A) COURSE

Course Id:	Course
5678	Modeling and simulation

Class Hours per Week	Lab hours per week	Complementary practices	Credits	Total hour course
3	2	3	8	48 Class 32 practice

A) GENERAL COURSE INFORMATION:

	EE (IEA)	ME (IM)	MME (IMA)	EME (IME)	MTE (IMT)
Level:	IV				
Course Type (Required/Elective)	Required				
Prerequisite Course:	Algebra B				
CACEI Classification:	CI				

C) COURSE OBJECTIVE

At the end of the course, the student will be capable of:
Analyze non sinusoidal periodical functions, as well as utilizing of Laplace transforms for solving linear differential equations that allow representing some physical systems.

D) TOPICS (CONTENTS AND METHODOLOGY)

1. Introduction to Matlab		**6 Hours**
Specific Objective:	Analyze the basic environment for the management of Matlab.	
1.1. - Environment of Matlab. 1.2. - General purpose commands of Matlab. 1.3. - mathematical functions of Matlab. 1.4. - Graphic Visualization in Matlab.		
Readings and other resources	Readings for researching of concepts as well as to complement and strengthen the topics discussed in class. Internet, literature tailored to the needs of the subject, consulting and research related topics.	
Teaching Methodologies	Exhibition topics by teacher and/or students; use of some didactic techniques; discussion and analysis sessions; development of lab practices according topics covered in class	
Learning Activities	Class exercises and homework as well as it´s respective results interpretation; digital simulation exercises, diverse activities in digital platforms.	

2. Functions	**6 Hours**

Specific Objective:	Develop management functions whose physical quantity changes with time.
2.1.- Definition of functions 2.2. - Lineal function. 2.3. - Unit step function. 2.4. - Unit impulse function.	
Readings and other resources	Readings for researching of concepts as well as to complement and strengthen the topics discussed in class. Internet, literature tailored to the needs of the subject, consulting and research related topics.
Teaching Methodologies	Exhibition topics by teacher and/or students; use of some didactic techniques; discussion and analysis sessions; development of lab practices according topics covered in class
Learning Activities	Class exercises and homework as well as it´s respective results interpretation; digital simulation exercises, diverse activities in digital platforms.

3. Fourier Series	**6 Hours**
Specific Objective:	Analyze and representing non sinusoidal periodic functions with a Fourier serie.
3.1.- Periodic functions 3.2.- Fourier Series 3.3.- Even and odd functions 3.4.- Obtaining Fourier Coefficient. 3.5.- Matlab applications with non-sinusoidal signals.	
Readings and other resources	Readings for researching of concepts as well as to complement and strengthen the topics discussed in class. Internet, literature tailored to the needs of the subject, consulting and research related topics.
Teaching Methodologies	Exhibition topics by teacher and/or students; use of some didactic techniques; discussion and analysis sessions; development of lab practices according topics covered in class
Learning Activities	Class exercises and homework as well as it´s respective results interpretation; digital simulation exercises, diverse activities in digital platforms.

4. Laplace Transform	**6 Hours**
Specific Objective:	Develop basic theory of Laplace transform.
4.1.- Laplace transform of elemental functions. 4.2.- Laplace transform properties. 4.3.-Inverse Laplace Transform 4.4.- Solution with Matlab	
Readings and other resources	Readings for researching of concepts as well as to complement and strengthen the topics discussed in class. Internet, literature tailored to the needs of the subject, consulting and research related topics.
Teaching Methodologies	Exhibition topics by teacher and/or students; use of some didactic techniques; discussion and analysis sessions; development of lab practices according topics covered in class
Learning Activities	Class exercises and homework as well as it´s respective results interpretation; digital simulation exercises, diverse activities in digital platforms.

5. Laplace Transform Applications	**6 Hours**
Specific Objective:	Use the Laplace transform to solve ordinary differential equations.

5.1.- Solution of linear differential equations of first order. 5.2.- Solution of linear differential equations of second and bigger order. 5.3.- Solution with Matlab	
Readings and other resources	Readings for researching of concepts as well as to complement and strengthen the topics discussed in class. Internet, literature tailored to the needs of the subject, consulting and research related topics.
Teaching Methodologies	Exhibition topics by teacher and/or students; use of some didactic techniques; discussion and analysis sessions; development of lab practices according topics covered in class
Learning Activities	Class exercises and homework as well as it´s respective results interpretation; digital simulation exercises, diverse activities in digital platforms.

6. Matlab programming and Introduction to Simulink		**6 Hours**
Specific Objective:	Analyze some Matlab functions, to handle its programming, as well as the definition of basic models in Simulink.	
6.1.- Structured Functions 6.2.- Model creation with Simulink 6.3.- Simulation parameters 6.4.- Analysis of simulation results.		
Readings and other resources	Internet, bibliography according to the needs of the project, consulting.	
Teaching Methodologies	Exhibition topics by teacher and/or students; use of some didactic techniques; discussion and analysis sessions; development of lab practices according topics covered in class	
Learning Activities	Class exercises and homework as well as it´s respective results interpretation; digital simulation exercises, diverse activities in digital platforms.	

7. Mathematical representation of physical systems.		**12 Hours**
Specific Objective:	Integrate the modeling and simulation of some physical systems.	
7.1.- Transference function 7.2. - Representation in space state. 7.3.- Modeling of electrical and mechanical systems. 7.4.- Applications in Matlab/Simulink		
Readings and other resources	Internet, bibliography according to the needs of the project, consulting.	
Teaching Methodologies	Exhibition topics by teacher and/or students; use of some didactic techniques; discussion and analysis sessions; development of lab practices according topics covered in class	
Learning Activities	Class exercises and homework as well as it´s respective results interpretation; digital simulation exercises, diverse activities in digital platforms.	

E) TEACHING AND LEARNING METHODOLOGIES

- In class will be developed individually and by team, exercises of the topics to promove abstract and analitic reasoning.
- Some teaching techniques that encourage meaningful learning will be used, in some topics of the subject.
- managing, searching and interpreting information related to the topics will be promoted.
- Use of ICT will be promoted, by Homework or projects.

F) EVALUATION CRITERIA:

Evaluation:	Schedule	Suggested Form of Evaluation and weighing	Topics
First Partial exam *Written exam: 80%* *Homework, simulations, project: 20%* *Total 100%*	Session 18	33.3 %	Topics 1, 2 y 3
Second Partial exam *Written exam: 80%* *Homework, simulations, project: 20%* *Total 100%*	Session 30	33.3 %	Topics 4 y 5
First Partial exam *Written exam: 80%* *Homework, simulations, project: 20%* *Total 100%*	Session 48	33.3 %	Topics 6 y 7
Total	16 weeks		100%
Ordinary Final Exam		Average of the 3 partial grades	
Laboratory		It must be accredited to pass the course	
Extraordinary exam		Written theoretical exam of all units 100%	
Title exam		Written theoretical exam of all units 100%	
Regularization exam		Written theoretical exam of all units 100%	

Each evaluation is weighted with the guidelines and requirements of the professor teaching the course. To Pass the Subject is necessary to develop an integrating Project with the knowledge and experiences of another subjects.

G) BIBLIOGRAPHY AND ELECTRONIC RESOURCES

Main Books

Análisis de Fourier. Hwei P. Hsu. Ed. Prentice Hall, 1998, ISBN 968 444 356 0. México.

Transformadas de Laplace. Murray R. Spiegel. Series Schaum. Ed. Mc Graw Hill. 2000. ISBN 0 07 060 231 X. México.

Complementary Books

Ingeniería de control moderna. Katsuiko Ogata. Cuarta edición, Ed. Pearson Prentice Hall. ISBN 84 205 3678 4. España.

Internet Links

http://www.mathworks.com/products/matlab/