy for continuous Gaussian distribution source.
9th	Entropy for continuous Triangular distribution source. Entropy for continuous Exponential distribution source.
10th	Transition probability matrix of channel, discrete noiseless and noisy channel models, uniform channel. Ternary symmetric channel.
11th	Information transmission over symmetric channel, noiseless channel, binary symmetric channel, ternary symmetric channel.
12th	Memory and memory less information channels .Binary Erasure channel (BEC).
13th,14th	Capacity of discrete channel, channel capacity for noiseless channel. Channel efficiency and redundancy. Channel capacity for symmetric channels.
15th	Channel capacity for nonsymmetrical channels .binary nonsymmetrical channel.
16th	Mutual information of continuous channel. Capacity of continuous channels. Efficiency and redundancy of continuous channel.

17th ,18th	Sampling of continuous source .Sampling Theorem. Nyquist theorem for transmission over band limited continuous channel. Shannon-Hartly channel capacity theorem.
19th	Cascaded information channels .Parallel information channels.
20th	Source encoding; fixed and variable length codes. Prefix property .Average length of source code. Source code efficiency and redundancy.
21st	Fano coding method.
22nd	Shannon – Fano coding method.
23rd	Huffman Coding. Hamming distance.
24th	Channel Coding in Digital Communication Systems. Forward Error Correction (FEC)
25th	Block codes. Cyclic Redundancy Check (CRC)
26th	Repetition Codes, Single Parity Check Codes.
27th	Why do we need to compress? . Data compression basics. Lossless Compression. Run-Length Encoding (RLE)
28th	Principles of example of Coding Methods used in file and image compression .ZIP .JPEG
29th, 30th	Speech coding and compression techniques overview (LPC block diagram). Delta modulation. Vocoder Principle. Performance measuring.