Faculty of Engineering & Technology

Introduction to Information Theory

Information :

Course Code :	COM 582	**Level**	: Undergraduate	**Course Hours :**	3.00- Hours

Department : Specialization of Electronics & Communication

Area Of Study :

- Define information, entropy and its properties.
- Understand source coding theorem and data compression algorithm.
- Define mutual information related to capacity of communication channel.
- Understand Channel capacity theorem as the basis for reliable communication.
- Tradeoff between channel BW and SNR.

Description :

Introduction: uncertainty, information, entropy and its properties, Source coding: Shannon coding, prefix coding, Kraft-Mcmillan inequality, First Shannon theorem, Huffman coding, Lempel Ziv coding, Discrete memoryless channels: transition probability, binary symmetric channel, Mutual information and its properties, Channel capacity, Definition, Binary symmetric channel. Channel coding theorem: second Shannon theorem differential entropy and mutual information for continuous ensembles, Differential entropy, Mutual information, Channel capacity theorem: implications on different communication systems, Constant rate encoding, Linear encoding, Kraft rule for inequalities, Variable rate data compression Hofmann coding.

Course outcomes :

a.Knowledge and Understanding: :

1 -	Understand source and channel coding theorems
2 -	Understand information measures and entropy.

b.Intellectual Skills: :

1 -	Apply mathematics to model communication system.
2 -	Use simulation tools to source coding algorithms (MATLAB).
3 -	Make tradeoff between, BW and SNR

c.Professional and Practical Skills: :

1 -	Apply theories and techniques of mathematics to information measure and channel capacity.
2 -	Apply theories to find track off between BW and SNR
3 -	Apply theories to source and channel coding algorithms.

d.General and Transferable Skills: :

1 -	Collaborate effectively within multidisciplinary team
2 -	Communicate effectively.
3 -	Demonstrate efficient IT capabilities.

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Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Information and entropy	10	6	4
Source coding theorem and coding algorithm	15	9	6
Discrete memory-less channels	10	6	4
Mutual information	10	6	4
Channel capacity	10	6	4
Channel coding theorem	10	6	4
Capacity of continuous channel	10	6	4

Teaching And Learning Methodologies :

Lecture

Tutorial

Laboratory

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
″Á̈Final exam	40.00		
o Assignment	10.00		
o In Class Quizzes and Participation	20.00		
o Mid-Term Exams	30.00		

Recommended books :

Simon HaykingCommunication Systemś4th Edition