A) COURSE

Course Id:	Course
5726	Digital Signal Processing

Class Hours per Week	Lab hours per week	Complementary practices	Credits	Total hour course
3	2	3	8	48

B) GENERAL COURSE INFORMATION:

	EE (IEA)	ME (IM)	MME (IMA)	EME (IME)	MTE (IMT)
Level:	VIII				VIII
Course Type (Required/Elective)	Elective				Elective
Prerequisite Course:	Digital Systems Design (5659) and Electronics I (5591)				Digital Systems Design (5659) and Electronics I (5591)
CACEI Classification:	CI				CI

C) COURSE OBJECTIVE

At the end of the course, the student will be capable of:
Design FIR and IIR Digital filter using mathematics resources as the Discrete Fourier Transform and the Z Transform

D) TOPICS (CONTENTS AND METHODOLOGY)

Signals and Digital Processing		Hours
Specific Objective:	**The student will understand the fundamentals of Digital Signal Processing**	
1.1 Signal characterization and classification. **1.2 Basic operations used on signal processing** **1.3 Basic type of signals** **1.4 Signal processing applications** **1.5 Why Digital Signal Processing?** **1.6 Discrete time signals** **1.7 Common sequences and representation** **1.8 Sampling process** **1.9 Aliasing signals**		

Readings and other resources	Sanjit K. Mitra, Digital Signal Processing. A computer- based approach, 3rd Edition, McGraw-Hill 2007 Acquisition data software
Teaching Methodologies	Theory exposition Exercises Computer simulation
Learning Activities	Problems resolution Homework Investigation work

Discrete time digital signal processing		**Hours**
Specific Objective:	**This chapter will show the student the basic concepts of discrete time digital signal processing**	
2.1 Introduction to DSP **2.2 Sampling of continuous time signals** **2.3 Sampling of Passband Signal** **2.4 Sample-and-Hold circuit** **2.5 Analog-to-Digital converter** **2.6 Digital-to-Analog converter** **2.7 Reconstruction Filter Design** **2.8 Effect of Sample-and-Hold operation**		
Readings and other resources	Sanjit K. Mitra, Digital Signal Processing. A computer- based approach, 3rd Edition, McGraw-Hill 2007 Acquisition data software	
Teaching Methodologies	Theory exposition Exercises Computer simulation	
Learning Activities	Problems resolution Homework Investigation work	

Analog Signal Processing		**Hours**
Specific Objective:	**The student will apply the strategies for Analog Signal Conditioning and identify the implied problems**	
3.1 Analog signal conditioning **3.2 Signal conversion process** **3.3 Architecture and characteristics of systems for signal conditioning and processing** **3.4 Instrumentation amplification** **3.5 No linear analog conditioning** **3.6 Analog conditioning noise**		
Readings and other resources	Sanjit K. Mitra, Digital Signal Processing. A computer- based approach, 3rd Edition, McGraw-Hill 2007 Acquisition data software	

Teaching Methodologies	Theory exposition Exercises Computer simulation
Learning Activities	Problems resolution Homework Investigation work

4. IIR and FIR filter design		**Hours**
Specific Objective:	**The students will learn the IIR and FIR design**	
4.1 Preliminary conditions of IIR filters **4.2 Design of Passband IIR filters** **4.3 IIR spectral transformation** **4.4 Preliminary conditions of FIR filters** **4.5 FIR filter design based on windowed Fourier Series** **4.6 FIR filter design of minimum phase** **4.7 FIR filter design computationally efficient**		
Readings and other resources	Sanjit K. Mitra, Digital Signal Processing. A computer- based approach, 3rd Edition, McGraw-Hill 2007 Acquisition data software	
Teaching Methodologies	Theory exposition Exercises Computer simulation	
Learning Activities	Problems resolution Homework Investigation work	

5. Analysis of finite wordlenght effects		**Hours**
Specific Objective:	**The student will analyze the problems caused by the digital signal processing implementation and propose possible solutions**	
5.1 The quantization Process and Errors **5.2 Quantization of Fixed-Point Numbers** **5.3 Quantization of Floating -point Numbers** **5.4 Analysis of Coefficient Quantization Effects** **5.5 A/D Conversion Noise analysis** **5.6 Analysis of Arithmetic Round-Off Effects** **5.7 Dynamic Range Scaling** **5.8 Signal-to-Noise Ratio in Low-Order IIR Filters** **5.9 Low-Sensitivity Digital Filters** **5.10 Reduction of Product round-Off Errors Using Error Feedback** **5.11 Limit cycles in IIR Digital Filters** **5.12 Round-Off Errors in FFT Algorithms**		
Readings and other resources	Sanjit K. Mitra, Digital Signal Processing. A computer- based approach, 3rd Edition, McGraw-Hill 2007 Acquisition data software	

Teaching Methodologies	Theory exposition Exercises Computer simulation
Learning Activities	Problems resolution Homework Investigation work

E) TEACHING AND LEARNING METHODOLOGIES

a) Topics Explanations.
b) Problem solving.
c) Project oriented learning

F) EVALUATION CRITERIA:

Evaluation:	Schedule	Suggested Form of Evaluation and weighing	Topics
1st Term	Session 16	Exam 85%, Homework 15%,	Units 1 and 2
2nd Term	Session 32	Exam 85%, Homework 15%,	Units 2 and 3
3rd Term	Session 48	Exam 85%, Homework 15%,	Units 3 and 4
Final evaluation		100% (Average of the partial evaluations)	
Other activity:			
Extraordinary Exam	According to schedule	100% Exam	100% of topics
Title Exam	According to schedule	100% Exam	100% of topics
Regularization Exam	According to schedule	100% Exam	100% of topics

G) BIBLIOGRAPHY AND ELECTRONIC RESOURCES

Main Books

Sanjit K. Mitra, Digital Signal Processing. A computer-based approach, 3rd Edition, McGraw-Hill 2007.

Complementary Books

1. Proakis, John G.; Manolakis, Dimitris G., Digital Signal Processing. Principles, algorithms and aplications. 3ª Ed. Pearson Prentice Hall 2006.

2. Proakis, John G.; Ingle, Vinary K. Digital Signal Processing. Using Matlb. PWS Publishing Company 2000.

Internet Links