

GUJARAT TECHNOLOGICAL UNIVERSITY
ELECTRONICS & COMMUNICATION (SIGNAL PROCESSING & COMMUNICATION)
(41)
SIGNAL PROCESSING AND COMMUNICATION LABORATORY
SUBJECT CODE: 2734101
SEMESTER: III

Type of course: Laboratory course in signal processing and communication

Prerequisite: Signal Analysis and Transforms, Digital Image processing, Digital Modulation and Coding, Advances in Wireless communication

Rationale: NA

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	ESE (V)		PA (I)			
					ESE	OEP	PA	RP		
0	2#	8	5	0	0	50	30	10	10	100

Sr. No.	Content	Total Hrs	% weightage
1.	Perform image compression using huffman coding	02	24%
2.	Perform image negative and thresholding using dsk6713	02	
3.	Implementation of histogram equalization using dsk 6713	02	
4.	Perform contrast stretching operation in dsk6713	02	
5.	Perform image filtering using dsk6713	02	
6.	Perform logical operation on an input image using dsk6713.	02	
7.	Perform image rotation operation on an input image using dsk6713.	02	
8.	Add transparent object in an input image using matlab	02	26%
9.	Write a matlab program for generating the panoramic image from given images	02	
10.	Detect the numbers from an input text image using matlab(optical character recognition)	02	
11.	Detect the touching objects and determine its feature vector from an input text image using matlab.	02	10%
12.	To study and software implementation of DTMF signal generator and decoder.	02	
12.	To study and implement amplitude modulator using DSK-6713	02	
13.	To study and analyze BER performance of different modulation techniques under different channel conditions.	02	10%
14.	To study Phase lock loop and implementation of PLL based frequency synthesizer.	02	
15.	To study and analysis of LMS algorithm for adaptive noise cancellation.	02	
16.	To study and analysis of MIMO Communication system	02	10%
17.	To study and analysis SIC and GSIC based multiuser detection schemes.	02	

18.	Introduction to universal software define radio peripherals.	02	10%
19.	To study and perform spectrum sensing using software define radio. .	02	
20.	To Study and Implement UDP/TCP protocol.	02	5%
21.	To study and analysis of thermal noise in communication system.	02	5%
22.	To study and analysis of rain attenuation in communication system.	02	

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment;

Reference Books:

1. B.P/Lathi, Zhi Ding, "Modern Digital and Analog Communication System", Oxford University Press
2. Herbert Taub, Donald Schiiling, "Principles of Communication Systems", McGrawHill Education.
3. Simon Haykin, Michale Moher, "Modern Wireless Communications", Pearson.
4. Xiaodong Wang, H. Vincent Poor, "Wireless Communication Systems: Advanced Techniques for Signal Reception", Pearson.
5. Theodore S. Rappaport, "Wireless Communications: Principles and Practice" Second Edition, Pearson Education.
6. R.C.Gonzalez, R.E.Woods, "Digital Image Processing", 3/e Pearson Education.
7. S. Jayaraman , S.Esakkirajan, "Digital Image Processing", McGraw Hill.
8. Horst Bunke, Abraham Kandel, "Applied Pattern Recognition", Springer International Edition, Springer.
9. Frank Y.Shih, "Image Processing and Mathematical Morphology", CRC Press
10. Gonzalez, Woods and Eddins, " Digital Image Processing using MATLAB, McGrawHill
11. Frank Shih," Image Processing and Pattern Recognition, Wiley
12. Margues Q.," Practical Image and Video processing using MATLAB, Wiley
13. Apte Shaila, "Digital Signal Processing", Wiley
14. Gopi E.S., " Algorithm Collections for Digital Signal processing applications using MATLAB, Springer
15. Gose E. , Johnsonbugh R. and Jost S., " Pattern Recognition and Image Analysis, Prentice-Hall

Course Outcome:

This is the lab course exclusively design to enhance the practical background of PG students in the field of signal processing and communication. This course clarifies theoretical and practical background of many signal processing and communication algorithms. Course also enhances the preliminary knowledge required to realize any digital signal processing algorithm into the hardware.

Major Equipments and Software:

1. Matlab®,
2. NI LabVIEW®
3. Software Define Radio,
4. RF Transmitter/Receiver system
5. DSP kit (DSK-6713)(TI)
6. Code Composer Studio(TI)

List of Open Source Software/learning website:

1. <http://www.sss-mag.com/>
2. www.agilent.co.in(Application Notes)
3. <http://www.itu.int>
4. <http://imageprocessingplace.com>
5. <http://scilab.org>
6. www.ti.com (DSK-6713 Instruction Manual)
7. www.ni.com (to study USRP Instruction manual)

Open Ended Problems:

1. Design an algorithm for computing the Discrete Cosine Transform (DCT) of a given image matrix.
2. Calculate the Run length coding for the given image.
3. Design an algorithm for computing the LZW coding of given image matrix.
4. Design an algorithm for compression of the text image using run length coding method.
5. Design an algorithm for computing the multi-level thresholding on an input image.
6. Design an algorithm for rotating an input image to 90° with respect to X-coordinates in Code Composer Studio.
7. Design an algorithm for performing the brightening operation on a given input image
8. Perform the biplane slicing operation on the input image and show all the bit planes using Code Composer Studio.
9. Design an algorithm for performing the image zooming using nearest neighbor interpolation technique for the given image using Code Composer Studio.
10. Design and implementation of energy efficient analog communication system for satellite communication
11. Design and implementation of energy efficient digital communication system using software define radio.
12. Design and implementation of localization algorithm for wireless network.
13. Implementation of wireless sensor network .
14. Hardware implementation of frequency synthesizer.
15. Hardware implementation of LMS algorithm.
16. Estimation of rain attenuation using empirical measurements.

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.

