Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Electronics and Communication Engineering

BEC604 COMMUNICATION ENGINEERING - II

Sixth Semester, 2016-17 (Even Semester)

Course (catalog) description

The course considers basic concepts of sampling, quantization and coding that are fundamental to digital transmission of analog signals. This course deals with the concepts of analog pulse modulation techniques .The course provides Comprehensive coverage of baseband transmission of binary data and types of digital modulation (ASK, FSK, and PSK) from both a mathematical description and from a block-diagram system approach. The course implement the concept of spread spectrum communication system.

Compulsory/Elective course : Compulsory for ECE students

Credit & contact hours : 3 & 45

Course Coordinator : Mr.R.Mohanraj, Asst.Professor.

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Mr.R.Mohanraj	III ECE	SA019		mohanraj.ece	9.00-9.50 AM

Relationship to other courses:

Pre –requisites : Communication Engineering –I

Assumed knowledge : The students will have knowledge on Analog Communication.

Following courses : BEC703 Cellular Mobile Communication, BEC016 Cognitive Radio

Syllabus Contents

UNIT I SAMPLING AND QUANTIZATION 9 HOURS

Sampling Process – Aliasing – Instantaneous sampling – Natural Sampling –Flat Sampling – Quantization of signals – sampling and quantizing effects –channel effects – SNR for quantization pulses – data formatting techniques –Time division multiplexing.

UNIT II DIGITAL MODULATION 9 HOURS

PCM Systems – Noise Considerations in PCM system – Overall Signal-tonoise ratio for PCM system – Threshold effect – Channel Capacity – Virtues,Limitations & Modification of PCM system – PCM Signal Multiplexing – Differential PCM – Delta Modulation – Noise Considerations in Delta Modulation – SNR Calculations – Comparison of PCM, DPCM & DM.

UNIT III BASEBAND PULSE TRANSMISSION 9 HOURS

Maximum likelihood receiver structure – Matched filter receiver – Probability error of the Matched filter – Intersymbol interference – Nyquist criterion for distortionless baseband transmission – Correlative coding – Eye pattern.

UNIT IV PASS BAND DATA TRANSMISSION **9 HOURS**

Pass Band Transmission Model – Generation, Detection, Signal Space Diagram, Probability of Error for BFSK, BPSK, QPSK, DPSK, and Schemes – Comparison.

UNIT V *UNIT 5* M-ARY SIGNALLING AND INTRODUCTION TO SPREAD SPECTRUM TECHNIQUES **9 HOURS**

M-ary signaling, vectoral view of MPSK and MFSK signaling, symbol error performance of M-ary systems –Introduction – Discrete Sequence Spread Spectrum technique – Use of Spread Spectrum with CDMA-Ranging Using Discrete Sequence Spread Spectrum – Frequency Hopping Spread Spectrum –Generation & Characteristics of PN Sequence.

TOTAL 45 HOURS

Text book(s) and/or required materials

T1. Bernard Sklar, *"Digital Communication, Fundamentals and Application",* Pearson Education Asia, 2nd Edition, 2001.
T2. Simon Haykin, *"Communication Systems"*, John Wiley & Sons, 4th Edition, 2000
T3.Taub & Schilling, *"Principle of Communication Systems",* 2nd Edition, 2003

Reference Books:

R1. John G. Proakis, "Digital Communication", McGraw Hill Inc, 5th Edition, 2008. R2. Dennis Reddy &
R2.Singh, R.P. & Sapre, S.D, "Communication Systems: Analog &Digital", Tata McGraw-Hill, 5th reprint.
www.scribd.com

Computer usage: MatLab

Professional component

General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	0%
Professional subject	-	100%

Broad area : Circuit Theory | Electronics | Signal Processing | VLSI|Embedded

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	Feb 2nd week	Session 1 to 14	2 Periods
2	Cycle Test-2	March 2nd week	Session 15 to 28	2 Periods
3	Model Test	April 3rd Week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

To understand the concepts of analog pulse modulation techniques, coverage of baseband transmission of binary data and types of digital modulation (ASK, FSK, and PSK) from both a mathematical description and from a block-diagram system approach	Correlates to program outcome		
	H	M	L
1.Students will learn about the basic concepts of Sampling, basic concepts of baseband transmission of binary data	a,g,i	b,d,f	
2.They gain knowledge about basics of digital modulation techniques.	c,i	a,b,e,f,g,k	
3.They can understand the concepts of spread spectrum digital communication system	d,i	A	
4.To provide in-depth analysis of noise performance in various receivers	i	a,b,e,g	
5.Design basic communication systems	c	e,k	b
6.To understand the basic concepts of analog pulse modulation techniques		a,b,d	f,k

H: high correlation, M: medium correlation, L: low correlation

Draft Lecture Schedule

Session	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I SAMPLING AND QUANTIZATION			
1.	Sampling Process	No	[T1] Chapter -2
2.	Aliasing	No	
3.	Instantaneous sampling – Natural Sampling	No	
4.	Flat Sampling	No	
5.	Quantization of signals	No	
6.	sampling and quantizing effects –channel effects	No	
7.	SNR for quantization pulses	No	
8.	Data formatting techniques	No	
9.	Time division multiplexing	Yes	
UNIT II DIGITAL MODULATION			
10.	PCM Systems	Yes	[T2] Chapter -3
11.	Noise Considerations in PCM system	Yes	
12.	Overall Signal-tonoise ratio for PCM system	Yes	
13.	PCM-Threshold effect	Yes	
14.	Channel Capacity ,Virtues,Limitations & Modification of PCM system	No	
15.	PCM Signal Multiplexing – Differential PCM	Yes	
16.	Delta Modulation	Yes	
17.	Noise Considerations in Delta Modulation SNR Calculations	Yes	
18.	Comparison of PCM, DPCM & DM.	Yes	
UNIT III BASE BAND PULSE TRANSMISSION			
19.	Maximum likelihood receiver structure ———	No	[T2] Chapter -4 [R1]Chapter-5
20.	Matched filter receiver	No	
21.	Probability error of the Matched filter	No	
22.	Intersymbol interference	No	
23.	Nyquist criterion for distortionless baseband transmission	No	
24.	Correlative coding	No	
25.	Duobinary Encoder with Precoder	Yes	

26.	Modified Duobinary Encoder with Precoder	Yes	
27.	Eye Pattern	No	
UNIT IV PASS BAND DATA TRANSMISSION			
28.	Pass Band Transmission Model	No	[T2] Chapter -6 [R1]Chapter-5
29.	Generation, Detection of BFSK	No	
30.	Signal Space Diagram, Probability of Error for BFSK	No	
31.	Generation, Detection of BPSK	No	
32.	Signal Space Diagram, Probability of Error for BPSK	Yes	
33.	Generation, Detection of QPSK	No	
34.	Signal Space Diagram, Probability of Error for QPSK	Yes	
35.	Generation, Detection of DPSK	No	
36.	Signal Space Diagram, Probability of Error for DPSK,Comparison	Yes	
UNIT V M-ARY SIGNALING AND INTRODUCTION TO SPREAD SPECTRUM TECHNIQUES			
37.	M-ary signaling.	No	[T2] Chapter -7 [R1] Chapter-13
38.	Vectoral view of MPSK and MFSK signaling	No	
39.	Symbol error performance of M-ary systems	No	
40.	Introduction -Discrete Sequence Spread Spectrum technique	No	
41.	Use of Spread Spectrum with CDMA	No	
42.	Ranging Using Discrete Sequence Spread Spectrum	No	
43.	Frequency Hopping Spread Spectrum – Generation	No	
44.	Performance of Spread Spectrum Techniques	No	
45.	Characteristics of PN Sequence	Yes	

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	10%
Assignment /Seminar/online test/quiz	-	5%
Attendance	-	5%
Final exam	-	70%

Prepared by: Mr Mohanraj Assistant professor , Department of ECE **Dated :**

Addendum

ABET Outcomes expected of graduates of B.Tech / ECE / program by the time that they graduate*:*

a. An ability to apply knowledge of mathematics, science, and engineering

b. An ability to design and conduct experiments, as well as to analyze and interpret data

c. An ability to design a hardware and software system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

d. An ability to function on multidisciplinary teams

e. An ability to identify, formulate, and solve engineering problems

f. An understanding of professional and ethical responsibility

g. An ability to communicate effectively

h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

i. A recognition of the need for, and an ability to engage in life-long learning

j. A knowledge of contemporary issues

k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Educational Objectives

PEO1: PREPARATION

Electronics Engineering graduates are provided with a strong foundation to passionately apply the fundamental principles of mathematics, science, and engineering knowledge to solve technical problems and also to combine fundamental knowledge of engineering principles with modern techniques to solve realistic, unstructured problems that arise in the field of Engineering and non-engineering efficiently and cost effectively.

PEO2: CORE COMPETENCE

Electronics engineering graduates have proficiency to enhance the skills and experience to apply their engineering knowledge, critical thinking and problem solving abilities in professional engineering practice for a wide variety of technical applications, including the design and usage of modern tools for improvement in the field of Electronics and Communication Engineering.

PEO3: PROFESSIONALISM

Electronics Engineering Graduates will be expected to pursue life-long learning by successfully participating in post graduate or any other professional program for continuous improvement which is a requisite for a successful engineer to become a leader in the work force or educational sector.

PEO4: SKILL

Electronics Engineering Graduates will become skilled in soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, interpersonal relationship, group discussion and leadership ability to become a better professional.

PEO5: ETHICS

Electronics Engineering Graduates are morally boosted to make decisions that are ethical, safe and environmentally-responsible and also to innovate continuously for societal improvement.

Course Teacher	Signature
Mr.Mohanraj	

Course Coordinator **HOD/ECE**