ACADEMIC PROGRAM: ELECTRONIC CYBERNETIC ENGINEERING

Course name:	**Course ID:**
Computer Programming I	**CC401**

Location in curricular map: First semester.

Course Description.

This course is oriented to Engineering students who are going to apply basic concepts of structured programming and object oriented programming in order to design algorithms and create computer programs, so students can solve numerical problems and character handling problems. Along the course students learn to write flow diagrams, algorithms and JAVA programming techniques to solve engineering problems.

The course leads student to Programming methods as problem solution strategies. Student learns contents of elementary and intermediate complexity.

General learning outcomes:

At the end of the course students are expected to:

Know and apply methods of object oriented programming.

Design algorithms to solve numerical problems and alphanumeric expressions.

Write computer programs to solve specific problems.

Develop their ability to work in teams with responsibility and order.

Contents:	Hours
1. Algorithms and problem solving. 1.1. General introduction. 1.2. Algorithms. 1.3. Flow diagram and pseudo code in problem solving. 1.4. Java and its characteristics. 1.5. Compiling a JAVA program.	**6**
2. Introduction to Object Oriented Programming. 2.1. Object oriented programming (OOP). 2.2. Java data output. 2.3. Java data input. 2.4. Variables and constants.	**12**
3. Sequences and selections. 3.1. Arithmetic expressions. 3.2 Conversions between data types. 3.3. Sequences and assignments. 3.4. Logical expressions. 3.5. Conditional (IF). 3.6. Multiple switching selections. 3.7. Multiple selection applications.	**14**
4. Loops. 4.1. Loops. 4.2. Loops with a counter (for). 4.3. Conditional loops (while y do-while). 4.4. Nested for.	**12**
5. Problems involving functions. 5.1. Functions and methods. 5.2. Static methods (static). 5.3. Parameters. 5.4. Return values (return). 5.5. Applications.	**10**
6. Problems involving vectors. 6.1. Introduction. 6.2. Vectors in JAVA. 6.3. Applications.	**10**

Learning activities: All the activities are individual or by team (general group activities or integrating subgroups). They are classified in activities inside classroom (ICA) or outside classroom (OCA) ones. All ICA's are directed by the corresponding professor or expositor (if it could be convenient). Every OCA would be finished in a completely independent form, but under the proper supervision of Faculty. For every subject the learning activities could be at least the following (or others, similar or higher in pedagogical characteristics):

1. Case Analysis to state clearly the accomplishments of the course, properly linked to the real state of contemporary engineering.
2. Cooperative sessions to analyze and solve problems. When could be convenient laboratory sessions are mandatory, of course in presence of Faculty.
3. Learning based on structures and non structured problems. The goal is that students must state, solve and discuss proposals of solutions. They must evidence research and effective communications skills, in full accordance to Institutional Learning Outcomes.
4. Plenary discussions directed by students themselves and also directed by professor. Take care that this is not the only pedagogical strategy to be adopted.
5. Project oriented learning, focused on local requirements of Engineering Science.
6. Visits to companies, in order to gather important information about state of art of the subject. When this strategy could not be pertinent, it can be substituted by conference or Case Analysis.

Evaluation criteria and procedures:

The student's learning is to be measured under the following criteria:

1. Cooperative attitude, expressed by concrete and measurable actions that will be a clear evidence of the accomplishment of learning outcomes.
2. Engagement, honesty, seriousness, responsibility, attitude of participation and creativity expressed in the furtherance of learning outcomes.
3. Ability and dexterousness expressed in problem solving.
4. Fulfillment of proposed rubrics.
5. Reasonable attendance to class (when required 100% with no failure).

Form	**Instrument**	Percentage
Problem solving	Home works, questionnaires, essays, summaries, documental and data base researches.	35%
Objective tests	At a mid term and a final written exam.	45%
Diverse products	Class project by teams, e-portfolios. Evidence generation, according the nature of subject.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Java 2 Programming.	Luis Joyanes Aguilar e Ignacio Zahonero Martínez	McGraw Hill	2002
2	Reference	Java 2 Reference Manual	Helbert Schildt	McGraw Hill	2001
3	Reference	Java 2 Programming Fundamentals	Helbert Schildt	McGraw Hill	2001

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Course name:	Course ID:
Mathematics	**MA400**

Location in curricular map: First semester

Course description:

This course is offered to all the students of Business, Administration or Engineering with the aim of providing basic mathematics that allows them to take the subsequent mathematics courses or the ones pertaining to the axis of their professional formation.

This course covers the concepts of logic mathematics, mathematical functions and matrix algebra in a practical way. Regardless of the chosen major, all engineering, administration and business students must have the ability to analyze, model, calculate and represent data and figures of the systems they are studying.

Course learning outcomes:
At the end of the course the student is expected to:
Know and understand:
The following concepts of logical mathematics: Proposition, truth tables, tautology, equivalency, fallacy, syllogism and inference laws.
The following concepts of mathematical functions: function, domain, and range of a function and how the mathematical functions are classified.
The following concepts of algebra: equation, inequality, matrix, matrix determinant, Gauss-Jordan method and cofactors method.
Know:
How to apply logical mathematics to analyze, synthesize and evaluate the logic consistence of written texts and oral expressions.
To sketch the behavior of a mathematical function and model the behavior of real phenomena through functions.
To solve linear equation systems through algebra and matrix methods.
To formulate and solve problems with linear equations systems
To develop their ability to work in teams in a responsible and organized way.

Contents:	**Hours**
1. Mathematical logic. **1.1. Introduction and course set up.** 1.2. Propositional logic. 1.3. Expressions of Language. 1.4. Logical Connectives and truth tables. 1.5. Formulas and truth tables. 1.6. Equivalences, tautologies and fallacies. 1.7. Inferential logic. 1.8. Logical implication. 1.9. Inference laws. 1.10. Consistence of premises. 1.11. Direct and indirect proof. 1.12. Syllogism Analysis.	**20**
2. Mathematical functions**.** 2.1. Basic concepts: Function, domain and range of a function. 2.2. Types of mathematical functions. 2.3. Linear functions. 2.4. Polynomial functions. 2.5. Rational functions. 2.6. Power functions. 2.7. Functions defined by sections. 2.8. Logarithmic functions. 2.9. Exponential functions. 2.10. Trigonometric functions. 2.11. Application of mathematical functions.	**20**
3. Matrix algebra and systems of linear equations. 3.1. Equation and equation systems. 3.2 Systems of linear equations with two variables. 3.3. Systems of inequalities. 3.4. Systems of linear equations with more than two variables. 3.5. Matrixes and matrix algebra. 3.6. Inverse of a matrix. 3.7. Determinant and properties of the determinant. 3.8. Applications of the systems of equations and inequalities.	**24**

Learning Activities: The learning experience in this course will be individual and in groups; some directed by the instructor and others will be carried out individually by the students outside the classroom. Those carried out by students will be held in the following way:

1. Collaborative work inside the classroom to analyze and debate over the contents under instructor supervision.
2. Case methods to apply and assess the scope and limitations of the course content.
3. Cooperative work outside the classroom to analyze cases and problem solving.
4. Learning based on structured and non-structured problems in order for students to learn to formulate problems and apply the course content by generating solutions, working individually as well as in groups after brainstorming.
5. Content presentation by the instructor, avoiding at all cost its becoming a costume throughout the course.
6. Learning based on application projects in groups, in order for students to apply their knowledge in these projects.

Evaluation criteria and procedures:
Students' performance throughout the course will be based on the following criteria:

1. The manifested willingness and cooperation with concrete actions to achieve the learning objectives of each unit of the course's general objective.
2. The manifested commitment, honesty, seriousness, responsibility, quality, participation and creativity when executing all learning activities developed throughout the course.
3. The manifested ability and dexterity o solve the specific problems throughout the course.

Considering the criteria mentioned above, the following Evaluation form is proposed:

Form	**Instrument**	Percentage
Interrogation and problem solving	Individual and group assignments in the form of questionnaires, essays, summaries, structured problems to solve and bibliographical or internet research.	35%
Problem Solving	Individual objective tests: Partial and final exam.	45%
Product request	Application, documental or field research project and individual or group report of the project	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Algebra and Trigonometry with Analytical Geometry	Earl W. Swokowski y Jeffery A. Cole	Thomson-Learning	2002
2	Reference	Introductory mathematical analysis for business, economics and life and social sciences	Ernest F. Haeussler, Richard S. Paul y Tech Laurel	Prentice-Hall	2001
3	Reference	Mathematical Analysis for Business, Economics and the Life and Social Sciences	Jagdish C. Arya y Robin W. Lardner	Pearson	1993

Course name:	Course ID:
Introduction to electronic cybernetics	**CE403**

Location in curricular map: First semester

Course description:

This course is designed to introduce first year students to university life, and to discover the aspects relating to engineering as a profession, as well as a deeper knowledge of the career path they have chosen. During the course, the necessary induction to the various areas of CETYS University is given, so the student may adapt to student life in a quick manner and make use of the facilities and services that are available.

To take this course it is necessary to be enrolled in any of the engineering programs, and have a positive attitude and open mind to learn new things. The knowledge and abilities developed throughout this course will be of great use to the student so he or she may have a better understanding of the academic program they have chosen, the courses that it contains and the relationships between them, as well as the professional and personal profile that is expected at the conclusion of the academic program.

Course learning outcomes:
At the end of the course the student will:
Know and comprehend:
- The purposes and objectives of a university.
- His or her role as a student and the role of the university professor.
- The structure of the university and the primary documents regarding its educational aspects.
- The origin, evolution and field of application of engineering as a profession.
- The shades that support the generic profile of CETYS alumni.
- The curricular plan of the Electronic Cybernetics Engineering academic program.
- The specific exit profile, terminal abilities and professional field of the Electronic Cybernetics Engineer.

Develop:
- Projects that apply knowledge of the professional field.
- Capacity for working in teams in a responsible and organized manner.
- Research methodologies and abilities for the solving of simple engineering problems.

Course content:	**Hours**
1. Introduction to University. 1.1. Introduction. 1.2. Purposes and objectives of the University. 1.3. Roles of the University student and professor. 1.4. Structure of CETYS University. 1.5. Rules and policies.	**8**
2. Introduction to engineering and its historic development. 2.1. Engineering and science. 2.2. Origins and evolution of engineering. 2.3. Areas of engineering. 2.4. Current and future tendencies of engineering.	**10**
3. Analysis of the Electronic Cybernetics Engineering academic program. 3.1. Definition and history. 3.2. Curricular analysis. 3.3. Functions and abilities of the Electronic Cybernetics Engineer. 3.4. Areas of specialization.	**10**
4. Selected topics in Electronic Cybernetics Engineering. 4.1 Hardware elements of a computer. 4.2 Software elements of a computer. 4.3 Numbering systems.	**36**

4.4 Principles of Boolean Algebra. 4.5 Control systems. 4.6.Computer networks.	

Learning activities: The learning experiences in this course will be individual and in groups; the in-class activities will be guided by the professor and the independent activities will be done by the student outside the classroom. The generic forms for the learning activities that will be done by the student are the following:

1. Collaborative work in the class room, guided by the professor, analyzing and debating the course topics.
2. Case study method to apply and evaluate scope and limitations of the course topics.
3. Cooperative work outside the classroom for case study analysis and problem solving.
4. Learning based on structured and non-structured problems in which the students learn to formulate problems and apply the course content to generate solutions, through individual efforts as well as in team efforts, via brainstorming.
5. Course topics presented by the professor, avoiding at all costs that this becomes the norm of the course.
6. Learning based on application projects in teams, so students apply their knowledge to projects of their own interest.
7. Visits to local industries so students may become familiar with the systems and work practices that operate in their profession.

Evaluation criteria and procedures:
The performance of the students throughout the course will be based on the following criteria:
(1) The availability and cooperation manifested in concrete actions, towards the achievement of the course learning outcomes.

(2) The commitment, honesty, seriousness, responsibility, quality, participation and creativity manifested in the execution of the learning activities developed throughout the course.

(3) The ability and skills manifested to solve specific problems worked throughout the course.

Taking into account the criteria mentioned above, the following evaluation scheme is suggested:

Form	**Instrument**	Percentage
Inquiry and problem solving	Individual and group homework tasks in the form of quizzes, essays, summaries, structured problem solving, bibliographical and internet research.	35%
Problem solving	Individual objective tests: Partial examinations and a final examination.	45%
Delivery of products	Application project, documental or field research, and team project report.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Introduction to engineering technology and engineering	Val D. Hawks y A. Brent. Strong	Prentice Hall	2000
2	Reference	Introduction to engineering technology	Robert J. Pond	Prentice Hall	2001
3	Reference	Introduction to computers for engineering and technology	Kenneth C. Mansfield y James L. Antonakos.	Prentice Hall	2000

Course name:	Course ID:
Thinking Skills Development	**CS401**

Location in curricular map: Second semester

Course description:

The nature of this course is experienced-based and theoretical and attempts to power the students cognitive abilities through specific strategies that foster the development of critical and creative thinking in problem solving, so they experience direct repercussions in the performance of the different courses in their curriculum as well as in their daily life. This is a course that, because of its thematic and formative contents, is located in the first semester of all majors.

Course learning outcomes:
At the end of the course, the student is expected to:
Know and understand:
The concepts of intelligence, creativity, innovation, the basic functioning of the brain, divergent thinking, convergent thinking and emotional intelligence, as well as the thinking formal operations

Know:
How to elaborate self-diagnosis on each of the types of intelligence according to Gardner.

Elaborate a personal program to develop the components of emotional intelligence as mentioned by Goleman.

Elaborate and present an innovation project in teams.

Apply the creative process to problem solving.

Develop their ability to work in teams in a responsible and organized way.

Content:	Hours
1. Thinking and brain.	**10**
1.1. Introduction and course set up.	
1.2. Historical antecedents of intelligence.	
1.3. Definitions of intelligence.	
1.4. Neurophysiology.	**10**
2. Types of intelligence.	
2.1. Brain hemispheres.	
2.2. Convergent thinking.	
2.3. Divergent thinking.	
2.4. Emotional intelligence.	
3. Emotional intelligence.	**14**
3.1. Factors according to Goleman:	
3.1.1. Self-consciousness.	
3.1.2. Self-control.	
3.1.3. Motivation.	
3.1.4. Empathy.	
3.2. Relationship management.	
4. Convergent thinking.	**14**
4.1. Instruments enrichment program.	
4.2. Organization (algorithmic thinking).	
4.3. Classifications.	
4.4. Numerical progressions and syllogisms	
5. Divergent thinking.	**16**
5.1. What is creativity?	
5.2. Where is my creativity?	
5.3. Everyday creativity.	
5.4. Advantages of being creative.	
5.5. Myths of creativity.	
5.6. Stages of the creative process	
5.7. Criteria for the Evaluation of creativity.	
5.8. Perception.	
5.9. Recovery of the creative power.	

Learning Activities: The learning experience in this course will be individual and in groups; some directed by the instructor and others will be carried out individually by the students outside the classroom. Those carried out by students will be held in the following way:

1. Collaborative work inside the classroom to analyze and debate over the contents under instructor supervision.
2. Case methods to apply and assess the scope and limitations of the course content.
3. Cooperative work outside the classroom to analyze cases and problem solving.
4. Learning based on structured and non-structured problems in order for students to learn to formulate problems and apply the course content by generating solutions, working individually as well as in groups after brainstorming.
5. Content presentation by the instructor, avoiding at all cost its becoming a costume throughout the course.
6. Learning based on application projects in groups, in order for students to apply their knowledge in these projects.

Evaluation criteria and procedures:

Students' performance throughout the course will be based on the following criteria:

1. The manifested willingness and cooperation with concrete actions to reach the learning objectives of each unit of the course's general objective.
2. The manifested commitment, honesty, seriousness, responsibility, quality, participation and creativity when executing all the learning activities developed throughout the course.
3. The manifested ability and dexterity to solve specific problems throughout the course.

Considering the criteria mentioned above, the following Evaluation form is proposed:

Form	**Instrument**	Percentage
Interrogation and problem solving	Individual and group assignments in the form of questionnaires, essays, summaries, structured problems to solve and bibliographical or internet research.	35%
Problem Solving	Individual objective tests: Partial and final exam.	45%
Product request	Application, documental or field research project and individual or group report of the project.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Intelligence Reframed: Multiple Intelligences for the 21st Century	Howard Gardner	Basic Books	2000
2	Reference	Six Thinking Hats	Edward De Bono	Garnica	1999
3	Reference	Emotional Intelligence	Daniel P. Goleman	Bantam Books	1997

Course Name:	Course ID:
Globalization and Economic Development	**EC400**

Location in the curricular map: First semester

Course description:
In this course students will be introduced to the study of Globalization in its theoretical foundations as well as in the essential condition for its development, such as: economic growth, free international trade, the short term capital movement, direct foreign investment, the migrating phenomena, the development of communication technologies and their cultural effect among others.

Students will judge the advantages and disadvantages of globalization, distinguishing the different forms that it takes. As part of the learning activities of the course students will carry on **application projects** through field research, knowledge application, problem identification, methodology development, creativity and input of ideas. The topics to consider will be the following:

- The importance of capital international flows for development (wealth and serious crisis)
- Commercial liberalization (beneficial or crisis provoking?)
- Does globalization reduce real salaries and provoke the loss of jobs?
- How are the capitals, services and merchandise international movements counted?
- Technology changes that technology reflects.
- The aptitude of national economies to generate competitive advantages.

Course learning outcomes:
At the end of the course the student is expected to:

Know:

What globalization is. The role of commercial liberalization these days. What sustainable development is. How it affects the development of communication technologies and what its cultural effect is. What is understood by international free trade and direct foreign investment.

Understand:

The advantages and disadvantages of globalization. Which the key economic variables are. How a country can reach a sustainable development. The role of cultural differences.

Apply their knowledge about globalization and sustainable development in analysis cases, economic politics discussions and the elaboration of the course application project.
Develop their ability to work in teams in a responsible and organized way.

Contents:	**Hours**
1. Globalization**.** 1.1. Globalization before the XX Century. 1.2. Globalization during the XX Century. 1.3. Globalization in the XX Century. 1.4. Defining Globalization. 1.5. Real and virtual Globalization.	**10**
2. Who regulates Globalization? 2.1. Regulating Institutions of International Trade. 2.2. International Monetary Fund (IMF). 2.3. The Gold Standard System. 2.4. The Currency Markets. 2.5. The Balance of Payments. 2.6. The position of international investment (financial rules). 2.7. Barriers to International Trade. 2.8. Pareto Movements.	**11**
3. Economic development and growth. 3.1. The frontier of production possibilities. 3.2. The classic theories of growth. 3.3. The modern theories of growth. 3.4. The Harrod-Domar model. 3.5. The Solow model. 3.6. The limits of growth. 3.7. Concepts of economic convergence. 3.8. The theory of dependency.	**10**

4. Globalization and poverty. 4.1. Globalization and Knowledge 4.2. University and Globalization. 4.3. The World of Poverty. 4.4. The Vicious Circle of underdevelopment.	**10**
5. Cultural Globalization. 5.1. Culture and Development 5.2. Globalization in tourism 5.3. Globalization and its effects in migrating movements 5.4. Demographics and Development 5.5. The Effects of globalization on women's role and children's right in the most traditional societies. 5.5 The role of the United States in Globalization.	**10**
6. Globalization: Growth and Development (study cases). 6.1 Savings, Productivity and Structured Growth. Study Case: Singapore. 6.2. Gradual Transaction from a planned economy. Study case: China. 6.3. Substitution of Imports. Study case: India 6.4 Chile's Economic Miracle and its political dependence on transnational companies. Study Case: Chile 6.5 A new American Century? Iraq and the disguised war between the Dollar and the Euro. Study Case. 6.4.About the origin, the use and content of the sustainable term. Study Case 6.5 The social movements in the globalization era. Study Case 6.6 "Globalization, Empire or Imperialism? A contemporary Debate" Study Case 6.7 "The Argentinean politic system crisis in a globalized context and one of its consequences: urban poverty" Study Case 6.8 "Politic Economy of Capitalist Globalization" Study Case	**13**

Learning Activities: The learning experience in this course will be individual and in groups; some directed by the instructor and others will be carried out individually by the students outside the classroom. Those carried out by students will be held in the following way:

1. Collaborative work inside the classroom to analyze and debate over the contents under instructor supervision.
2. Case methods to apply and assess the scope and limitations of the course content.
3. Cooperative work outside the classroom to analyze cases and problem solving.
4. Learning based on structured and non-structured problems in order for students to learn to formulate problems and apply the course content by generating solutions, working individually as well as in groups after brainstorming.
5. Content presentation by the instructor, avoiding at all cost its becoming a costume throughout the course.
6. Learning based on application projects in groups, in order for students to apply their knowledge in these projects.

Evaluation criteria and procedures:

Students' performance throughout the course will be based on the following criteria:

1. The manifested willingness and cooperation with concrete actions to achieve the learning objectives of each unit of the course's general objective.
2. The manifested commitment, honesty, seriousness, responsibility, quality, participation and creativity when executing all learning activities throughout the course.
3. The manifested ability and dexterity to solve specific problems throughout the course.

Considering criteria mentioned above, the following Evaluation form is proposed:

Form	**Instrument**	Percentage
Interrogation and problem solving	Individual and group assignments in the form of questionnaires, essays, summaries, structured problems to solve and bibliographical or internet research.	35%
Problem Solving	Individual objective tests: Partial and final exam.	45%
Product request	Application, documental or field research project and individual or group report of the project.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Globalization: A Very Short Introduction (Very Short Introductions)	Manfreb B. Steger	Oxford University Press	2003
2	Reference	Globalization & Growth: Case Studies in National Economic Strategies	Richard H. K. Vietor	South-Western College/West	2004
3	Reference	International Economics: Theory & Policy	Paul Krugman y Maurice Obstfeld	Addison-Wesley	1998

Course name:	Course ID:
Computer Assisted Drawing	**MC400**

Location in curricular map: Second semester.

Course description:

This course is designed to offer students a knowledge basis on Engineering Drawing. Along the course students will apply the basic principles of technical drawing in the description and form of objects using the foundations of Computer Assisted Drawing.
With the knowledge acquired along the course students will make, understand and interpret the technical engineering drawings used in manufacturing mechanical parts and products designed by them.

Knowledge and skills developed by students will be very useful for a better understanding and successful development of the rest of the subjects, and in any other issue related with engineering practice.

General Learning Outcomes:

At the end of the course students are expected to:

Know:

- How to apply foundations of technical drawing in the description of objexts in orthogonal and isometric forms.
- How to apply basic rules to assign dimensions to describe any objects.
- Use principles of principal sights determination sector and auxiliary.
- Sketch engineering drawings.
- Use a convenient drawing software as AUTOCAD or higher in engineering usefulness.
- Improve self – learning skills.

Develop their capacity to work in teams with responsibility and order.

Contents:	Hours
1. Common drawing 1.1. General introduction. 1.2. Handmade drawing: sketching. 1.3. Principles of mechanical drawing. 1.4. Basic instruments. 1.5. Geometry.	**10**
Orthogonal projections 2.1. Systems of projections. 2.2. Sights and viewpoints. 2.3. Multiple views. 2.4. Line alphabet. 2.5. Selection of the three views representing an object. 2.6. Line precedence. 2.7. Surface projections. 2.8. Representation of holes.	**12**
3. Auxiliary views. 3.1. Sections. 3.2. Types of sectional views. 3.3. Engineering conventions. 3.4. Section and line patterns. 3.5. Primary auxiliary sight. 3.6. Secondary auxiliary sight.	**12**
4. Dimensioning. 4.1. Foundations. 4.2. Types of dimensions. 4.3. Rules for dimensioning 4.4. Engineering dimensioning.	**10**
5. Isometric projections. 5.1. Principles of isometric drawing. 5.2. Isometric sections. 5.3. Dimensioning in Isometrics.	**10**
6. Intersections and developments. 6.1. Line developments. 6.2. Radial developments. 6.3. Triangulations. 6.4. Intersections.	**10**

Learning activities: All the activities are individual or by team (general group activities or integrating subgroups). They are classified in activities inside classroom (ICA) or outside classroom (OCA) ones. All ICA's are directed by the corresponding professor or expositor (if it could be convenient). Every OCA would be finished in a completely independent form, but under the proper supervision of Faculty. For every subject the learning activities could be at least the following (or others, similar or higher in pedagogical characteristics):

1. Case Analysis to state clearly the accomplishments of the course, properly linked to the real state of contemporary engineering.
2. Cooperative sessions to analyze and solve problems. When could be convenient laboratory sessions are mandatory, of course in presence of Faculty.
3. Learning based on structures and non structured problems. The goal is that students must state, solve and discuss proposals of solutions. They must evidence research and effective communications skills, in full accordance to Institutional Learning Outcomes.
4. Plenary discussions directed by students themselves and also directed by professor. Take care that this is not the only pedagogical strategy to be adopted.
5. Project oriented learning, focused on local requirements of Engineering Science.
6. Visits to companies, in order to gather important information about state of art of the subject. When this strategy could not be pertinent, it can be substituted by conference or Case Analysis.

Evaluation criteria and procedures:

The student's learning is to be measured under the following criteria:

1. Cooperative attitude, expressed by concrete and measurable actions that will be a clear evidence of the accomplishment of learning outcomes.
2. Engagement, honesty, seriousness, responsibility, attitude of participation and creativity expressed in the furtherance of learning outcomes.
3. Ability and dexterousness expressed in problem solving.
4. Fulfillment of proposed rubrics.
5. Reasonable attendance to class (when required 100% with no failure).

Form	**Instrument**	Percentage
Problem solving	Home works, questionnaires, essays, summaries, documental and data base researches.	35%
Objective tests	At a mid term and a final written exam.	45%
Diverse products	Class project by teams, e-portfolios. Evidence generation, according the nature of subject.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Año**
1	Text	Fundamentals of computer aided drawing	Warren J. Luzadder	Prentice-Hall	2000
2	Reference	Technical drawing	Henry Spencer, James Novak, John Dygdon, Thomas Dygdon y Cecil Spencer Henry.	Alfaomega	2004
3	Reference	Engineering Drawing and Design.	Cecil H. Jensen y J. D. Helsel.	McGraw-Hill	2002

Course name:	Course ID:
Differential calculus	**MA401**

Location in curricular map: Second semester.

Course description:

The scope of this branch of Mathematics is dynamic: is useful to describe change and movement. That is why it regards with limit quantities. The first classes will be very useful to acquire a general scope of the subject previous to a deeper consideration of theorems and results. Some topics studied are: graphic analysis of functions in real domain, techniques for the calculation of limits, geometrical and physical applications, use of derivatives to solve engineering problems and so forth. This course is strongly related to Integral Calculus, Differential Equations, Multivariate Calculus, Physics (I, II, III), Probability and Statistics.

General Learning Outcomes:

At the end of the course students are expected to:
Know the basis of Calculus in one real variable, continuity of functions and derivatives.

Understand: all the concepts above as fundamental engineering tools.

Apply: all the concepts above to identify, state, solve and discuss problems in maxima and minima under one real variable, and time rate changes as well.

Develop: their ability to work in teams with responsibility and order.

Contents:	Hours
1. Limits and derivatives. 1.1. General introduction. 1.2. Mathematical modeling using functions. 1.3. Limits. 1.4. Theorems in limits. 1.5. One sided limits. 1.6. Limits to infinity. 1.7. Continuity.	**20**

1.8. Tangent lines, instant velocities and time rates. 1.9. Derivatives. **2. Differentiating rules.** 2.1. Polynomial and exponential functions. 2.2. Rules for products and quotients. 2.3. Derivatives of trigonometric functions. 2.4. Chain rule. 2.5. Implicit differentiation. 2.6. Higher order derivatives. 2.7. Exponential functions. 2.8. Derivatives of logarithms. **3. Applications.** 3.1. Time rates. 3.2. Maximum and minima. 3.3. Rolle's theorem and mean value theorem. 3.4. Graphic analysis. 3.5. Sketching curves. 3.6. Undetermined forms and L'Hôpital's rule. 3.7. Optimization.	**20** **24**

Learning activities: All the activities are individual or by team (general group activities or integrating subgroups). They are classified in activities inside classroom (ICA) or outside classroom (OCA) ones. All ICA's are directed by the corresponding professor or expositor (if it could be convenient). Every OCA would be finished in a completely independent form, but under the proper supervision of Faculty. For every subject the learning activities could be at least the following (or others, similar or higher in pedagogical characteristics):

1. Case Analysis to state clearly the accomplishments of the course, properly linked to the real state of contemporary engineering.
2. Cooperative sessions to analyze and solve problems. When could be convenient laboratory sessions are mandatory, of course in presence of Faculty.
3. Learning based on structures and non structured problems. The goal is that students must state, solve and discuss proposals of solutions. They must evidence research and effective communications skills, in full accordance to Institutional Learning Outcomes.
4. Plenary discussions directed by students themselves and also directed by professor. Take care that this is not the only pedagogical strategy to be adopted.
5. Project oriented learning, focused on local requirements of Engineering Science.

6. Visits to companies, in order to gather important information about state of art of the subject. When this strategy could not be pertinent, it can be substituted by conference or Case Analysis.

Evaluation criteria and procedures:

The student's learning is to be measured under the following criteria:

1. Cooperative attitude, expressed by concrete and measurable actions that will be a clear evidence of the accomplishment of learning outcomes.
2. Engagement, honesty, seriousness, responsibility, attitude of participation and creativity expressed in the furtherance of learning outcomes.
3. Ability and dexterousness expressed in problem solving.
4. Fulfillment of proposed rubrics.
5. Reasonable attendance to class (when required 100% with no failure).

Form	**Instrument**	Percentage
Problem solving	Home works, questionnaires, essays, summaries, documental and data base researches.	35%
Objective tests	At a mid term and a final written exam.	45%
Diverse products	Class project by teams, e-portfolios. Evidence generation, according the nature of subject.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Calculus of one variable	James Stewart.	Thomson.	2001
2	Reference	Calculus with analytic geometry	C. Henry Edwards y David E. Penney	Prentice-Hall	2002
3	Reference	Calculus	Earl W. Swokowski	PWS Publishing	2000

Course name:	Course ID:
Computer Programming II	**CE402**

Location in curricular map: Second semester.

Course description.

This course is oriented to Engineering students, who will strength programming skills under the object oriented protocol in order to solve every day numerical and logical problems in engineering practice. In the first part of the course students are expected to create classes, and apply the graphic interface to solve problems. In the second part students will create objects and export them to at least to different applications. Programming language is JAVA at advanced level or any similar or higher in characteristics and quality.

General learning outcomes:

At the end of the course students are expected to:

Know and understand concepts of object oriented programming: classes, objects, recycling, graphic interface, predefined class, proper class, encapsulation, heritage and polymorphism.

Develop: Algorithms and programs using JAVA, similar or higher.

Contents:	Hours
1. Introduction.	**8**
1.1. Course characteristics.	
1.2. Classes and Objects using JAVA.	
1.3. Recycling.	
1.4. Evolving data types.	
1.5. The class String.	
2. Prescribed classes to handle data.	**8**
2.1. Arrays.	
2.2. Applications.	
3. Graphic User Interface.	**8**
3.1. Concepts and definitions.	
3.2 Abstract Windows Toolkit.	

3.3. Applications.	
4. Prescribed classes. 4.1. Files. 4.2. Classes involving files. 4.3. Applications.	**8**
5. User designed classes. 5.1. Encapsulation, heritage and polymorphism. 5.2. User designed classes. 5.3. Applications.	**18**
6. Data structures. 6.1. Definitions. 6.2. Design of Data Structures. 6.3. Applications.	**14**

Learning activities: All the activities are individual or by team (general group activities or integrating subgroups). They are classified in activities inside classroom (ICA) or outside classroom (OCA) ones. All ICA's are directed by the corresponding professor or expositor (if it could be convenient). Every OCA would be finished in a completely independent form, but under the proper supervision of Faculty. For every subject the learning activities could be at least the following (or others, similar or higher in pedagogical characteristics):

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3. Learning based on structures and non structured problems. The goal is that students must state, solve and discuss proposals of solutions. They must evidence research and effective communications skills, in full accordance to Institutional Learning Outcomes.
4. Plenary discussions directed by students themselves and also directed by professor. Take care that this is not the only pedagogical strategy to be adopted.
5. Project oriented learning, focused on local requirements of Engineering Science.
6. Visits to companies, in order to gather important information about state of art of the subject. When this strategy could not be pertinent, it can be substituted by conference or Case Analysis.

Evaluation criteria and procedures:

The student's learning is to be measured under the following criteria:

1. Cooperative attitude, expressed by concrete and measurable actions that will be a clear evidence of the accomplishment of learning outcomes.
2. Engagement, honesty, seriousness, responsibility, attitude of participation and creativity expressed in the furtherance of learning outcomes.
3. Ability and dexterousness expressed in problem solving.
4. Fulfillment of proposed rubrics.
5. Reasonable attendance to class (when required 100% with no failure).

Form	**Instrument**	Percentage
Problem solving	Home works, questionnaires, essays, summaries, documental and data base researches.	35%
Objective tests	At a mid term and a final written exam.	45%
Diverse products	Class project by teams, e-portfolios. Evidence generation, according the nature of subject.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Java 2 Programming manual	Luis Joyanes Aguilar y Matilde Fernández Azuela	McGraw-Hill	2001
2	Reference	JAVA 2 Reference manual	Herbert Schildt	McGraw-Hill	2001
3	Reference	JAVA 2 Programming course	Fco. Javier Ceballos	AlfaOmega	2000

Course name:	Course ID:
Physics I	**FI400**

Location in curricular map: Second semester.

Course description:

This is a practical and theoretical course which will lead students to the complete understanding of the principles of Statics. Along the course students will know and understand how to calculate the conditions of Mechanical Equilibrium for particles and Rigid Bodies, also centers of gravity and moments of inertia will be calculated for simple geometries. This course has the complete foundations for the next: Dynamics. Students are supposed to understand Algebra and Differential Calculus which is given simultaneously.

General Learning Outcomes.
At the end of the course students are expected to:

Know and understand systems of units and measuring, vectors and scalars and equilibrium conditions for rigid body elements.

Know how to convert from one system of units to another.

Calculate the conditions of equilibrium for particles, rigid bodies and structures.

Contents:	**Horas**
1. Algorithms and problem solving. 1.1. General introduction. 1.2. Systems of units. 1.3. Equivalences and conversions.	**6**
2. Vectors 2.1. Scalars and vectors. 2.2. Vector addition. 2.3. Cartesian components. 2.4. Forces on a particle. 2.5. Resultant force for concurrent components.	**12**

2.6. Equilibrium of the particle	
3. Equivalent systems of force. 3.1. Moments. 3.2. Couples. 3.3. Equivalent couples. 3.4. Systems of equivalent forces.	**12**
4. Mechanical equilibrium. 4.1. Free body diagram. 4.2. Equilibrium conditions. 4.3. Equilibrium of rigid bodies in two or three dimensions.	**12**
5. Trusses. 5.1. Introduction. 5.2. Types of trusses. 5.3. Methods of analysis.	**12**
6. Centroids and moment of inertia. 6.1. Plane Centroids. 6.2. Moment of inertia. 6.3. Steinner's theorem. 6.4. Radius of gyration. 6.5. Section module.	**10**

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2. Cooperative sessions to analyze and solve problems. When could be convenient laboratory sessions are mandatory, of course in presence of Faculty.
3. Learning based on structures and non structured problems. The goal is that students must state, solve and discuss proposals of solutions. They must evidence research and effective communications skills, in full accordance to Institutional Learning Outcomes.
4. Plenary discussions directed by students themselves and also directed by professor. Take care that this is not the only pedagogical strategy to be adopted.

5. Project oriented learning, focused on local requirements of Engineering Science.
6. Visits to companies, in order to gather important information about state of art of the subject. When this strategy could not be pertinent, it can be substituted by conference or Case Analysis.

Evaluation criteria and procedures:

The student's learning is to be measured under the following criteria:

1. Cooperative attitude, expressed by concrete and measurable actions that will be a clear evidence of the accomplishment of learning outcomes.
2. Engagement, honesty, seriousness, responsibility, attitude of participation and creativity expressed in the furtherance of learning outcomes.
3. Ability and dexterousness expressed in problem solving.
4. Fulfillment of proposed rubrics.
5. Reasonable attendance to class (when required 100% with no failure).

Form	**Instrument**	Percentage
Problem solving	Home works, questionnaires, essays, summaries, documental and data base researches.	35%
Objective tests	At a mid term and a final written exam.	45%
Diverse products	Class project by teams, e-portfolios. Evidence generation, according the nature of subject.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Engineering Mechanics: Statics	Anthony Bedford y Wallace T. Fowler	Prentice-Hall	2001
2	Reference	Vector Mechanics for Engineers, Statics and Dynamics	Ferdinand P. Beer y E. Russell Jr. Johnston	McGraw-Hill	2003
3	Reference	Engineering Mechanics - Statics	Russell C. Hibbeler	Prentice-Hall	2003

Course name:	Course ID:
Digital Electronics I	**CE404**

Location in curricular map: Second semester

Course description:
This course studies and applies the analysis and design techniques for combinational and basic sequential digital circuits. Also integrated circuits in small and medium scale for the design and construction of sequential digital circuits. Computer based analysis and design tools will be used.
The course topics include: Numbering systems, Boolean Algebra, Combinational Circuits, Sequential Circuits.

Course learning outcomes:
At the end of the course the student will.
Know y **comprehend:**

- The various numbering systems and their importance to digital design and computing.
- The fundamentals of Boolean algebra, its theorems, symbols and differences with traditional algebra.
- The tabulation of any Boolean algebra expression into a truth table.
- The characteristics and functioning of a Flip-Flop.
- The characteristics of combinational and sequential circuits.
- The importance of a systems approach for an engineer, and the application of this throughout the course, via the interaction with classmates from his or her academic program and others, thus developing positive attitudes towards interdisciplinary collaborative and cooperative work.

Know how to do:

- Conversions between various types of numbering systems.
- The corresponding circuit diagram from a Boolean expression and vice-versa.
- The tabulation of any Boolean expression into a truth table.
- Algebraic simplification using the Boolean algebra theorems to reduce a Boolean algebra expression to its minimum form.
- Algebraic simplification using graphical and tabulation techniques to reduce a Boolean algebra expression to its minimum form.
- Analysis, design, construction and debugging of digital circuits of the arbitrary counter type using flip-flops.
- Analysis of combinational digital circuits of at least 5 variables, and sequential circuits of the arbitrary counter type.
- Design, implementation and tests of combinational digital circuits of at least 5 variables, and sequential circuits of the arbitrary counter type.

Develop the capacity to work in teams in an organized and responsible manner.

Course content:	Hours
1. Numbering systems. 1.1. Introduction. 1.2. Binary system. 1.3. Octal and hexadecimal systems. 1.4. Conversions between systems.	**10**
2. Boolean algebra. 2.1. Basic operations. 2.2. Algebraic expressions. 2.3. Symbols and circuit diagrams. 2.4. Truth tables. 2.5. Basic theorems. 2.6. Sum of products and product of sums. 2.7. Duality. 2.8. Consensus and algebraic simplification.	**18**
3. Combinational circuits. 3.1. Basic definitions. 3.2. Designs based on truth tables. 3.3. Minterm expansion. 3.4. Maxterm expansion. 3.5. "Don´t Cares". 3.6. Karnaugh maps. 3.7. Quine-McCluskey method. 3.8. Circuits with multiple outputs.	**18**
4. Sequential circuits. 4.1. Effect of time in sequential circuits. 4.2. Flip-Flops. 4.3. Flip-Flops of type SR, JK, T y D. 4.4. Flip-Flops with clock. 4.5. Characteristic equations. 4.6. Design of ascending binary counters. 4.7. Counters for other sequences. 4.8. Shift registers.	**18**

Learning activities: The learning experiences in this course will be individual and in groups; the in-class activities will be guided by the professor and the independent activities will be done by the student outside the classroom. The generic forms for the learning activities that will be done by the student are the following:

1. Collaborative work in the class room, guided by the professor, analyzing and debating the course topics.
2. Case study method to apply and evaluate scope and limitations of the course topics.
3. Cooperative work outside the classroom for case study analysis and problem solving.
4. Learning based on structured and non-structured problems in which the students learn to formulate problems and apply the course content to generate solutions, through individual efforts as well as in team efforts, via brainstorming.
5. Course topics presented by the professor, avoiding at all costs that this becomes the norm of the course.
6. Learning based on application projects in teams, so students apply their knowledge to projects of their own interest.

Evaluation criteria and procedures:
The performance of the students throughout the course will be based on the following criteria:

1. The availability and cooperation manifested in concrete actions, towards the achievement of the course learning outcomes.
2. The commitment, honesty, seriousness, responsibility, quality, participation and creativity manifested in the execution of the learning activities developed throughout the course.
3. The ability and skills manifested to solve specific problems worked throughout the course.

Taking into account the criteria mentioned above, the following evaluation scheme is suggested:

Form	**Instrument**	Percentage
Inquiry and problem solving	Individual and group homework tasks in the form of quizzes, essays, summaries, structured problem solving, bibliographical and internet research.	35%
Problem solving	Individual objective tests: Partial examinations and a final examination.	45%
Delivery of products	Application project, documental or field research, and team project report.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Fundamentals of Logic Design	Charles H. Roth	Brooks Cole	2003
2	Reference	Análisis y Diseño de Circuitos Lógicos Digitales	Victor P. Nelson, Troy H. Nagle, Bill D. Carroll, J. David Irwin.	Prentice-Hall	1995
3	Reference	Digital systems: Principles and applications	Ronald J. Tocci y Neal S. Widmer.	Prentice-Hall	2000

Course name:	Course ID:
Cultural appreciation I	CS403

Location in curricular map: Second semester.

Course description:

This course is orchestrated with the 2004 majors with the objective of presenting to students an integral vision of the history of art, the history of thinking and the history of culture so they can develop sensitivity towards artistic expressions.

This course is not designed to make students acquire or develop an artistic skill but to make them know and understand how art works, its impact on culture and society in general.

If this understanding of art is achieved, a sense o appreciation of art, thinking and culture in its diverse expressions can be developed helping professionals to acquire a integral formation and a more diverse and complete thinking structure.

Course learning outcomes:
At the end of the course the student is expected to:
Know:
The state of the art of culture (in a conceptual level)
The importance of culture in society.
The diverse stages of art development and its impact on society.
The diverse stages of thinking and ideas development.
Identify:
Culture as an inherent part in all social processes.
Art as an everyday expression of human life
Art as a cultural expression and communication act.
The context of knowledge generation and transmission.
Criteria for the appreciation of art beyond beauty, expression and balance.
Develop:
Ability of analysis of different cultural and artistic expressions in contemporary society.
Conceptual framework of knowledge development.
Sensitivity and appreciation of artistic expressions that motivate them to continue enjoying those modalities that interest them.
Conceptual framework of art and its expressions.
Their ability to communicate orally and through writing

Contents:	**Hours**
1. Theory of culture 1.1. Introduction and course set up 1.2. Towards a concept of culture 1.3. Culture and communication 1.4. Virtual culture and dynamic culture 1.5. Cultural rights in globalization	**12**
2. History of thinking 2.1. The awakening of men 2.2. From ancient times to the Middle Ages 2.3. From 1492 to XX Century 2.4. Postmodernism and the information era	**10**
3. History of Art 3.1. Classic and traditional 3.2 Ancient art 3.3. The Renaissance 3.4 Modern and Contemporary art.	**10**

Learning Activities: The learning experience in this course will be individual and in groups; some directed by the instructor and others will be carried out individually by the students outside the classroom. Those carried out by students will be held in the following way:

1. Collaborative work inside the classroom to analyze and debate over the contents under instructor supervision.
2. Case methods to apply and assess the scope and limitations of the course content.
3. Cooperative work outside the classroom to analyze cases and problem solving.
4. Learning based on structured and non-structured problems in order for students to learn to formulate problems and apply the course content by generating solutions, working individually as well as in groups after brainstorming.
5. Content presentation by the instructor, avoiding at all cost its becoming a costume throughout the course.
6. Learning based on application projects in groups, in order for students to apply their knowledge in these projects.
7. Visits to museums, galleries, exhibits and artistic representations

Evaluation criteria and procedures:

Students' performance throughout the course will be based on the following criteria:

1. The manifested willingness and cooperation manifested with concrete actions to achieve the learning objectives of each unit of the course's general objective.
2. The manifested commitment, honesty, seriousness, responsibility, quality, participation and creativity when executing all the learning activities developed throughout the course.
3. The manifested ability and dexterity to solve specific problems throughout the course.

Considering the criteria mentioned above, the following Evaluation form is proposed:

Form	**Instrument**	Percentage
Interrogation and problem solving	Individual and group assignments in the form of questionnaires, essays, summaries, structured problems to solve and bibliographical or internet research.	45%
Problem Solving	Individual objective tests: Partial and final exam.	25%
Request of products	Application, documental or field research project and individual or group report of the project.	30%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	History of art: Slip-cased	Anthony H. W. Y Janson Janson	Harry N Abrams	2001
2	Reference	Hybrid Cultures	Néstor García Canclini	Paidos	2000
3	Reference	Life and Death of Ideas: Brief History of Western Thinking	José María Valverde	Ariel	2003

Course name:	Course ID:
Integral Calculus	**MA402**

Location in curricular map: Third semester.

Course description:

This course is natural continuation of Differential Calculus. It represents one of the basic foundations to develop higher courses in engineering. Students will identify the principal techniques of Integration: Definite and Indefinite, applied of course to determination of Areas, Volumes and other Engineering applications. Students are expected to know and understand algebraic and transcendental functions (exponential, logarithmic and trigonometric).

General Learning Outcomes.

At the end of the course students are expected to:

Know and understand what is an integral, definite or indefinite and the principal technique of integration useful in Engineering.

Evaluate volumes and surfaces using infinite sums and their limits, specially applying conic sections.
Make a catalog of integrals and basic formulae, validating results with real prototypes.

Contents:	Hours
1. Integrals: general introduction. 1.1 Areas and distances. 1.2 Summation notation. 1.3 Definite integral as limit of a sum. 1.4 Fundamental properties of definite integrals: linearity. 1.5 Fundamental theorem of Calculus.	**20**
2. Definite integral. 2.1 Fundamental formulae of integration. 2.2 Change of variables. 2.3 Integration by parts. 2.4 Integration by trigonometric substitution.	**20**

3. Applications of Integrals. 3.1 Surfaces. 3.2 Surfaces under more than one curve. 3.3 Volumes: sections and annulus. 3.4 Application project.	**24**

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1. Case Analysis to state clearly the accomplishments of the course, properly linked to the real state of contemporary engineering.
2. Cooperative sessions to analyze and solve problems. When could be convenient laboratory sessions are mandatory, of course in presence of Faculty.
3. Learning based on structures and non structured problems. The goal is that students must state, solve and discuss proposals of solutions. They must evidence research and effective communications skills, in full accordance to Institutional Learning Outcomes.
4. Plenary discussions directed by students themselves and also directed by professor. Take care that this is not the only pedagogical strategy to be adopted.
5. Project oriented learning, focused on local requirements of Engineering Science.
6. Visits to companies, in order to gather important information about state of art of the subject. When this strategy could not be pertinent, it can be substituted by conference or Case Analysis.

Evaluation procedures and criteria:

The student's learning is to be measured under the following criteria:

1. Cooperative attitude, expressed by concrete and measurable actions that will be a clear evidence of the accomplishment of learning outcomes.
2. Engagement, honesty, seriousness, responsibility, attitude of participation and creativity expressed in the furtherance of learning outcomes.
3. Ability and dexterousness expressed in problem solving.
4. Fulfillment of proposed rubrics.
5. Reasonable attendance to class (when required 100% with no failure).

Form	**Instrument**	Percentage
Problem solving	Home works, questionnaires, essays, summaries, documental and data base researches.	35%
Objective tests	At a mid term and a final written exam.	45%
Diverse products	Class project by teams, e-portfolios. Evidence generation, according the nature of subject.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	**"Cálculo de una Variable: Trascendentes tempranas".**	James Stewart.	Publisher: Thomson Learning.	2001
2	Reference	"Calculus". Volume I	Robert T. Smith y Roland B. Minton	McGraw-Hill, Second edition.	2003
3	Reference	Calculus	Edwin J. Purcell, Dale Varberg y Steven E. Rigdon	Prentice-Hall, Eighth edition.	2001

Course name: Physics II	Course ID: FI401

Location in curricular map: Third semester

Course description:

The course introduces students to Dynamics, Second Newton's Law, Work and Energy, Impulse and Momentum. Also Conservation Laws are studied in detail for conservative systems. In addition many laboratory practices are developed to have clear idea of the statistical handling of laboratory data. Students are supposed to know Algebra, Differential Calculus and the basis of Integral calculus.

General Learning Outcomes.

At the end of the course students are expected to:
Know the principles that make possible motion, under kinematical and kinetic laws of nature.
Apply knowledge to practical engineering application.
Give a correct measure of acceleration of gravity.
Use stroboscope to state equation of motion of objects.
Construct a prototype that illustrates clearly at least one principle of conservation.

Contents:	Hours
1. Kinematics: rectilinear motion.	**14**
1.1. General introduction.	
1.2. Course purposes and scope.	
1.3. Position, velocity, acceleration.	
1.4. Acceleration of gravity.	
1.5. Graphic analysis.	
1.6. Instantaneous and mean values.	
2. Dynamics in Cartesian coordinates.	
2.1. Free body and mass acceleration diagram.	
2.2. Forces depending on time.	**10**
2.3. Forces depending on position.	
2.4. Forces depending on velocity.	
3. Particle Dynamics in curvilinear coordinates.	

3.1. Tangent and normal coordinates. 3.2. Polar and cylindrical coordinates. 3.3. Dynamics and force determination. **4. Conservation.** 4.1 Work produced by force. 4.2 Conservation of energy. 4.3 Conservative forces. 4.4 Mechanical power. 4.5 Impulse and momentum. **5. Systems of particles and Rigid Bodies.** 5.1. Relative quantities. 5.2. Collisions. 5.3. Conserved quantities. 5.4. Type of motion of rigid bodies. 5.5. Mass moment of inertia. 5.6. Plane motion of rigid bodies..	**13** **13** **14**

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5. Project oriented learning, focused on local requirements of Engineering Science.
6. Visits to companies, in order to gather important information about state of art of the subject. When this strategy could not be pertinent, it can be substituted by conference or Case Analysis.

Evaluation:

The student's learning is to be measured under the following criteria:

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2. Engagement, honesty, seriousness, responsibility, attitude of participation and creativity expressed in the furtherance of learning outcomes.
3. Ability and dexterousness expressed in problem solving.
4. Fulfillment of proposed rubrics.
5. Reasonable attendance to class (when required 100% with no failure).

Form	**Instrument**	Percentage
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Objective tests	At a mid term and a final written exam.	45%
Diverse products	Class project by teams, e-portfolios. Evidence generation, according the nature of subject.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	**"Mechanics for engineers: Dynamics".**	Anthony Bedford y Wallace Fowler.	Pearson Education.	2000.
2	Reference	Vector Mechanics for Engineers, Dynamics	Ferdinand. P. Beer, E. Russell Johnston, William E. Clausen y George Staab	Publisher McGraw-Hill Science/Engineering/Math, 7th.	2003.
3	Reference	Engineering Mechanics: Dynamics	Russell C. Hibbler.	Publisher Prentice Hall, 7th.	1995.

Course name:	Course ID:
Numerical Methods	**MA403**

Location in curricular map: Third semester.

Course description:

In this course students will apply programming skills to develop algorithms and heuristic models to solve numerical problems of Engineering practice. Some techniques studied are: solving equations (algebraic and transcendental), interpolation, least squares, numerical integration, and applied projects to engineering problems. A programming language is required (Java, C#, similar or higher in mathematical capability).

General Learning Outcomes:

At the end of the course students are expected to:

Know and understand the methods of numerical analysis useful in engineering.
Write JAVA, C# (similar or higher) computer programs to solve transcendental equations by at least three different methods.
Determine definite integrals (convergent).
Determine interpolation, extrapolation and function description of curves with prescribed points.

Contents:	**Hours**
1. Numerical solution of equations.	**17**
1.1. General Introduction.	
1.2 Algorithms, iterative processes, rounding and error distribution.	
1.3 Iterative methods for equations in one unknown.	
1.4 Newton – Raphson method (NRM) and improved NRM.	
1.5 Regula Falsi.	
1.6 Linear interpolation.	
1.7 Lagrange polynomials.	
1.8 Divided differences (Newton Method).	
2. Numerical Integration and differentiation.	
2.1 Trapezoidal approximation.	**15**

2.4 Simpson's method. 2.5 Approximate differentiation. **2.4 Application: functions expressed by infinite series.** **3. Numerical Methods and Linear Algebra.** 3.1 Method of Cholesky. 3.2 Pivot strategies. 3.3 Method of Gauss. 3.4 Method of Gauss and Seidel. 3.5 Factoring special matrices. **4. Least squares.** 4.1 Estimating minimum error. 4.2 Straight line fitting. 4.3 Changes of variables to convert general to linear models. 4.4 Application project.	**17** **15**

Learning activities: All the activities are individual or by team (general group activities or integrating subgroups). They are classified in activities inside classroom (ICA) or outside classroom (OCA) ones. All ICA's are directed by the corresponding professor or expositor (if it could be convenient). Every OCA would be finished in a completely independent form, but under the proper supervision of Faculty. For every subject the learning activities could be at least the following (or others, similar or higher in pedagogical characteristics):

1. Case Analysis to state clearly the accomplishments of the course, properly linked to the real state of contemporary engineering.
2. Cooperative sessions to analyze and solve problems. When could be convenient laboratory sessions are mandatory, of course in presence of Faculty.
3. Learning based on structures and non structured problems. The goal is that students must state, solve and discuss proposals of solutions. They must evidence research and effective communications skills, in full accordance to Institutional Learning Outcomes.
4. Plenary discussions directed by students themselves and also directed by professor. Take care that this is not the only pedagogical strategy to be adopted.
5. Project oriented learning, focused on local requirements of Engineering Science.
6. Visits to companies, in order to gather important information about state of art of the subject. When this strategy could not be pertinent, it can be substituted by conference or Case Analysis.

Evaluation criteria and procedures:

The student's learning is to be measured under the following criteria:

1. Cooperative attitude, expressed by concrete and measurable actions that will be a clear evidence of the accomplishment of learning outcomes.
2. Engagement, honesty, seriousness, responsibility, attitude of participation and creativity expressed in the furtherance of learning outcomes.
3. Ability and dexterousness expressed in problem solving.
4. Fulfillment of proposed rubrics.
5. Reasonable attendance to class (when required 100% with no failure).

Form	**Instrument**	Percentage
Problem solving	Home works, questionnaires, essays, summaries, documental and data base researches.	35%
Objective tests	At a mid term and a final written exam.	45%
Diverse products	Class project by teams, e-portfolios. Evidence generation, according the nature of subject.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	**"Advanced Mathematics for Engineering".**	Erwn Kreyszig.	Limusa Wiley.	2000.
2	Reference	An Introduction to Numerical Methods and Analysis	James F. Epperson.	Publisher Wiley.	2001
3	Reference	Numerical Methods for Engineers: With Software and Programming Applications.	Steven C. Chapra y Raymond Canale.	Publisher McGraw-Hill.	2001

Course name:	Course ID:
Digital Electronics II	**CE405**

Location in curricular map: Third semester

Course description:
This course seeks to expose students to the design techniques for digital sequential circuits and their simulation. The designs must satisfy particular needs or interests of the students. During the course, advanced design techniques will be covered, using sequential and iterative circuit models. Medium and large scale circuits such as memories, counters and programmable logic devices will be used to design sequential digital circuits. Computer aided analysis and design will be used.
The student who takes this course must have knowledge and fundamentals of schematic diagrams, digital circuit construction, Boolean algebra simplification techniques and Karnaugh maps.

Course learning outcomes:
At the end of the course the student will:
Know and **comprehend:**
- The functioning of flip-flops.
- The principles of analog to digital and digital to analog conversions.
- The various types of programmable logic in the market.

Know how to:
- Design sequential circuits of Mealy and Moore types.
- Optimize sequential circuit designs via state and equation reduction.
- Design counter circuits that follow any counting sequence.
- Design cells for use in iterative circuits.
- Use medium and large scale integration devices for the design of sequential circuits.
- Use analog to digital and digital to analog converters for application development.
- Program logic devices for specific applications.
- Use simulation programs for digital circuits to aid in their design.

Course content:	Hours
1. Sequential circuits. 1.1. Introduction. 1.2. Flip-flops. 1.3. General model. 1.4. State diagrams. 1.5. State tables. 1.6. State reduction. 1.7. State assignment. 1.8. Input and output equations.	**16**
2. Iterative circuits. 2.1. Relationship between iterative and sequential circuits. 2.2. Parity detector design. 2.3. Magnitude comparator design. 2.4. Sequence detector design.	**16**
3. Design using medium and large scale design components. 3.1. Counter based design. 3.2. Multiplexer based design. 3.4. EPROM based design. 3.5. Analog to digital and digital to analog converters.	**16**
4. Design with programmable logic devices. 4.1. Types of devices. 4.2. General methodology. 4.3. Logic compiler. 4.4. File types. 4.5. Programming. 4.6. Simulation.	**16**

Learning activities: The learning experiences in this course will be individual and in groups; the in-class activities will be guided by the professor and the independent activities will be done by the student outside the classroom. The generic forms for the learning activities that will be done by the student are the following:

7. Collaborative work in the class room, guided by the professor, analyzing and debating the course topics.
8. Case study method to apply and evaluate scope and limitations of the course topics.
9. Cooperative work outside the classroom for case study analysis and problem solving.
10. Learning based on structured and non-structured problems in which the students learn to formulate problems and apply the course content to generate solutions, through individual efforts as well as in team efforts, via brainstorming.
11. Course topics presented by the professor, avoiding at all costs that this becomes the norm of the course.
12. Learning based on application projects in teams, so students apply their knowledge to projects of their own interest.

Evaluation criteria and procedures:
The performance of the students throughout the course will be based on the following criteria:

4. The availability and cooperation manifested in concrete actions, towards the achievement of the course learning outcomes.
5. The commitment, honesty, seriousness, responsibility, quality, participation and creativity manifested in the execution of the learning activities developed throughout the course.
6. The ability and skills manifested to solve specific problems worked throughout the course.

Taking into account the criteria mentioned above, the following evaluation scheme is suggested:

Form	**Instrument**	Percentage
Inquiry and problem solving	Individual and group homework tasks in the form of quizzes, essays, summaries, structured problem solving, bibliographical and internet research.	35%
Problem solving	Individual objective tests: Partial examinations and a final examination.	45%
Delivery of products	Application project, documental or field research, and team project report.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Fundamentals of logic design.	Charles H. Roth.	Thomson, fifth edition.	2003.
2	Reference	Digital systems: Principles and applications.	Ronald J. Tocci.	Prentice-Hall; novena edición.	2003.
3	Reference	Analysis and design of digital logic circuits.	Victor Nelson.	Prentice Hall.	1996.

Course name:	Course ID:
Advanced Communication in Spanish	**CS400**

Location in curricular map: Third semester.

Course description:

This course mainly develops, as a workshop, the practice of the process that the planning of different writings and speeches imply, and the oral presentation before different audiences to inform, motivate and convince.

Course learning outcomes:
At the end of the course, the student is expected to:

Know and apply skills regarding the ideal planning, structuring and writing of documents to communicate before an audience with a specific purpose.
Structure through writing information from different reliable sources that support an oral presentation before a determined audience. Oral and bodily communication with informative, motivational and persuasive discourses.
Design oral presentations that reflect the process learned in the course.
Construct an individual public presentation using verbal and visual supports.
Develop an analysis scheme from cases, exercises and videos and other dynamic techniques that allow students to improve their communication skills.

Contents:	**Hours**
1. Introduction, set up and antecedents 1.1. The process of human communication 1.2. Nature and purpose of the course 1.3. Importance and usefulness of the course to college students 1.4. Application video	**10**
2. Speech creative planning 2.1. Specification of the objective. 2.2. Selection of the topic 2.3. Drafting and writing of the speech 2.4. Role of the introduction and conclusion in a speech 2.5. Application video	**14**
3. Elaboration of speeches according to different purposes 3.1. Speech with information purposes 3.2. Speech with motivational purposes 3.3. Speech with persuasive purposes 3.4. Application video	**14**
4. Support for the communicator and his speech 4.1. Verbal Supports 4.2. Visual Supports 4.3. Visual Communication 4.4. Application Video	**14**
5. Good communicator characteristics 5.1. Credibility 5.2. Honesty 5.3. Knowing how to listen 5.4. Improvisation 5.5. Persuasion ethics 5.6. Application case.	**12**

Learning Activities: The learning experience in this course will be individual and in groups; some directed by the instructor and others will be carried out individually by the students outside the classroom. Those carried out by students will be held in the following way:

1. Collaborative work inside the classroom to analyze and debate over the contents under instructor supervision.
2. Case methods to apply and assess the scope and limitations of the course content.
3. Cooperative work outside the classroom to analyze cases and problem solving.
4. Learning based on structured and non-structured problems in order for students to learn to formulate problems and apply the course content by generating solutions, working individually as well as in groups after brainstorming.
5. Content presentation by the instructor, avoiding at all cost its becoming a costume throughout the course.
6. Learning based on application projects in groups, in order for students to apply their knowledge in these projects.

Evaluation criteria and procedures:

Students' performance throughout the course will be based on the following criteria:

1. The manifested willingness and cooperation concrete actions to achieve the learning objectives of each unit of the course's general objective.
2. The manifested commitment, honesty, seriousness, responsibility, quality, participation and creativity when executing all learning activities developed throughout the course.
3. The manifested ability and dexterity to solve specific problems throughout the course.

Considering the criteria mentioned above, the following Evaluation form is proposed:

Form	**Instrument**	Percentage
Interrogation and problem solving	Individual and group assignments in the form of questionnaires, essays, summaries, structured problems to solve and bibliographical or internet research.	35%
Problem solving	Individual objective tests: Partial and final exam.	45%
Product request	Application, documental or field research project and individual or group report of the project.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Communicate!	Rudolph F. Verderber	Thomson	1999
2	Reference	Oral Communication the Art, the Science of Public Speaking	Hielen McEntee de Madero	Alambra Mexicana	1992
3	Reference	Non-verbal Communication	Mark Knapp L.	Paidós	1997

Course name:	**Course ID:**
Cultural Appreciation II	CS404

Location in curricular map: Third semester

Course description:

This course is orchestrated with all the majors with the objective of presenting to students an integral vision of the fine arts.

This course is not designed to make students acquire or develop an artistic skill but to make them know and understand how the different artistic disciplines work.

If this understanding of art is achieved, a sense o appreciation of art, thinking and culture in its diverse expressions can be developed helping professionals to acquire a integral formation and a more diverse and complete thinking structure.

Course learning outcomes:
At the end of this course the student is expected to:
Know:
✱ The four great aspects of art.
✱ The social context and artistic disciplines and identify:
- ✱ **The different artistic disciplines**
- ✱ **The diverse genres of the artistic disciplines**
- ✱ The main aesthetic proposals
- ✱ The semantic, formal and cultural level of a work of art and/or an artistic manifestation.

Develop:
✱ Appreciation for the artistic aspects and expression of their interest.

✱ Opinions and points of view about artistic expressions beyond liking and aesthetic appreciation.
✱ Their body language.
✱ Their oral and written communication.

Contents:	**Hours**
1. Scenic arts. 1.1. Introduction and course set up. 1.2. Theater. 1.3. Dance. 1.4. Opera.	8
2. Visual arts. 2.1. Photography. 2.2. Cinema. 2.3. Painting. 2.4. Sculpture.	8
3. Literature. 3.1. Literature, literary criticism and creation. 3.2. Literary genres. 3.3. Literature selected topics.	8
4. Music. 4.1. Music and its language. 4.2. Elements of a musical work: Melody, harmony, rhythm, structure And lyric. 4.3. Musical genres, their expressions and evolution.	8

Learning Activities: The learning experience in this course will be individual and in groups; some directed by the instructor and others will be carried out individually by the students outside the classroom. Those carried out by students will be held in the following way:

1. Collaborative work inside the classroom to analyze and debate over the contents under instructor supervision.
2. Case methods to apply and assess the scope and limitations of the course content.
3. Cooperative work outside the classroom to analyze cases and problem solving.
4. Learning based on structured and non-structured problems in order for students to learn to formulate problems and apply the course content by generating solutions, working individually as well as in groups after brainstorming.
5. Content presentation by the instructor, avoiding at all cost its becoming a costume throughout the course.
6. Learning based on application projects in groups, in order for students to apply their knowledge in these projects.
7. Visits to museums, galleries, exhibits and artistic representations.

Evaluation criteria and procedures:

Students' performance throughout the course will be based on the following criteria:

1. The manifested willingness and cooperation with concrete actions to achieve the learning objectives of each unit of the course's general objective.
2. The manifested commitment, honesty, seriousness, responsibility, quality, participation and creativity when executing all learning activities developed throughout the course.
3. The manifested ability and dexterity to solve the specific problems throughout the course.

Considering the criteria mentioned above, the following Evaluation form is proposed:

Form	**Instrument**	Percentage
Interrogation and problem solving	Individual and group assignments in the form of questionnaires, essays, summaries, structured problems to solve bibliographical or internet research.	45%
Problem Solving	Individual objective tests: Partial and final exam.	25%
Product request	Application, documental or field research project and individual or group report of the project.	30%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	History of art: Slipcased.	Anthony H. W. y Janson Janson	Harry N Abrams	2001
2	Reference	Understanding music.	Jeremy Judkin	Prentice-Hall	2001
3	Reference	Bedford Introduction to Literature: Reading, Thinking, Writing.	Michael Meyer	Bedford/St. Martin's	2001

Course name:	Course ID:
Computer Architecture	**CE406**

Location in curricular map: Fourth semester

Course description:

This course exposes the students to the functioning and structure of a digital computer so that they can eventually describe its organization and internal functioning. Throughout the course the students will identify the relevant characteristics of various generations of digital computers and learn techniques to represent and convert numeric quantities of various computer numbering systems.

The student who takes this course must be able to analyze design and debug sequential circuits, use medium and large scale integration components, and be willing to learn with a favorable attitude towards team work.

Course learning outcomes:
At the end of the course the student will:

Know and **comprehend:**

- The internal workings of a computer.
- The representative machines of the generations of computers
- The various systems to represent quantities in a computer.
- The components of a digital computer.
- The architecture of a microprocessor.

Know how to:

- Explain the internal workings of a computer.
- Describe, given the general characteristics of a computer, the effect of these in the elements that conform it.
- Describe the relevant characteristics of the generations of computers.
- Convert numeric quantities between any numeric base.
- Do arithmetic operations in binary according to internal operation models for a computer.
- Design and construct electronic circuits to do arithmetic operations in a binary system.
- Describe, for a given computer organization, the sequence of micro-operations required for the execution of a specific instruction.
- Determine, given a set of instructions, the hardware elements necessary for their execution.
- Design the necessary control circuitry for the system to function according to specifications.
- Design the necessary circuitry to configure a memory array according to given specifications, using commercial components and adapting the design for speed and response requirements.
- Design the necessary circuitry and programming to communicate a basic processor with input and output elements.
- Do a program in assembly language.
- Construct an operational microcontroller including its memory and input/output systems.

Course content:	Hours
1. Computer organization. 1.1. Introduction. 1.2. Basic elements. 1.3. Differences between computers. 1.4. Internal function of computers.	**6**
2. Evolution of computers. 2.1. Representative machines of various generations of computers. 2.2. Outstanding characteristics.	**4**
3. Arithmetic logic unit and central processing unit. 3.1. Data representation. 3.2. Logic and arithmetic operation in binary. 3.3. Adders. 3.4. Multipliers. 3.5. Dividers. 3.6. Adding-subtraction. 3.7. Registers. 3.8. Transference between registers. 3.9. Tri-state gates. 3.10. Logic micro-operations.	**16**
4. Control unit, memory unit and input/output unit. 4.1. Instruction execution. 4.2. Control transference. 4.3. Control unit design. 4.4. Memory classification. 4.5. Internal memory organization. 4.6. Memory parameters. 4.7. Input/output unit generalities. 4.8. Input and output devices. 4.9. Input and output addressing.	**22**
5. Introduction to assembly language. 5.1. Microprocessor architecture. 5.2. Addressing modes. 5.3. Data movement instructions. 5.4. Arithmetic and logic instructions. 5.4. Program control instructions. 5.5. Assembler and linker.	**16**

Learning activities: The learning experiences in this course will be individual and in groups; the in-class activities will be guided by the professor and the independent activities will be done by the student outside the classroom. The generic forms for the learning activities that will be done by the student are the following:

1. Collaborative work in the class room, guided by the professor, analyzing and debating the course topics.
2. Case study method to apply and evaluate scope and limitations of the course topics.
3. Cooperative work outside the classroom for case study analysis and problem solving.
4. Learning based on structured and non-structured problems in which the students learn to formulate problems and apply the course content to generate solutions, through individual efforts as well as in team efforts, via brainstorming.
5. Course topics presented by the professor, avoiding at all costs that this becomes the norm of the course.
6. Learning based on application projects in teams, so students apply their knowledge to projects of their own interest.

Evaluation criteria and procedures:
The performance of the students throughout the course will be based on the following criteria:

1. The availability and cooperation manifested in concrete actions, towards the achievement of the course learning outcomes.
2. The commitment, honesty, seriousness, responsibility, quality, participation and creativity manifested in the execution of the learning activities developed throughout the course.
3. The ability and skills manifested to solve specific problems worked throughout the course.

Taking into account the criteria mentioned above, the following evaluation scheme is suggested:

Form	**Instrument**	Percentage
Inquiry and problem solving	Individual and group homework tasks in the form of quizzes, essays, summaries, structured problem solving, bibliographical and internet research.	35%
Problem solving	Individual objective tests: Partial examinations and a final examination.	45%
Delivery of products	Application project, documental or field research, and team project report.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Structured Computer organization	Andrew S. Tanenbaum.	Prentice Hall, fifth edition.	2005
2	Reference	Computer Organization and Architecture	William Stallings.	Prentice Hall, sixth edition.	2002.
3	Reference	Computer Organization and Design: The Hardware/Software Interface.	David. A Petterson, John L. Hennessy. Peter J. Ashenden, y James R. Larus, Daniel J. Sorin.	Morgan Kaufmann, third edition.	2004.

Course name:	Course ID:
Electrical Circuits	**CE407**

Location in curricular map: Fourth semester

Course description:

The purpose of this course is to develop the use of circuit analysis techniques in students. In this course only networks with passive elements will be covered, however the techniques that will be studied may be applied to any electrical circuit with passive and/or active elements. Various analysis methods will be covered, beginning with purely resistive circuits, then continuing with transient behavior of circuits with non-linear elements, and concluding with steady state behavior in alternate current circuits of the same type. It is recommended that this course be taken in parallel with Differential Equations and Physics III.

The student who takes this course must be able to solve simultaneous equations, as well as linear differential equations, and know the basic concepts of electricity and magnetism.

Course learning outcomes:
At the end of the course the student will:

Know and **comprehend:**

- The principles of measurement instrumentation.
- The effects of frequency in an electrical circuit.
- The characteristics of sinusoid signals and the application of phasors.
- The behavior of capacitors and inductors.

Know how to:

- Apply circuit analysis tools for resistive, RC, RL and RLC continuous current and alternating current circuits.
- Calculate currents, voltages and equivalent resistance in simple resistive circuits.
- Replace circuit portions for equivalents.
- Determine the transitory behavior of an RLC circuit.
- Analyze electrical circuits to determine their behavior.
- Adequately use electrical measurement instruments.
- Use simulation programs to aid in the analysis of electrical circuits.
- Do power consumption calculation for circuit elements.
- Modify circuits to improve their power factor without affecting their performance.

Course content:	**Hours**
1. Introduction to resistive circuits in continuous current. 1.1. Introduction. 1.2. Models theory. 1.3. Unit systems. 1.4. Circuit variables. 1.5. Circuit parameters. 1.6. Ohm's Law. 1.7. Kirchhoff's Law. 1.8. Series and parallel connections. 1.9. Voltage and current dividers. 1.10. Delta and star connections.	**12**
2. Analysis methods. 2.1. Nodal method. 2.2. Mesh method. 2.3. Linearity and superposition. 2.4. Thevenin and Norton theorems. 2.5. Source transformation. 2.6. Maximum energy transfer.	**14**

3. Transient circuit analysis. 3.1. Inductance and capacitance. 3.2. RC circuits. 3.3. RL circuits. 3.4. RLC circuits.	**14**
4. Analysis of circuits with sinusoidal excitation. 4.1. Sinusoidal wave characteristics. 4.2. Complex excitation functions. 4.3. Phasors. 4.4. Impedance and admittance. 4.5. Sinusoidal permanent regime response. 4.6. Nodes and mesh methods. 4.7. Superposition and source transformation. 4.8. Thevenin and Norton theorems. 4.9. Phasor diagram.	**14**
5. Mean power and effective values. 5.1. Instantaneous power. 5.2. Mean power. 5.3. Effective values of voltage and current. 5.4. Apparent power and power factor. 5.5. Complex power.	**10**

Learning activities: The learning experiences in this course will be individual and in groups; the in-class activities will be guided by the professor and the independent activities will be done by the student outside the classroom. The generic forms for the learning activities that will be done by the student are the following:

1. Collaborative work in the class room, guided by the professor, analyzing and debating the course topics.
2. Case study method to apply and evaluate scope and limitations of the course topics.
3. Cooperative work outside the classroom for case study analysis and problem solving.
4. Learning based on structured and non-structured problems in which the students learn to formulate problems and apply the course content to generate solutions, through individual efforts as well as in team efforts, via brainstorming.
5. Course topics presented by the professor, avoiding at all costs that this becomes the norm of the course.
6. Learning based on application projects in teams, so students apply their knowledge to projects of their own interest.

Evaluation criteria and procedures:
The performance of the students throughout the course will be based on the following criteria:

1. The availability and cooperation manifested in concrete actions, towards the achievement of the course learning outcomes.
2. The commitment, honesty, seriousness, responsibility, quality, participation and creativity manifested in the execution of the learning activities developed throughout the course.
3. The ability and skills manifested to solve specific problems worked throughout the course.

Taking into account the criteria mentioned above, the following evaluation scheme is suggested:

Form	**Instrument**	Percentage
Inquiry and problem solving	Individual and group homework tasks in the form of quizzes, essays, summaries, structured problem solving, bibliographical and internet research.	35%
Problem solving	Individual objective tests: Partial examinations and a final examination.	45%
Delivery of products	Application project, documental or field research, and team project report.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Fundamentals of Electric Circuits.	Charles K. Alexander. Matthew N.O. Sadiku.	McGraw-Hill Companies, second edition.	2002.
2	Reference	Basic Engineering Circuit Analysis.	J. David Irwin.	Wiley, seventh edition.	2001.
3	Reference	Introductory Circuit Analysis.	Robert L. Boylestad.	Prentice-Hall, tenth edition.	2002.

Course name:	Course ID:
Probability	**MA404**

Location in curricular map: Fourth semester.

Course description:

In this course students are required to understand the foundations of Probability theory. They will know about random variables, sampling, conditional probability, Bayes' theorem, and functions of random variables. Students are required to complete two Calculus courses and have a positive attitude through team work. Other objective is to properly formulate functions of random variables applied to engineering problems.

General Learning Outcomes.

At the end of the course students are expected to:

Know and understand the theorems and concepts related to random variables: discrete and continuous, functions of probability distributions, expected values and variance of random variables.

Describe and state numerically the behavior or random variables useful to calculate probabilities in engineering problems.

Contents:	**Hours**
1. General introduction.	
1.1. Random variables, samples and events.	**22**
1.2. Fundamental axioms.	
1.3. Models to enumerate sampling space.	
1.4. Addition rules.	
1.5. Conditional probability.	
1.6. Product laws and dependence of variables.	
1.7. Bayes' theorem.	
2. Random variables and probability distributions.	**20**
2.1. Random variables.	
2.2. Discrete distributions.	
2.3. Expected value and variance.	
2.4. Continuous distributions.	

2.5. Expected value and variance. 2.6. Joint probability distributions. 2.7. Dependence. 2.8. Functions of random variables. 2.9. Chebyshev's theorem. 2.10. Moments generating functions. **3. Special discrete functions.** 3.1. Uniform. 3.2. Bernoulli. 3.3. Binomial and Multinomial. 3.4. Geometric. 3.5. Hyper geometric. 3.6. Poisson. **4. Special continuous functions.** 4.1. Uniform. 4.2. Exponential. 4.3. Normal.	**12** **10**

Learning activities: All the activities are individual or by team (general group activities or integrating subgroups). They are classified in activities inside classroom (ICA) or outside classroom (OCA) ones. All ICA's are directed by the corresponding professor or expositor (if it could be convenient). Every OCA would be finished in a completely independent form, but under the proper supervision of Faculty. For every subject the learning activities could be at least the following (or others, similar or higher in pedagogical characteristics):

1. Case Analysis to state clearly the accomplishments of the course, properly linked to the real state of contemporary engineering.
2. Cooperative sessions to analyze and solve problems. When could be convenient laboratory sessions are mandatory, of course in presence of Faculty.
3. Learning based on structures and non structured problems. The goal is that students must state, solve and discuss proposals of solutions. They must evidence research and effective communications skills, in full accordance to Institutional Learning Outcomes.
4. Plenary discussions directed by students themselves and also directed by professor. Take care that this is not the only pedagogical strategy to be adopted.
5. Project oriented learning, focused on local requirements of Engineering Science.
6. Visits to companies, in order to gather important information about state of art of the subject. When this strategy could not be pertinent, it can be substituted by conference or Case Analysis.

Evaluation criteria and procedures:

The student's learning is to be measured under the following criteria:

1. Cooperative attitude, expressed by concrete and measurable actions that will be a clear evidence of the accomplishment of learning outcomes.
2. Engagement, honesty, seriousness, responsibility, attitude of participation and creativity expressed in the furtherance of learning outcomes.
3. Ability and dexterousness expressed in problem solving.
4. Fulfillment of proposed rubrics.
5. Reasonable attendance to class (when required 100% with no failure).

Form	**Instrument**	Percentage
Problem solving	Home works, questionnaires, essays, summaries, documental and data base researches.	35%
Objective tests	At a mid term and a final written exam.	45%
Diverse products	Class project by teams, e-portfolios. Evidence generation, according the nature of subject.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Probability and statistics for engineering and computer science applications.	J. Susan Milton y Jesé C. Arnold	McGraw-Hill, Fourth edition	2004
2	Reference	Probability problems	Piotr Marian Wisniewski y Gabriel Velazco Sotomayor	Thomson Learning	2001
3	Reference	Probability and statistics for engineers.	Sheldon Ross	McGraw-Hill, second edition	2001

Course name:	Course ID:
Differential Equations	**MA407**

Location in curricular map: Fourth semester.

Course description:
The course is designed to understand and apply derivatives to model engineering systems, in order to state and discuss a complete solution of the problem, and also the dynamic properties of it. Some topics treated are: first order equations (linear and special non linear cases), higher order equations (linear) and Laplace Transformation. For this course is mandatory a complete domain of Differential and Integral Calculus. The course is necessary to understand Control Theory, Advanced Dynamics, Thermodynamics and Fluid Mechanics.

General Learning Outcomes.
At the end of the course students are expected to:
State, solve, discuss and apply linear and special nonlinear first order differential equations, and also linear equations with constant coefficients of higher order.
Solve and discuss engineering problems using Laplace Transform.
Model engineering situations using appropriate differential equations and give a unique solution.

Contents:	**Hours**
1. General introduction.	
1.1 Definitions and terminology.	**8**
1.2 Initial value problems.	
1.3 Differential equations and modeling.	
2. First order differential equations.	**20**
2.1 Initial values.	
2.2 Separation of variables.	
2.3 Homogeneous equations.	
2.4 Exact equations.	
2.5 Linear equations.	
2.6 Equation of Bernoulli.	
2.7 Change of variables.	**8**
3. Modeling.	
3.1 Orthogonal trajectories.	
3.2 Linear equations.	
3.2 Non linear equations.	**14**

4. Higher order equations. 4.1 Theoretical basis. 4.2 Initial value and boundary value problems. 4.3 Homogeneous equations. 4.4 Non-homogeneous equations. 4.5 Reduction of order. 4.6 Linear equations, constant coefficients. 4.7 Undetermined coefficients. 4.8 Method of Annihilation. 4.9 Variation of parameters. **5. Laplace's transform.** 5.1 Definition. 5.2 Inverse. 5.3 Theorem of translation and transform of derivatives. 5.4 Transforms of integrals and periodical functions. 5.5 Applications. 5.6 Dirac Delta function. 5.7 Systems of linear equations.	**14**

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1. Case Analysis to state clearly the accomplishments of the course, properly linked to the real state of contemporary engineering.
2. Cooperative sessions to analyze and solve problems. When could be convenient laboratory sessions are mandatory, of course in presence of Faculty.
3. Learning based on structures and non structured problems. The goal is that students must state, solve and discuss proposals of solutions. They must evidence research and effective communications skills, in full accordance to Institutional Learning Outcomes.
4. Plenary discussions directed by students themselves and also directed by professor. Take care that this is not the only pedagogical strategy to be adopted.
5. Project oriented learning, focused on local requirements of Engineering Science.
6. Visits to companies, in order to gather important information about state of art of the subject. When this strategy could not be pertinent, it can be substituted by conference or Case Analysis.

Evaluation criteria and procedures:

The student's learning is to be measured under the following criteria:

1. Cooperative attitude, expressed by concrete and measurable actions that will be a clear evidence of the accomplishment of learning outcomes.
2. Engagement, honesty, seriousness, responsibility, attitude of participation and creativity expressed in the furtherance of learning outcomes.
3. Ability and dexterousness expressed in problem solving.
4. Fulfillment of proposed rubrics.
5. Reasonable attendance to class (when required 100% with no failure).

Form	**Instrument**	Percentage
Problem solving	Home works, questionnaires, essays, summaries, documental and data base researches.	35%
Objective tests	At a mid term and a final written exam.	45%
Diverse products	Class project by teams, e-portfolios. Evidence generation, according the nature of subject.	20%
	TOTAL	**100%**

Bibliography

	Type	Title	Author	Publisher	Year
1	Text	Differential equations with modeling applications	Dennis G. Zill	Publisher Thomson, seventh edition	2002
2	Reference	Differential equations with frontier value problems	Dennis G. Zill	Publisher Thomson, fifth edition	2002
3	Reference	Elementary Differential Equations	Earl D. Rainville, Phillip E. Bedient y Richard E Bedient	Prentice Hall, 8^{th}.	1996

Course name:	Course ID:
Physics III.	**FI402**

Location in curricular map: Fourth semester.

Course description:
This is a theoretical – practical course which considers the study of electrical charge, electrical fields, resistive circuits, alternating currents, magnetic fields, Maxwell equations and Optics (elements). The concepts of Vector Analysis studied in Physics I, and the principles of Calculus are indispensable in the course. Handling of trigonometric functions is strongly recommended.

General Learning Outcomes
At the end of the course students are expected to:
Know and understand the principles, related phenomena and interactions between charge and energy, capacitance, electro magnetic fields and magnetic induction.
Construct and analyze resistive, capacitive and inductive circuits and elements.
Construct and analyze optical devices according to contents.

Contents:	**Hours**
1. Electrostatics.	**14**
1.1. Introduction.	
1.2. Electric charge Coulomb´s law.	
1.3. Electric field.	
1.4. Gauss's theorem.	
1.5. Electric potential.	
2. Capacitance.	**10**
2.1. Definition and determination.	
2.2. Types of capacitors	
2.3. Series and parallel connections.	
2.4. Energy stores in capacitors.	
2.5. Dielectric constant and materials.	
3. Electric circuits.	**14**
3.1. Electric current and current density.	
3.2. Resistivity and conductivity.	
3.3. Ohm's law.	
3.4. Energy and electrical power.	
3.5. Electromotive force.	

3.6. Series and parallel connections. 3.7. Kirchoff's laws. 3.8. Node and Mesh analysis. 3.9. Theorem of superposition. **4. Magnetic phenomena.** 4.1. Magnets and fields. 4.2. Magnetic forces on charges. 4.3. Hall effect. 4.4. Biot-Savart's law. 4.5. Ampere´s law. 4.6. Solenoids and toroids. 4.7. Faraday's law of induction. 4.8. Lenz's law. 4.9. Generators and motors. 4.10. Inductance. **5. Foundations of optics.** 5.1. Nature and propagation of light. 5.2. Principles of Optics. 5.3. Reflection and refraction on flat surfaces. 5.4. Mirrors and lenses. 5.5. Interference and diffraction. 5.6. Electromagnetic spectra. 5.7. Polarization. 5.8. Lasers.	**14** **12**

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5. Project oriented learning, focused on local requirements of Engineering

Science.

6. Visits to companies, in order to gather important information about state of art of the subject. When this strategy could not be pertinent, it can be substituted by conference or Case Analysis.

Evaluation:

The student's learning is to be measured under the following criteria:

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2. Engagement, honesty, seriousness, responsibility, attitude of participation and creativity expressed in the furtherance of learning outcomes.
3. Ability and dexterousness expressed in problem solving.
4. Fulfillment of proposed rubrics.
5. Reasonable attendance to class (when required 100% with no failure).

Form	**Instrument**	Percentage
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Objective tests	At a mid term and a final written exam.	45%
Diverse products	Class project by teams, e-portfolios. Evidence generation, according the nature of subject.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Physics for Scientists and Engineers (with Physics Now and InfoTrac).	Raymond A. Serway, John W. Jewett.	Brooks Cole, 6th.	2003.
2	Reference	Fundamentals of Physics, Volume 2.	David Halliday, Robert Resnik, Jearl Walker	Wiley, 7th	2004
3	Reference	Physics – The nature of things Volume II	John Burke, Susan M. Lea.	International Thomson Editors.	2001

Course name:	Course ID:
Analog Electronics I	**CE408**

Location in curricular map: Fifth semester

Course description:

The course is focused first on the study of semiconductor materials and their electrical characteristics, then the unions of semiconductor materials, type N and P, and how these generate semiconductor diodes, the analysis of various types of diodes, lastly the study of transistors and the various configurations of amplifiers based on these.

The course has a strong emphasis in lab work to reinforce in a practical manner the theoretical aspects covered throughout the course.

The general topics for the course are: semiconductors, diodes, bipolar transistors and field effect transistors.

Course learning outcomes:
At the end of the course the student will:

- ***Know*** the electrical characteristics of semiconductor materials.
- ***Know*** and **comprehend** the operation principles of a semiconductor.
- ***Know how to do*** analysis of a circuit that contains semiconductor diodes.
- ***Know and comprehend*** the various types of diodes.
- ***Know how to do*** the design of a circuit with diodes for a specific application.
- ***Know*** *and* ***comprehend*** the operation and configuration principles of amplifiers based on bipolar transistors.
- ***Know how to do*** amplifier design based on bipolar transistors.
- ***Know how to do*** the design of commutation circuits based on bipolar transistors.
- ***Know*** *and* ***comprehend*** the operation and configuration principles of amplifiers based on field effect transistors.
- ***Know how to do*** the design of amplifiers based on field effect transistors.
- ***Know how to do*** the integration of various types of amplifiers for a specific application.
- ***Know*** *and* ***comprehend*** the importance of a systems approach for an engineer, and the application of this throughout the course, via the interaction with classmates from his or her academic program and others, thus developing positive attitudes towards interdisciplinary collaborative and cooperative work.

Course content:	Hours
1. SEMICONDUCTOR MATERIALS 1.1. Introduction. 1.2 Charge, potential, mobility and conductivity. 1.3 Characteristics of an intrinsic semiconductor. 1.4 Impurity and charge density in a semiconductor. 1.5 Properties of silicon and germanium. 1.6 Potential variation in a semiconductor.	**8**
2. DIODES 2.1 The ideal PN diode. 2.2 The PN diode as a rectifier. 2.3 V/I characteristics of the diode and its variation with temperature. 2.4 Dynamic resistance. 2.5 Circuit analysis with common diodes. 2.6 Characteristics of zener diodes. 2.7 Analysis and design of circuits with zener diodes. 2.8 Other diodes and thyristors.	**16**
3. BIPOLAR TRANSISTORS 3.1 NPN and PNP transistors. 3.2 Current amplification in the transistor. 3.3 Qualitative analysis of the common base configuration. 3.4 Common emitter amplifier configuration. 3.5 Power calculations. 3.6 Coupling and de-coupling capacitors. 3.7 Follower-emitter configuration. 3.8 Small signal analysis. 3.9 Cascade amplifiers. 3.10 Differential amplifiers. 3.11 Darlington amplifier.	**26**
4. FIELD EFFECT TRANSISTORS 4.1 FET characteristics. 4.2 The FET union. 4.3 The metal oxide semiconductor FET. 4.4 FET operation modes.	**14**

Learning activities: The learning experiences in this course will be individual and in groups; the in-class activities will be guided by the professor and the independent activities will be done by the student outside the classroom. The generic forms for the learning activities that will be done by the student are the following:

1. Collaborative work in the class room, guided by the professor, analyzing and debating the course topics.
2. Case study method to apply and evaluate scope and limitations of the course topics.
3. Cooperative work outside the classroom for case study analysis and problem solving.
4. Learning based on structured and non-structured problems in which the students learn to formulate problems and apply the course content to generate solutions, through individual efforts as well as in team efforts, via brainstorming.
5. Course topics presented by the professor, avoiding at all costs that this becomes the norm of the course.
6. Learning based on application projects in teams, so students apply their knowledge to projects of their own interest.

Evaluation criteria and procedures:
The performance of the students throughout the course will be based on the following criteria:

1. The availability and cooperation manifested in concrete actions, towards the achievement of the course learning outcomes.
2. The commitment, honesty, seriousness, responsibility, quality, participation and creativity manifested in the execution of the learning activities developed throughout the course.
3. The ability and skills manifested to solve specific problems worked throughout the course.

Taking into account the criteria mentioned above, the following evaluation scheme is suggested:

Form	**Instrument**	**Percentage**
Formative aspects, Values and Attitude	Rubric	10%
Evaluation of Knowledge	Partial and Final Examinations	35%
Problem Solving and Documental Research	Homework tasks	20%
Evaluation of Skills and Abilities	Lab Practices and Final Project	35%
	TOTAL	**100%**

Bibliography

No.	Type	Title	Author	Publisher	Year
1	Text	Electronics: Circuit theory and electronic devices	Robert L. Boylestad, Louis Nashelsky	Pearson Education, 8th edition.	2001
2	Reference	Principles of electronics	Albert P. Malvino	McGraw Hill, sixth edition.	1998
3	Reference	Discrete and integrated electronic circuits	Donald L. Schilling	McGraw Hill	1993

Course Name: Advanced Communication in English	Course ID: ID400

Placement in Curricular map: Fifth Semester

Course description: This course represents another space in the curriculum through which the nuances of internationalization of all majors at CETYS university are propelled. In the case of this course, its objet is the study of the English language, but from a professional practice point of view. In this class, students will have the opportunity to substantially improve their mastery of the English language, especially though an intensive approach of speaking and writing. This course involves a series of learning activities through which students will have to make use of the language in typical conditions of the practice of their major, as well as in social interaction, with the intention of improving their oral and written skills as well as the vocabulary associated to their studies. On the other hand, this course is critical for students who wish to participate in academic exchange programs with foreign universities where the official language is English. This course demands a positive attitude toward collaborative and cooperative learning from its participants, an ability to work in groups, and a commitment to Continuous Improvement in their mastery of the English language.

Course learning outcomes:
At the end of this course the student is expected to:

Master the **English language by speaking and writing correctly, in order to continue improving the use of the language.**
Understand the importance of the English language in a professional sphere, and specifically in activities in which English is common in their professional life.
Use the sources of information that can help maintain technical vocabulary updated in their professional career.
Use the terminology, in English, associated to the practice of their career.
Know how to follow a job interview fluently in English, as well as work meeting and presentations.

Formulate their professional resume in English, as well as other legal and work documents related to the practice of their career.

Employ the vocabulary of their studies correctly and abundantly, in English.

Course content:	**Hours**
Unit 1. English in the work place, people, and organizations. 1.1. Introduction and course overview. **1.2. Organizational structure.** **1.3. Work, forms of work, and people at work.** **1.4. Directive styles and business leaders.** **1.5. Recruitment and personnel selection: Skills and competencies.**	**16**
Unit 2. English in the functional areas of an organization. 2.1. Marketing, markets, and competition. 2.2. Product design, innovation, and development. 2.3. Materials, suppliers, and production. 2.4. Money in finances and economy. 2.5. Business philosophies.	**16**
Unit 3. English in people and business skills. 3.1. Time and its management. 3.2. Stress management. 3.3. Meetings, group work, and presentations. 3.4. Negotiating skills. 3.5. Telephone calls, fax, and e-mail.	**16**
Unit 4. English in organizational culture and values. 4.1. Cultures and organizational culture. 4.2. Power management and distance among cultures. 4.3. Tran cultural business practices. 4.4. Corporate acquisitions and alliances. 4.5. Corporate and product image.	**16**

Learning Activities:
The learning experience in this course will be individual and in groups; some directed by the instructor and others will be carried out individually by the student outside the classroom. Those carried out by students will be held in the following way:

1. Collaborative work in the classroom to analyze and debate over course content under instructor supervision.

2. Case methods to apply and assess the scope and limitations of the course content.

3. Cooperative work outside the classroom to analyze cases and problem solving.

4. Learning based on structured and non-structured problems in order for students to learn formulate problems and the course content by generating solutions, working individually as well as in groups, after brainstorming.

5. Content presentation by the instructor, avoiding at all cost its becoming a custom throughout the course

6. Learning based on application projects in groups in order for students to apply their knowledge in these projects..

Evaluation criteria and procedures:
Students' performance throughout the course Hill be base don the following criteria:

1. The manifested willingness and cooperation with concrete actions to achieve the learning objectives of each unit of the course's general objective.
2. The manifested commitment, honesty, seriousness, responsibility, quality, participation, and creativity when executing all learning activities developed throughout the course.
3. The manifested ability and dexterity to solve specific problems throughout the course.

Considering the criteria mentioned above, the following Evaluation form is proposed:

Form	**Instrument**	**Percentage**
Interrogation and problem solving.	Individual and group assignments, in the form of questionnaires, essays, structured problems to solve biographical or internet research	35%
Problem solving	Individual objective tests: partial and final exam.	45%
Product Request	Application, documental or field research project and individual or group report of the project.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Business Vocabulary in Use Advanced.	Bill Mascull.	Cambridge University Press.	2004.
2	Reference	Business Vocabulary in Use intermediate.	Bill Mascull.	Cambridge University Press.	2002.
3	Reference	Common American Phrases in Everyday Contexts: A Detailed Guide to Real-Life Conversation and mall Talk	Richard A. Spears.	McGraw-Hill, second edition	2002.

CETYS
UNIVERSIDAD

Course name:	**Course ID:**
Data Structures	**CC404**

Location in curricular map: Fifth semester.

Course Description.

The principal goal of the course is initiate students in scientific organization of computer data, it offers a modern treatment of Data Structures and gives an object oriented viewpoint, files, lists, arrays, trees, tables and other structures are analyzed and developed. Algorithms are studied under a concept level and then implemented in C++ language or similar in capabilities. Courses on Computer Programming (I II) are mandatory as previous requisites.

General Learning Outcomes:
At the end of the course students are expected to:

Identify several data types, apply the concept of Abstract Data Type (ADT)
Define the complexity time function.
Provide theoretical sustain and structures of TAD in concrete examples.
Apply the concept of Queue and Stack, Binary Tree and Graph.

Foundations.	**Hours**
1.1 General introduction. 1.2 Abstract Data Types. 1.3 Foundations of Programming Languages. 1.4 Sorting.	**20**
Linear Lists.	
2.1 Linear ADT. 2.2 Sequential adressing. 2.3 Linked lists. 2.4 Piling. 2.4 Queues.	14

Trees. 3.1 Binary tree ADT. 3.2 Operations. 3.3 Searching binary trees. 3.4 Balanced binary trees. Graphs. 4.1 Concepts definitions and uses. 4.2 Graph and ADT. 4.3 Algorithms. 4.3 Applications.	**14** **16**

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Evaluation criteria and procedures:

The student's learning is to be measured under the following criteria:

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3. Ability and dexterousness expressed in problem solving.
4. Fulfillment of proposed rubrics.
5. Reasonable attendance to class (when required 100% with no failure).

Form	**Instrument**	Percentage
Problem solving	Home works, questionnaires, essays, summaries, documental and data base researches.	35%
Objective tests	At a mid term and a final written exam.	45%
Diverse products	Class project by teams, e-portfolios. Evidence generation, according the nature of subject.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Editorial**	**Year**
1	Text	Algorithms and data structures in C. ISBN: 84-481-4077-X	Joyanes A.,L. y Zahonero M	McGraw Hill: España.	2004
2	Reference	Object Oriented Data Structures and Algorithms.	Heileman G.L.	McGraw Hill: México.	1998
3	Reference	Visual Studio .NET online help.	Microsoft.	On line.	2009

Course name:	Course ID:
Statistical Inference	**MA405**

Curricular location: Fifth semester

Course description:

In this course students learn about classical statistics methods, as analysis aids to facilitate decision making in planning, design and operate control systems of his (her) interest. Students will formulate, design, operation and control of systems base don the numerical data taken from samples. A terminal project will be carried to ensure application of the course contents. Probability basis and Calculus are mandatory.

General Learning Outcomes.
At the end of the course students are expected to:

Analyze data using Statistics tools.
Apply sampling to decisions making.
Apply Analysis of variance and Hypothesis testing.
Apply estimation and confidence intervals for means, variances and standard deviations.

	Hours
General Introduction. 1.1. Definitions. 1.2. Statistical inference and descriptive Statistics. 1.3. Descriptive models in Statistics. 1.4. Central tendency measurements. 1.5. Proportions.	**6**
Sampling 2.1. Random sampling. 2.2. Sampling distributions. 2.3. Central Limit Theorem. 2.4. Normal distribution. 2.5. t-Student. 2.6. Squared Chi.	**18**

2.7. F Distribution. Estimation. 3.1. Types. 3.2. Point estimators. 3.3. Estimators for central tendency measurements and confidence intervals. Hypothesis testing. 4.1. Elements. 4.2. Type - I Type II errors. 4.3. Hypothesis for mean and standard deviation.	**18** **22**

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Diverse products	Class project by teams, e-portfolios. Evidence generation, according the nature of subject.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Editorial**	**Year**
1	Text	Probability and statistics applied to engineering.	Douglas C. Montgomery y George C. Runger.	McGraw Hill	2004
2	Reference	Probability and statistics with applications to engineering and computer sciences.	J. Susan Milton y Jesse C. Arnold J.	McGraw Hill	2004
3	Reference	Statistics for business and economics.	David R. Anderson, Dennis J Sweeney, Thomas A. Williams.	South Western College	2004

Course name:	Course ID:
Operating Systems	**CC406**

Location in curricular map: Fifth semester

Course description.

This course is related with strong abilities and skills beyond programming, which are those related to stating the optimal conditions of software environment and the design of the software platform to facilitate the performance of programs and systems. Some of the operating systems considered are: Linux (similar or higher) and programming languages like C, Java, similar or higher in computability resources.

General Learning Outcomes.
At the end of the course students are expected to:

Know and understand the conditions of operation, hardware demands and benefits of several Operating Systems.

Project the best and most pertinent operating system to be installed under diverse conditions.

Distinguish the possible breaks of a system and evaluate its operation.

Understand the algorithms used to administrate computer's memory.

Apply System Engineering.

Course Content	**Hours**
Introduction.	
1.1 Preview.	**6**
1.2 What is an Operating System (OS)?	
1.3 History of Operating Systems.	
1.4 The various OSs.	
1.5 Hardware.	
1.6 General concepts.	
1.7 System petitions.	
1.8 Structure of an OS.	
Processes and Threads	**18**
2.1 Processes.	
2.2 Sub processes.	
2.3 Communication.	
2.4 Usual problems.	
2.5 Time planning.	
2.6 Resources.	
2.7 Irreversible blockades.	
2.8 Ostrich algorithm.	
2.9 Detection and recovery of blockades.	
2.10 How to avoid mutual blockades.	
2.11 Prevention.	
Memory administrations.	**18**
3.1 Basic memory.	
3.2 Interchange.	
3.3 Virtual Memory.	
3.4 Page replacement algorithm.	
3.5 Modeling.	
3.6 Designing systems with paging.	
3.7 Implementation.	
3.8 Segmentation.	
File Input / Output.	
4.1 Hardware.	**11**
4.2 Software.	
4.3 Layers.	
4.4 Disks.	
4.5 Clocks.	
4.6 Character oriented terminal.	
4.7 User graphic interface.	
4.8 Network terminal.	
4.9 Energy Administration.	
4.10 Files	
4.11 Directories.	
4.12 Implementation of system files.	
4.13 Examples.	11
Safety	
5.1 Safe environment.	
5.2 Authentication.	
5.3 Inside Attacks.	
5.4 Outside Attacks.	
5.5 Protection Mechanisms.	

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Evaluation criteria and procedures:

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2. Engagement, honesty, seriousness, responsibility, attitude of participation and creativity expressed in the furtherance of learning outcomes.
3. Ability and dexterousness expressed in problem solving.
4. Fulfillment of proposed rubrics.
5. Reasonable attendance to class (when required 100% with no failure).

Form	**Instrument**	Percentage
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Diverse products	Class project by teams, e-portfolios. Evidence generation, according the nature of subject.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Editorial**	**Year**
1	Text	Modern Operating Systems	Andrew S. Tannenbaum	Prentice Hall	2008
2	Reference	Sistemas Operativos: Una visión aplicada	Jesús E. Carretero	McGraw Hill	2008
3	Reference	How to Progam in Java	Harvey M. Deitel	Prentice Hall	2004

Course name:	Course ID:
Microprocessor Design	**CE409**

Location in curricular map: Sixth semester

Course description:

In this course the student will be exposed to the fundamental designs of computer systems based on 16 and 32 bit microprocessors including their characteristics and programming, as well as the devices they will interact with. During the course, the students will develop abilities for computer aided design as well as time analysis. The course contemplates an integrating final project that consists in the design of a basic computer system for a specific application the student selects. This course uses knowledge and abilities acquired in the Computer Architecture course regarding assembly language programming, as well as knowledge and abilities form the Digital and Analog Electronics courses to design the communication elements of the system. This course is important for courses that appear in the next semesters such as: Interface Design, Control Systems and Mechatronics.

Course learning outcomes:

At the end of the course the student will:

Know and comprehend:

The characteristics of a microprocessor, the selection process of a microprocessor, the support circuitry for the microprocessor to work, the applications of the memory map and devices.

The function of the input and output ports, the interconnection characteristics of input/output devices, the principles of operations of input/output devices.

Know how to do:

- The analysis of a minimum system based on a microprocessor using computer based design tools and time analysis.
- The design of the communication interconnection ports to input and output data.
- The design of basic input/output devices.
- Assembly language programs for a selected microprocessor for the realization of specific operations.
- The design of a minimum system based on a microprocessor using computer based design tools.
- Collaborative and cooperative work in a team environment.

Course content:	Hours
Unit 1: Introduction to microprocessors. 1.1. Introduction. 1.2. Advantages of microprocessor design. 1.2. Basic elements of a microprocessor. 1.3. Electrical and time characteristics of a microprocessor. 1.4. Design phases. 1.5. Diagnostic tools.	**12**
Unit 2: The microprocessor. 2.1. Basic concepts. 2.2. Internal organization. 2.3. Communication channels. 2.4. Support circuitry. 2.5. Minimum configuration. 2.6. Instruction set.	**24**
Unit 3: Memory subsystems. 3.1. Internal characteristics and organization. 3.2. Memory maps. 3.3. Boot programs. 3.4. Memory arrays. 3.5. Synchronization of the microprocessor.	**20**
Unit 4: Input/output devices. 4.1. Addressing and device mapping. 4.2. Keyboards and switches. 4.3. Luminous indicators and screens. 4.4. Relays and actuators. 4.5. Interface with analog devices.	**20**
Unit 5: Applications. 5.1. Data acquisition systems. 5.2. Process control. 5.3. Automatic test systems.	**20**

Learning activities: The learning experiences in this course will be individual and in groups; the in-class activities will be guided by the professor and the independent activities will be done by the student outside the classroom. The generic forms for the learning activities that will be done by the student are the following:

1. Collaborative work in the class room, guided by the professor, analyzing and debating the course topics.
2. Case study method to apply and evaluate scope and limitations of the course topics.
3. Cooperative work outside the classroom for case study analysis and problem solving.
4. Learning based on structured and non-structured problems in which the students learn to formulate problems and apply the course content to generate solutions, through individual efforts as well as in team efforts, via brainstorming.
5. Course topics presented by the professor, avoiding at all costs that this becomes the norm of the course.
6. Learning based on application projects in teams, so students apply their knowledge to projects of their own interest.

Evaluation criteria and procedures:
The performance of the students throughout the course will be based on the following criteria:

1. The availability and cooperation manifested in concrete actions, towards the achievement of the course learning outcomes.
2. The commitment, honesty, seriousness, responsibility, quality, participation and creativity manifested in the execution of the learning activities developed throughout the course.
3. The ability and skills manifested to solve specific problems worked throughout the course.

Taking into account the criteria mentioned above, the following evaluation scheme is suggested:

Form	**Instrument**	Percentage
Inquiry and problem solving	Individual and group homework tasks in the form of quizzes, essays, summaries, structured problem solving, bibliographical and internet research.	40%
Problem solving	Individual objective tests: Partial examinations and a final examination.	40%
Delivery of products	Application project, documental or field research, and team project report.	20%
	TOTAL	**100%**

Bibliography

No.	**Type**	**Title**	**Author**	**Publisher**	**Year**
1	Text	Microprocessors and Microcomputer-based system design	Rafiquzzaman, Mohamed	CRC press 5^{th} edition	2005
2	Reference	Intel Microprocessors	Barry B. Brey	Prentice Hall.	2002
3	Reference	Fundamentals of logic design and computers	Mano, Morris	Prentice-Hall.	2005

Course name:	Course ID:
Analog Electronics II	**CE410**

Location in curricular map: Sixth semester

Course description:
This course continues the learning begun in the Analog Electronics I course, regarding the transistors, introducing now the study of linear integrated circuits, their configurations, use and applications.
The general topics of the course are: Introduction to linear circuits, general purpose amplifiers, active filters, voltage regulators, comparators, timers and function generators, commutation sources

Course learning outcomes:
At the end of the course the student will:

- ***Know*** and **comprehend** the various characteristics of linear integrated circuits.
- ***Know*** and **comprehend** the various characteristics of operational amplifiers, their configurations and applications.
- ***Know how to do*** analysis of electronic circuits as well as basic and specific applications that involve operational amplifiers.
- ***Know how to do*** design, implementation and tests of electronic circuits that involve operational amplifiers to solve application problems.
- ***Know how to do*** the integration of various basic and specific application circuits for problem solving.
- ***Know how to do*** the preliminary analysis, design and evaluation of a system integrated by various electronic circuits based on linear integrated circuits for the solving of application problems.
- ***Know*** *and* ***comprehend*** the importance of a systems approach for an engineer, and the application of this throughout the course, via the interaction with classmates from his or her academic program and others, thus developing positive attitudes towards interdisciplinary collaborative and cooperative work.

Course content:	Hours
1. INTRODUCTION TO THE OPERATIONAL AMPLIFIER 1.1 Introduction. 1.2 Linear circuits. 1.3 Definition and characteristics of the operational amplifier. 1.4 Primary characteristics of the operational amplifier. 1.5 Operational amplifier configurations. 1.6 Instrumentation amplifiers. 1.7 Comparators. 1.8 Level and zero crossing detectors. 1.9 Application.	**18**
2. FILTROS ACTIVOS 2.1 Introduction. 2.2 Active filters. 2.3 Active filter configurations using operational amplifiers. 2.4 Active filters and integrated circuits. 2.5 Applications.	**18**
3. TIMERS AND FUNCTION GENERATORS 3.1 Introduction. 3.2 The LM555 timer. 3.3 Integrated circuit function generators.	**12**
4. REGULATORS 4.1 Introduction. 4.2 Regulators in series and parallel. 4.3 Linear regulators. 4.4 Commutation sources. 4.5 Types of commutation regulators. 4.6 Applications.	**16**

Learning activities: The learning experiences in this course will be individual and in groups; the in-class activities will be guided by the professor and the independent activities will be done by the student outside the classroom. The generic forms for the learning activities that will be done by the student are the following:

1. Collaborative work in the class room, guided by the professor, analyzing and debating the course topics.
2. Case study method to apply and evaluate scope and limitations of the course topics.
3. Cooperative work outside the classroom for case study analysis and problem solving.
4. Learning based on structured and non-structured problems in which the students learn to formulate problems and apply the course content to generate solutions, through individual efforts as well as in team efforts, via brainstorming.
5. Course topics presented by the professor, avoiding at all costs that this becomes the norm of the course.
6. Learning based on application projects in teams, so students apply their knowledge to projects of their own interest.

Evaluation criteria and procedures:
The performance of the students throughout the course will be based on the following criteria:

1. The availability and cooperation manifested in concrete actions, towards the achievement of the course learning outcomes.
2. The commitment, honesty, seriousness, responsibility, quality, participation and creativity manifested in the execution of the learning activities developed throughout the course.
3. The ability and skills manifested to solve specific problems worked throughout the course.

Taking into account the criteria mentioned above, the following evaluation scheme is suggested:

Form	**Instrument**	**Percentage**
Formative aspects, Values and Attitude	Rubric	10%
Evaluation of Knowledge	Partial and Final Examinations	35%
Problem Solving and Documental Research	Homework tasks	20%
Evaluation of Skills and Abilities	Lab Practices and Final Project	35%
	TOTAL	**100%**

Bibliography

No.	**Type**	**Title**	**Author**	**Publisher**	**Year**
1	Text	Linear integrated circuits and operational amplifiers	Coughlin, Robert F.; Driscoll, Frederick F.	Prentice-Hall, sixth edition.	2000
2	Reference	Operational Amplifier Circuits: Analysis and Design	John C. C. Nelson.	Newnes, 2nd edition.	1995
3	Reference	Electronics: Circuit theory and electronic devices	Robert L. Boylestad, Louis Nashelsky	Pearson Education 8th edition.	2001

Course name:	**Course ID:**
Control Systems	**CE411**

Location in curricular map: Sixth semester

Course description:
During this course the student will be exposed to the study of linear control theory, as well as the design and use of controllers in continuous and discrete processes that have feedback elements.
The general topics of the course are: Introduction to Control Systems, Feedback Control Systems and their Modeling, Stability in Feedback Control Systems, Design of Feedback Control Systems and Introduction to Digital Control Systems.

Course learning outcomes:
At the end of the course the student will **know**, **comprehend** and **apply**:

- The theory of feedback linear control systems.
- Stability analysis and design for linear control systems.
- Steady state analysis and design for linear control systems.
- Controller design for linear control systems.

At the end of the course the student will also ***know*** *and* ***comprehend*** the importance of a systems approach for an engineer, and the application of this throughout the course, via the interaction with classmates from his or her academic program and others, thus developing positive attitudes towards interdisciplinary collaborative and cooperative work.

Course content:	Hours
1.INTRODUCTION TO CONTROL SYSTEMS 1.1 Introduction. 1.2 Historical background of process control. 1.3 Control process definitions and concepts. 1.4 Control system elements. 1.5 Classification of control systems.	**10**
2. FEEDBACK CONTROL SYSTEMS AND THEIR MODELING 2.1 Introduction. 2.2 System modeling. 2.3 Frequency domain modeling. 2.4 Time domain modeling. 2.5 Time response. 2.6 Reduction of multiple subsystems. 2.7 Applications.	**18**
3. STABILITY IN FEEDBACK CONTROL SYSTEMS 3.1 Introduction. 3.2 Stability. 3.3 Steady state error. 3.4 Root locus. 3.5 Applications.	**18**
4. DESIGN OF FEEDBACK CONTROL SYSTEMS AND INTRODUCTION TO DIGITAL CONTROL SYSTEMS 4.1 Introduction. 4.2 Design via root locus. 4.3 Frequency response. 4.4 Design via frequency response. 4.5 Design via state space. 4.6 Digital control systems. 4.7 Applications.	**18**

Learning activities: The learning experiences in this course will be individual and in groups; the in-class activities will be guided by the professor and the independent activities will be done by the student outside the classroom. The generic forms for the learning activities that will be done by the student are the following:

1. Collaborative work in the class room, guided by the professor, analyzing and debating the course topics.
2. Case study method to apply and evaluate scope and limitations of the course topics.
3. Cooperative work outside the classroom for case study analysis and problem solving.
4. Learning based on structured and non-structured problems in which the students learn to formulate problems and apply the course content to generate solutions, through individual efforts as well as in team efforts, via brainstorming.
5. Course topics presented by the professor, avoiding at all costs that this becomes the norm of the course.
6. Learning based on application projects in teams, so students apply their knowledge to projects of their own interest.

Evaluation criteria and procedures:
The performance of the students throughout the course will be based on the following criteria:

1. The availability and cooperation manifested in concrete actions, towards the achievement of the course learning outcomes.
2. The commitment, honesty, seriousness, responsibility, quality, participation and creativity manifested in the execution of the learning activities developed throughout the course.
3. The ability and skills manifested to solve specific problems worked throughout the course.

Taking into account the criteria mentioned above, the following evaluation scheme is suggested:

Form	**Instrument**	**Percentage**
Formative aspects, Values and Attitude	Rubric	10%
Evaluation of Knowledge	Partial and Final Examinations	35%
Problem Solving and Documental Research	Homework tasks	20%
Evaluation of Skills and Abilities	Lab Practices and Final Project	35%
	TOTAL	**100%**

Bibliography

No.	**Type**	**Title**	**Author**	**Publisher**
1	Text	Control Systems Engineering	Norman Nise S.	Wiley and Sons, 2004.
2	Reference	Control Solutions to accompany Control Systems Engineering	Norman Nise S.	Wiley and Sons, 2004.
3	Reference	Process Control and Instrumentation Technology	Curtis D. Johnson	Publisher Prentice-Hall., 2002.

Course Name: Research Methodology	Course ID: CS402

Placement in curricular map: Sixth Semester

Course description:
Develop in students a solid platform of information to develop basic research procedures on topics related to their major's field of work.

Course learning outcomes:
At the end of this course the student is expected to:

Apply fundamental models of research.

Design a system to identify in different cases the inherent problems of areas susceptible to research.

Build: information analysis, discerning between relevant and irrelevant facts.

Elaborate a writing in which a research problem is posed, that includes: definition of problem, objectives, justification, and delimitation.

Build A theoretical research frame proposed on the previous paragraph.

Operate the research hypothesis, defining, variables, indicators, measurement instruments, population, and sample.

Elaborate a research report.

Apply a strategy that allows for an adequate detection of information sources, discarding, based on its methodology fundaments, those that are not reliable.

Defend the importance of scientific research for any professional.

Elaborate a Project according to the appropriate methodology, which will be physically carried out and presented in the school facilities.

Course Content:	Hours
Unit 1 Establishing the problem 1.1 Science and the professional. 1.2 Ways of approaching knowledge. 1.3 Topics susceptible to being analyzed. 1.4 Research approaches. 1.5 Research Models 1.6 Establishing a problem 1.7 Application cases and problems.	**13**
Unit 2 Theoretical framework of research. 2,1 Collection of documented information. 2.2 Collection of empirical information. 2.3 Elaboration of the theoretical framework. 2.4 Application cases and problems.	**13**
Unit 3 Hypothesis 3.1 Hypothesis Determination 3.2 Sampling 3.3 Elaboration of the instrument for information collection. 3.4 Case and applications study.	**13**
Unit 4 Final Report. 4.1 Information processing using SPSS. 4.2 Elaboration of research reports. 4.3 Case and applications study.	**13**
Unit 5 Project: development of an enterprising model. 5.1 Exploration of the enterprising model. 5.2 Selection of the enterprising model. 5.3 Development of the enterprising model. 5.4 Presentation of the enterprising model. 5.5 Evaluation of the enterprising model.	**12**

Learning Activities:
The learning experience in this course will be individual and in groups; some directed by the instructor and others will be carried out individually by the student outside the classroom. Those carried out by students will be held in the following way:

1. Collaborative work in the classroom to analyze and debate over course content under instructor supervision.

2. Case methods to apply and assess the scope and limitations of the course content.

3. Cooperative work outside the classroom to analyze cases and problem solving.

4. Learning based on structured and non-structured problems in order for students to learn formulate problems and the course content by generating solutions, working individually as well as in groups, after brainstorming.

5. Content presentation by the instructor, avoiding at all cost its becoming a custom throughout the course

6. Learning based on application projects in groups in order for students to apply their knowledge in these projects.

Evaluation criteria and procedures:
Students' performance throughout the course Hill be base don the following criteria:

1. The manifested willingness and cooperation with concrete actions to achieve the learning objectives of each unit of the course's general objective.

2. The manifested commitment, honesty, seriousness, responsibility, quality, participation, and creativity when executing all learning activities developed throughout the course.

3. The manifested ability and dexterity to solve specific problems throughout the course.

Considering the criteria mentioned above, the following Evaluation form is proposed:

Form	Instrument	Percentage
Interrogation and problem solving.	Individual and group assignments, in the form of questionnaires, essays, structured problems to solve biographical or internet research	35%
Problem solving	Individual objective tests: partial and final exam.	45%
Product Request	Application, documental or field research project and individual or group report of the project.	20%

Bibliography

	Type	Title	Author	Publisher	Year
1	Text	Research Methodology	Roberto Hernández S., Carlos Fernández C. Pilar Baptista L.	McGraw-Hill	2003
2	Text	Research Methodology	Maurice Eyssautier de la Mora	Thomson	2006
3	Text	Document research technique.	Yolanda Jurado Rojas	Thomson	2002

Course name: Man and Environment	Course ID HU400

Location in the curricular map: Sixth Semester

Course description:
Course the reflects of how human beings relate to their natural environment and analyze the modifications that it suffers as a result of the different activities developed by man. It is expected that participants are allowed to search and develop the regulatory mechanisms to these changes; that they perceive the planet's self-regulation ability, and that consider themselves as capable to modify the environment in different guidance; the fundamental values to promote are the observation, tolerance, dialog, and respect for those who are different to us.

Course learning outcomes:
At the end of this course the student is expected to:
Know the impact that man causes on the environment when he follows the prevailing development model. **Apply** an environmental education proposal that allows him to improve the relationship man-society-nature in a determined space.
Design alternative development models to valuate and achieve an appropriate sustainability in the social occupation of natural spaces
Construct a commitment formula that reflects his personal and professional responsibility in the transformation of the environment
Develop a serious and profound critique of the context that could freely establish the priorities as an individual and as part of a society always considering the common good to be a person capable of getting closer to his society and environment.

Course contents:	**Hours**
Unit 1 Approximation to regional environment	20
1 Natural landscape ▪ Ecosystems of the region ▪ Value of the regional ecosystems	
2 Landscape transformation ▪ The first decades of the city ▪ Expansion and development ▪ Current situation	
3 Environmental crisis ▪ Population growth ▪ Economical diversity and environment ▪ Environmental impact	
4 Some solutions to the environmental crisis ▪ Protected Natural Areas (ANP)	
Unit 2 Modernity critical environmental areas	28
1 Historical appropriation of the natural space. ▪ Upper Paleolithic ▪ Neolithic and the beginning of the environmental crisis ▪ Chief Seattle's speech ▪ Entrance to modernity	
2 Environmental crisis of modernity ▪ Human population ▪ Human consumption ▪ Biodiversity loss ▪ Climatic manifestations	
3 Habitability ▪ Characteristics ▪ Cases of habitable cities	
Unit 3 Environmental education for a sustainable development	16
1 Environmental education ▪ International meetings ▪ Characteristics of environmental education ▪ Environmental projects	
2 Sustainable development ▪ Approaches on sustainability: economic, ecologic and social-politic ▪ The role of government ▪ The case of a sustainable culture: The Mayans	
3 Environmental values	

Learning Activities: The learning experience in this course will be individual and in groups; some directed by the instructor and others will be carried out individually by the students outside the classroom. Those carried out by students will be held in the following way:

1. Collaborative work inside the classroom to analyze and debate over the contents under instructor supervision.
2. Case methods to apply and assess the scope and limitations of the course content.
3. Cooperative work outside the classroom to analyze cases and problem solving.
4. Learning based on structured and non-structured problems in order for students to learn to formulate problems and apply the course content by generating solutions, working individually as well as in groups after brainstorming.
5. Content presentation by the instructor, avoiding at all cost its becoming a costume throughout the course.
6. Learning based on application projects in groups, in order for students to apply their knowledge in these projects.

Evaluation criteria and procedures:

Students' performance throughout the course will be based on the following criteria:

1. The manifested willingness and cooperation with concrete actions to achieve the learning objectives of each unit of the course's general objective.
2. The manifested commitment, honesty, seriousness, responsibility, quality, participation and creativity when executing all learning activities developed throughout the course.
3. The manifested ability and dexterity to solve the specific problems throughout the course.

Considering the criteria mentioned above, the following Evaluation form is proposed:

Form	**Instrument**	**Percentage**
Interrogation and problem solving	Individual and group assignments in the form of questionnaires, essays, summaries, structured problems to solve bibliographical or internet research.	35%
Problem Solving	Individual objective tests: Partial and final exam.	45%
Product request	Application, documental or field research project and individual or group report of the project.	20%
	TOTAL	**100%**

Bibliography

	Type	Title	Author	Publisher	Year
1	Text	Environmental Sciences. Ecology and Sustainable Development	Bernard Nebel, Richard Wright	Pearson Prentice Hall	1999
2	Text	Environmental Science and Sustainable Development	Ernesto Enkerlin	Thomson	1997
3	Text	Environmental Science. Let's Preserve the Earth	G. Tyler Miller	Thomson	2002
4	Reference	Ecology and Environment	G. Tyler Miller	Iberoamericana	1994

Course name:	Course ID:
Interface Design	**CE412**

Location in curricular map: Seventh semester

Course description:
During this course the student will be exposed to established interface standards, but also to the required knowledge for students to develop their own interface. Also the analysis of sensors and their interface with computer ports.
The general course topics are: interface standards, input/output by demand design, instrumentation fundamentals.

Course learning outcomes:
At the end of the course the student will know, comprehend and apply:

- Interface theory.
- Standard interfaces for computer systems.
- Proprietary interface construction for specific applications.
- Interface programming for use in computers.
- Instrumentation fundamentals.

At the end of the course the student will also ***know*** *and* ***comprehend*** the importance of a systems approach for an engineer, and the application of this throughout the course, via the interaction with classmates from his or her academic program and others, thus developing positive attitudes towards interdisciplinary collaborative and cooperative work.

Course content:	Hours
1. INTERFACE GENERALITIES 1.1 Introduction 1.2 Types of input/output devices. 1.3 Internal communication channels. 1.4 Interface standards.	**6**
2. INTERFACE DESIGN 2.1 Introduction. 2.2 Programmed input/output. 2.3 Registry interface. 2.4 Handshake interface. 2.5 Input/output by demand. 2.6 Interruptions. 2.7 Direct memory access. 2.8 Interface programming.	**20**
3. INTERFACE STANDARDS 3.1 Introduction. 3.2 Serial interfaces. 3.3 Parallel interfaces. 3.4 Wireless interfaces. 3.5 Circuits for interfaces.	**18**
4. INTERFACING SENSORS 4.1 Introduction. 4.2 A/D and D/A converters. 4.3 Sampling. 4.4 Temperature sensors. 4.5 Displacement sensors. 4.6 Optic sensors.	**18**

Learning activities: The learning experiences in this course will be individual and in groups; the in-class activities will be guided by the professor and the independent activities will be done by the student outside the classroom. The generic forms for the learning activities that will be done by the student are the following:

1. Collaborative work in the class room, guided by the professor, analyzing and debating the course topics.
2. Case study method to apply and evaluate scope and limitations of the course topics.
3. Cooperative work outside the classroom for case study analysis and problem solving.
4. Learning based on structured and non-structured problems in which the students learn to formulate problems and apply the course content to generate solutions, through individual efforts as well as in team efforts, via brainstorming.
5. Course topics presented by the professor, avoiding at all costs that this becomes the norm of the course.
6. Learning based on application projects in teams, so students apply their knowledge to projects of their own interest.

Evaluation criteria and procedures:
The performance of the students throughout the course will be based on the following criteria:

1. The availability and cooperation manifested in concrete actions, towards the achievement of the course learning outcomes.
2. The commitment, honesty, seriousness, responsibility, quality, participation and creativity manifested in the execution of the learning activities developed throughout the course.
3. The ability and skills manifested to solve specific problems worked throughout the course.

Taking into account the criteria mentioned above, the following evaluation scheme is suggested:

Form	Instrument	Percentage
Formative aspects, Values and Attitude	Rubric	10%
Evaluation of Knowledge	Partial and Final Examinations	35%
Problem Solving and Documental Research	Homework tasks	20%
Evaluation of Skills and Abilities	Lab Practices and Final Project	35%
	TOTAL	**100%**

Bibliography

No.	Type	Title	Author	Publisher
1	Text	PC Interfacing and Data Acquisition	Kevin James	Elsevier Limited
2	Reference	Interfacing sensors to the IBM PC	Tompkins, Willis.	Prentice Hall.
3	Reference	INTEL Microprocessors: Architecture, programming and interfacing the 8086	Brey, Barry	Pearson Education
4	Reference	Writing Windows WDM Device Drivers	Chris Cant	Academic Press

Course name:	Course ID:
Power Electronics	**CE414**

Location in curricular map: Seventh semester

Course description:
This course provide the theoretical and practical fundamentals of power semiconductor devices with a focus towards their operation and applications in converter circuits such as rectifiers, inverters, regulators, choppers, and control circuits for DC and AC motors.
It is important that the student who takes this course has theoretical and practical knowledge of mathematics, electricity and magnetism, electrical circuits and analog electronics.
The general course topics are: power semiconductors, AC converters and cycle converters, regulators, inverters, sources, AC and DC motor controllers.

Course learning outcomes:
At the end of the course the student will know, comprehend and apply:

- The fundamentals of power semiconductor devices.
- The analysis and design of converter circuits such as rectifiers, inverters, regulators, cycle converters and choppers.
- The analysis and design of control circuits for AC and DC motors.

At the end of the course the student will also ***know*** *and* ***comprehend*** the importance of a systems approach for an engineer, and the application of this throughout the course, via the interaction with classmates from his or her academic program and others, thus developing positive attitudes towards interdisciplinary collaborative and cooperative work.

Course content:	Hours
1. POWER SEMICONDUCTORS 1.5 Introduction. 1.6 Diodes. 1.7 Power transistors. 1.8 SCRs. 1.9 Triacs. 1.10 Other thyristors. 1.11 Heat transfer and cooling in semiconductors.	**16**
2. AC CONVERTERS AND CYCLE CONVERTERS 2.1 Introduction. 2.2 Non-controlled rectifier. 2.3 Controller rectifier. 2.4 Cycle converters.	**12**
3. REGULATORS, INVERTERS AND SOURCES 3.1 Introduction. 3.2 Regulators in commuted mode (choppers). 3.3 Inverter circuits. 3.4 DC power sources. 3.5 AC power sources.	**16**
4. MOTOR CONTROLLERS 4.1 Introduction. 4.2 DC motor controllers. 4.3 AC motor controllers.	**20**

Learning activities: The learning experiences in this course will be individual and in groups; the in-class activities will be guided by the professor and the independent activities will be done by the student outside the classroom. The generic forms for the learning activities that will be done by the student are the following:

1. Collaborative work in the class room, guided by the professor, analyzing and debating the course topics.
2. Case study method to apply and evaluate scope and limitations of the course topics.
3. Cooperative work outside the classroom for case study analysis and problem solving.
4. Learning based on structured and non-structured problems in which the students learn to formulate problems and apply the course content to generate solutions, through individual efforts as well as in team efforts, via brainstorming.
5. Course topics presented by the professor, avoiding at all costs that this becomes the norm of the course.
6. Learning based on application projects in teams, so students apply their knowledge to projects of their own interest.

Evaluation criteria and procedures:
The performance of the students throughout the course will be based on the following criteria:

1. The availability and cooperation manifested in concrete actions, towards the achievement of the course learning outcomes.
2. The commitment, honesty, seriousness, responsibility, quality, participation and creativity manifested in the execution of the learning activities developed throughout the course.
3. The ability and skills manifested to solve specific problems worked throughout the course.

Taking into account the criteria mentioned above, the following evaluation scheme is suggested:

Form	Instrument	Percentage
Formative aspects, Values and Attitude	Rubric	10%
Evaluation of Knowledge	Partial and Final Examinations	35%
Problem Solving and Documental Research	Homework tasks	20%
Evaluation of Skills and Abilities	Lab Practices and Final Project	35%
	TOTAL	**100%**

Bibliography

No.	Type	Title	Author	Publisher
1	Text	Industrial Electronics	Kissel, E. Thomas	Prentice Hall
2	Reference	Power electronics: circuits, devices and applications	Rashid, Muhammad H.	Pearson Education
3	Reference	Industrial electronics: power techniques	Gualda, J.A.	Alfaomega-Marcombo
4	Reference	Modern industrial electronics	Maloney, Timothy J.	Pearson Education

Course name:	Course ID:
Computer Networks	**CE413**

Location in curricular map: Seventh semester.

Course description:

The scope of this course is apply the knowledge in computer networks regarding the 7 layers of the OSI model and TCP/IP, focusing in:

- Linkage.
- Networking.
- Transport.
- Flags.

Also includes the more important aspects of Local Area Networks, Metropolitan Area Networks and World Area Networks, with the corresponding data transfer.

General Learning Outcomes:

At the end of the course students are expected to:

Identify the aspects for safe work in network environment.
Identify the principal topologies of networks.
Apply OSI model.
Apply and install at least one TCP / IP protocol.
Wireless data transfer.

Contents:	Hours
1. General Introduction.	**20**
1.1. Uses of networks.	
1.2. Topologies.	
1.3. Hardware and Software.	**20**
1.4. Examples.	
2. OSI models.	
2.1. Description.	
2.2. The seven layers.	
2.3. Examples.	
2.4. Applications.	**24**
3. TCP/IP Protocols.	
3.1. Description.	
3.2. Four layers.	
3.3. Other networking models.	
3.4. Commercial distributors and manufacturers.	
3.5. WANs.	

Learning activities: All the activities are individual or by team (general group activities or integrating subgroups). They are classified in activities inside classroom (ICA) or outside classroom (OCA) ones. All ICA's are directed by the corresponding professor or expositor (if it could be convenient). Every OCA would be finished in a completely independent form, but under the proper supervision of Faculty. For every subject the learning activities could be at least the following (or others, similar or higher in pedagogical characteristics):

1. Case Analysis to state clearly the accomplishments of the course, properly linked to the real state of contemporary engineering.
2. Cooperative sessions to analyze and solve problems. When could be convenient laboratory sessions are mandatory, of course in presence of Faculty.
3. Learning based on structures and non structured problems. The goal is that students must state, solve and discuss proposals of solutions. They must evidence research and effective communications skills, in full accordance to Institutional Learning Outcomes.
4. Plenary discussions directed by students themselves and also directed by professor. Take care that this is not the only pedagogical strategy to be adopted.
5. Project oriented learning, focused on local requirements of Engineering Science.
6. Visits to companies, in order to gather important information about state of art of the subject. When this strategy could not be pertinent, it can be substituted by conference or Case Analysis.

Evaluation criteria and procedures:

The student's learning is to be measured under the following criteria:

1. Cooperative attitude, expressed by concrete and measurable actions that will be a clear evidence of the accomplishment of learning outcomes.
2. Engagement, honesty, seriousness, responsibility, attitude of participation and creativity expressed in the furtherance of learning outcomes.
3. Ability and dexterousness expressed in problem solving.
4. Fulfillment of proposed rubrics.
5. Reasonable attendance to class (when required 100% with no failure).

Form	**Instrument**	Percentage
Problem solving	Home works, questionnaires, essays, summaries, documental and data base researches.	35%
Objective tests	At a mid term and a final written exam.	45%
Diverse products	Class project by teams, e-portfolios. Evidence generation, according the nature of subject.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Computer Networks	Andrew S. Tanenbaum	Pearsons	2006
2	Reference	Communication Networks: Fundamentals Concepts and Key Architectures	Alberto León-García, Indra Widjaja	McGraw Hill	2007
3	Reference	Computer Networks and Internets	Douglas E. Comer	Prentice Hall	2007

Course Name:	Course ID:
The Human Being, History, and Society	**HU401**

Placement in curricular map: Seventh Semester

Course description:
Develop in students an recognition of the Human Being as a being that participates in history and society; in history in different eras and spaces and with diverse cultural traits to understand the collective experience that precedes us; and in society where it is placed as a social subject in search of evaluating some contemporary social manifestations and its predictable future consequences, all this with the idea that the student can reflect on this and help locate themselves in reality in order to become responsible for their future.

Course learning outcomes:
At the end of this course the student is expected to:

Apply mechanisms that will allow identification and reconstruction of vision about mankind and contemporary and future society through study and reflection of diverse sociological thinking.
Design a system to identify the most outstanding traits of historical development in a micro and macro environment.
Build: social analysis procedures with more elements than current employees, in order to allow participation in social planning procedures.
Elaborate an essay where specific time periods are recognized, fundamentally identifying the role of human beings in history
Construct a serious and profound critique of the context, freely establishing priorities as an individual and as part of a society, always in favor of a common good.
Operate in the performance of their profession, a more intimate closeness with society.
Elaborate an outline that demonstrates the importance of historical knowledge for their Being and what to do as a social subject.
Apply a strategy that allows them to know and understand the difference and similarities of diverse cultures, in order to perform positively, locally, regionally, and in any other part of the world.
Elaborate a community intervention Project that will be defined by the instructor

Course content::	**Hours**
Unit 1 Society, Humanism, and School. 1.1 Exploration of the concept of Society. 1.2 The bases that make it tangible. 1.3 The specialty and temporality of the concept. 1.4 Basic categories for its analysis. 1.5 Mankind in Society 1.6 Humanism, Society, School. 1.7 Humanism concept 1.8 The role of individual education and humanism. 1.9 Humanized society vs. Dehumanized society. 1.10 Socially accepted values and humanism. 1.11 Humanism and university 1.12 Cases and application problems	**14**
Unit 2 Human Being and History 2,1 Why History? 2.2 Immediate history and the 90's decade 2.3 40's and 50's decade and the postwar. 2.4 Convulsions in the beginning of the 20^{th} century. 2.5 19^{th} century life and development 2.6 From modernism to the contemporary. 2.7 Cases and application problems	**14**
Unit 3 Contemporary paradigms: the visions of today's actors. Los 3.1 Today's actors 3.1.1 Alvin Toffler and his theory of change 3.1.2 Carlos Fuentes and the internationalization of cultures through a inclusive progress. 3.1.3 Erich Fromm: Where are we and where are we going? 3.1.4 Perry Anderson and his postmarxism view. 3.1.5 Paulo Freyre and his vision of Latin-American thinking. 3.1.6 Francis Fukuyama and confidence as a central value. 3.2 The crisis of the everyday 3.2.1 Major problems vs. notable topics. 3.2.2 Basic forms of reality knowledge. 3.2.3 The role of velocities of time. 3.2.4 The social role of a company 3.2.5 Education as a central element in society. 3.3 Cases and applications study.	
Unit 4 Contemporary society as a trampoline for a future society. 4.1 Regional social manifestations. 4.2 The role of hope in the dreams of mankind. 4.3 Social responsibility of mankind and youth. 4.4 Social values that should remain.	**14**

4.5 Intervention projects with the purpose of returning to a more just society. 4.6 Cases and applications study. **Unit 5 Social Intervention project in the community.** 5.1 Project definition and justification. 5.2 Project planning. 5.3 Project implementation. 5.4 Project Evaluation.	**8**

Learning Activities:

The learning experience in this course will be individual and in groups; some directed by the instructor and others will be carried out individually by the student outside the classroom. Those carried out by students will be held in the following way:

1. Collaborative work in the classroom to analyze and debate over course content under instructor supervision.

2. Case methods to apply and assess the scope and limitations of the course content.

3. Cooperative work outside the classroom to analyze cases and problem solving.

4. Learning based on structured and non-structured problems in order for students to learn formulate problems and the course content by generating solutions, working individually as well as in groups, after brainstorming.

5. Content presentation by the instructor, avoiding at all cost its becoming a custom throughout the course

6. Learning based on application projects in groups in order for students to apply their knowledge in these projects.

Evaluation criteria and procedures:

Students' performance throughout the course Hill be base don the following criteria:

1. The manifested willingness and cooperation with concrete actions to achieve the learning objectives of each unit of the course's general objective.

2. The manifested commitment, honesty, seriousness, responsibility, quality, participation, and creativity when executing all learning activities developed throughout the course.

3. The manifested ability and dexterity to solve specific problems throughout the course.

Considering the criteria mentioned above, the following Evaluation form is proposed:

Form	Instrument	Percentage
Interrogation and problem solving.	Individual and group assignments, in the form of questionnaires, essays, structured problems to solve biographical or internet research	35%
Problem solving	Individual objective tests: partial and final exam.	45%
Product Request	Application, documental or field research project and individual or group report of the project.	20%

Bibliography

	Type	Title	Author	Publisher	Year
1	Reference	Review of Mexico's History	Juan Brom	Grijalva	1996
2	Reference	Review of Universal History	Juan Brom	Grijalvo	1990
3	Reference	Introduction to Psychology	Peter Berger	Limusa	1996
4	Reference	Values in Education	Pedro Ortega, Ramón Mínguez	Ariel	2001
5	Reference	Minimal History of Mexico	Daniel Cossío Villegas	El Colegio de México	1994
6	Reference	Anatomy of a Mexican	Roger Bartra	Plaza Janés	2002

Course name:	Course ID:
Selected Topics in Programming	**CC414**

Location in curricular map: Eight semester

Course description:
This course is focused on topics regarding software and hardware tools and integration for industrial processes.
The general course topics are: connectivity between industrial applications, direct computer control, SCADA systems, machine vision.

Course learning outcomes:
At the end of the course the student will know, comprehend and apply:

- Various technologies that involve programming for process control applications.
- The fundamental components of a program dedicated to data exchange for production systems.
- Programming for the various layers of the manufacturing process, such as direct control, production and inspection monitoring using image processing and machine vision elements.

At the end of the course the student will also ***know*** *and* ***comprehend*** the importance of a systems approach for an engineer, and the application of this throughout the course, via the interaction with classmates from his or her academic program and others, thus developing positive attitudes towards interdisciplinary collaborative and cooperative work.

Course content:	Hours
1. CONNECTIVITY BETWEEN INDUSTRIAL APPLICATIONS. 1.1 Connectivity between applications and devices. ▪ DLL and OLE. ▪ OPC. ▪ ActiveX. 1.2 .NET applications. 1.3 Data base applications. 1.4 Industrial networks.	**16**
2. DIRECT COMPUTER CONTROL 2.1 Introduction: Advantages and disadvantages. 2.2 Selection of necessary hardware and software. ▪ Use of PC ports. ▪ DAQs. ▪ Industrial computers (PXI standard). 2.3 Applications.	**10**
3. SUPERVISORY CONTROL AND DATA ACQUISITION SYSTEMS (SCADA) 3.1 Open architectures. 3.2 Interface programming. 3.3 Integrating tools for decision making. 3.4 Automatic report generation. 3.5 Mobile device connectivity and terminal devices. 3.6 Applications.	**18**
4. MACHINE VISION 4.1 Integrating images into process control. 4.2 Image theory. ▪ Basic optics. ▪ Pattern, border, color recognition algorithms and other basic functions. 4.3 System components. ▪ Illumination. ▪ Optic elements. ▪ Cameras. ▪ Image acquisition. ▪ Application Programming Interfaces. 4.4 Applications.	**20**

Learning activities: The learning experiences in this course will be individual and in groups; the in-class activities will be guided by the professor and the independent activities will be done by the student outside the classroom. The generic forms for the learning activities that will be done by the student are the following:

1. Collaborative work in the class room, guided by the professor, analyzing and debating the course topics.
2. Case study method to apply and evaluate scope and limitations of the course topics.
3. Cooperative work outside the classroom for case study analysis and problem solving.
4. Learning based on structured and non-structured problems in which the students learn to formulate problems and apply the course content to generate solutions, through individual efforts as well as in team efforts, via brainstorming.
5. Course topics presented by the professor, avoiding at all costs that this becomes the norm of the course.
6. Learning based on application projects in teams, so students apply their knowledge to projects of their own interest.

Evaluation criteria and procedures:
The performance of the students throughout the course will be based on the following criteria:

1. The availability and cooperation manifested in concrete actions, towards the achievement of the course learning outcomes.
2. The commitment, honesty, seriousness, responsibility, quality, participation and creativity manifested in the execution of the learning activities developed throughout the course.
3. The ability and skills manifested to solve specific problems worked throughout the course.

Taking into account the criteria mentioned above, the following evaluation scheme is suggested:

Form	Instrument	Percentage
Formative aspects, Values and Attitude	Rubric	10%
Evaluation of Knowledge	Partial and Final Examinations	30%
Problem Solving and Documental Research	Homework tasks	20%
Evaluation of Skills and Abilities	Lab Practices Final Project	20% 20%
	TOTAL	**100%**

Bibliography

No.	Type	Title	Author	Publisher
1	Text	Programmable Automata	Joseph Balcells José Luis Romeral	Alfaomega – Marcombo
2	Reference	Automation, Production Systems, and Computer-Integrated Manufacturing.	Mikell P. Groover	Prentice Hall.
3	Reference	Digital Image Processing	Rafael C. Gonzalez Richard E. Woods	Prentice Hall
4	Reference	Process Control Instrumentation Technology	Johnson Curtis D.	Prentice Hall.

Course name:	Course ID:
Mechatronics	**CE415**

Location in curricular map: Eight semester

Course description:
The course provides theoretical and practical fundamentals of mechatronic devices and systems with a focus towards their operation and application, providing fundamentals of mechanisms and integrating theoretical and practical knowledge of electronics and computing acquired throughout the academic program.
It is important that the student who takes this course have theoretical and practical knowledge of electronics and control systems.
The general course topics are: introduction to mechatronics, mechanisms, kinematics and dynamics of manipulators, integration of mechatronic systems.

Course learning outcomes:
At the end of the course the student will know, comprehend and apply:

- The fundamentals of mechatronic systems.
- The fundamentals of mechanisms.
- The fundamentals of the kinematics and dynamics of manipulators.
- The analysis, design, and integration of mechatronic systems for specific applications.

At the end of the course the student will also ***know*** *and* ***comprehend*** the importance of a systems approach for an engineer, and the application of this throughout the course, via the interaction with classmates from his or her academic program and others, thus developing positive attitudes towards interdisciplinary collaborative and cooperative work.

Course content:	Hours
1. INTRODUCTION TO MECHATRONICS 1.1 Introduction. 1.2 Terminology and concepts. 1.3 Classification of mechatronic devices and systems. 1.4 Mechatronic devices in industry.	**10**
2. MECHANISMS 2.1 Introduction. 2.2 Materials in engineering. 2.3 Mechanisms: definition and classification. 2.4 Machine elements. 2.5 Relationship between electronic and mechanical systems. 2.6 Mechanisms and machines with intelligence.	**18**
3. KINEMATICS AND DYNAMICS OF MANIPULATORS 3.1 Introduction. 3.2 Robotic manipulators as mechanisms. 3.3 Direct and inverse kinematics of a manipulator. 3.4 Inverse kinematic solution and programming. 3.5 Manipulator dynamics. 3.6 Manipulator control. 3.7 Trajectory planning.	**18**
4. INTEGRATION OF MECHATRONIC SYSTEMS 4.1 Introduction. 4.2 Components of an industrial automation system. 4.3 Electronic, sensor and instrumentation systems. 4.4 Types of control. 4.5 Application project.	**18**

Learning activities: The learning experiences in this course will be individual and in groups; the in-class activities will be guided by the professor and the independent activities will be done by the student outside the classroom. The generic forms for the learning activities that will be done by the student are the following:

1. Collaborative work in the class room, guided by the professor, analyzing and debating the course topics.
2. Case study method to apply and evaluate scope and limitations of the course topics.
3. Cooperative work outside the classroom for case study analysis and problem solving.
4. Learning based on structured and non-structured problems in which the students learn to formulate problems and apply the course content to generate solutions, through individual efforts as well as in team efforts, via brainstorming.
5. Course topics presented by the professor, avoiding at all costs that this becomes the norm of the course.
6. Learning based on application projects in teams, so students apply their knowledge to projects of their own interest.

Evaluation criteria and procedures:
The performance of the students throughout the course will be based on the following criteria:

1. The availability and cooperation manifested in concrete actions, towards the achievement of the course learning outcomes.
2. The commitment, honesty, seriousness, responsibility, quality, participation and creativity manifested in the execution of the learning activities developed throughout the course.
3. The ability and skills manifested to solve specific problems worked throughout the course.

Taking into account the criteria mentioned above, the following evaluation scheme is suggested:

Form	Instrument	Percentage
Formative aspects, Values and Attitude	Rubric	10%
Evaluation of Knowledge	Partial and Final Examinations	35%
Problem Solving and Documental Research	Homework tasks	20%
Evaluation of Skills and Abilities	Lab Practices and Final Project	35%
	TOTAL	**100%**

Bibliography

No.	Type	Title	Author	Publisher
1	Text	Introduction to Mechatronics and & Measurement Systems	Alciatore, David G.	McGraw Hill
2	Reference	Introduction to Robotics: Analysis, Systems Applications	Niku, Saeed B.	Prentice Hall
3	Reference	Automation, Production Systems, and Computer-Integrated Manufacturing.	Mikell P. Groover	Prentice Hall.
4	Reference	Process Control Instrumentation Technology	Johnson Curtis D.	Prentice Hall.

Course name:	Course ID:
Applications of Networks	**CE042**

Location in curricular map: Eighth semester.

Course description:

In this terminal course students are required to demonstrate their skills in communication sciences to implement a networked solution in both senses: wire and wireless, to improve the transfer of information between a control unit and a processing unit. According to the engineering program the student is enrolled to the requirements could be hardware and software and even a servomechanism or robotic device, always focusing the optimal data transmission.

General Learning Outcomes.
At the end of the course students are expected to:

Transfer data successfully between a prescribed source to a processing unit which could exert one of the following actions:

Homogenize and interpret correctly information from different protocols of data interpretation.

Interpret instructions to get a mechanical or electrical effect.

Activate a data processing from a prescribed methodology.

Exchange information from disjoint operating systems properly

Contents:	**Hours**
1. Introduction.	**6**
1.1. Hardware generalities.	
1.2. Systems of storing.	
1.3. Systems and ways of backing up.	
2. Protocols	
2.1. Domain Name Service.	**12**
2.2. Dynamic Host configuration Protocol.	
2.3. Internet: HTTP, FTP.	
2.4. Remote desktop protocol.	
3. Linux Servers.	
3.1. DNS.	
3.2. DHCP.	**12**
3.3. Apache HTTP.	
3.4. Send Mail (SMTP).	
3.5. IMAP (and POP3).	
3.6. Remote session.	
3.7. FTPs.	
	17
4. Firewall Configuration.	
4.1. Definition.	
4.2. Classification.	
4.3. FTPs.	
5. Windows Networking.	
5.1. Introduction.	
5.2. Hardware and software.	
5.3. Policies.	**17**

Learning activities: All the activities are individual or by team (general group activities or integrating subgroups). They are classified in activities inside classroom (ICA) or outside classroom (OCA) ones. All ICA's are directed by the corresponding professor or expositor (if it could be convenient). Every OCA would be finished in a completely independent form, but under the proper supervision of Faculty. For every subject the learning activities could be at least the following (or others, similar or higher in pedagogical characteristics):

1. Case Analysis to state clearly the accomplishments of the course, properly linked to the real state of contemporary engineering.
2. Cooperative sessions to analyze and solve problems. When could be convenient laboratory sessions are mandatory, of course in presence of Faculty.
3. Learning based on structures and non structured problems. The goal is that students must state, solve and discuss proposals of solutions. They must evidence research and effective communications skills, in full accordance to Institutional Learning Outcomes.
4. Plenary discussions directed by students themselves and also directed by professor. Take care that this is not the only pedagogical strategy to be adopted.
5. Project oriented learning, focused on local requirements of Engineering Science.
6. Visits to companies, in order to gather important information about state of art of the subject. When this strategy could not be pertinent, it can be substituted by conference or Case Analysis.

Evaluation criteria and procedures:

The student's learning is to be measured under the following criteria:

1. Cooperative attitude, expressed by concrete and measurable actions that will be a clear evidence of the accomplishment of learning outcomes.
2. Engagement, honesty, seriousness, responsibility, attitude of participation and creativity expressed in the furtherance of learning outcomes.
3. Ability and dexterousness expressed in problem solving.
4. Fulfillment of proposed rubrics.
5. Reasonable attendance to class (when required 100% with no failure).

Form	**Instrument**	Percentage
Problem solving	Home works, questionnaires, essays, summaries, documental and data base researches.	35%
Objective tests	At a mid term and a final written exam.	45%
Diverse products	Class project by teams, e-portfolios. Evidence generation, according the nature of subject.	20%
	TOTAL	**100%**

Bibliography

	Type	**Title**	**Author**	**Publisher**	**Year**
1	Text	Computer Networks	Andrew S. Tanenbaum	Pearsons	2006
2	Reference	Communication Networks: Fundamentals Concepts and Key Architectures	Alberto León-García, Indra Widjaja	McGraw Hill	2007
3	Reference	Computer Networks and Internets	Douglas E. Comer	Prentice Hall	2007

Course Name:	Course ID:
Man and Ethics	**HU 402**

Location in curricular map:

This course is located in seventh or eighth semester of all of CETYS University's majors; it is not serialized with other courses but is recommended to be the last course to be taken as part of their general training.

Course description:

Human Being and Ethics is third in a series of three courses that CETYS has implanted in its three campuses for students of all bachelor degrees. These courses seek to imprint a distinctive characteristic in all CETYS students, through reflecting on Human Beings and the way they relate with their environment, their past, their society, and themselves.

This course reflects on some anthropological conceptions in order to later establish the fundamental criteria for a better ethical discernment from a human being centered point of view. It takes on the field of personal and social values, which are taken on in some margins of liberty. It culminates with the recognition of the responsibilities in the workplace to establish some reflection on professional ethics.

Students are required to have the ability of reading comprehension as well as writing essays, and book reports, ability for oral communication in public, as well as the skill and tolerance to work in groups. At a knowledgeable level, it is recommended that the student have clear basic concepts of anthropological reflection done in the Human Beings, History, and Society course.

Course learning outcomes

At the end of this course, students will:

- Elaborate an essay where different versions of Human Beings and Ethics will be discussed.
- Create an organizational chart where the contents of the unit are integrated.
- Present a written paper where a reflection upon his/her own values will be exposed.
- Structure a code of ethics according to their profession.

Course content:

	Hours
Unit I: Relationship of humans and the world.	16
1.1. Some visions about Humans	
1.2. The world of Humans	
1.3. Problems to approaching ethics	
1.4 Types of Ethics	
1.5 Ethics and problems in Mexico	
1.6 Ethics in CETYS' mission	16
Unit II: Human Liberty and Conscience	
2.1. Humane acts and acts of humans	
2.2. Amoralism	
2.3. Liberty	
2.4 Types of Liberty	
2.5 Responsibility modifiers	
2.6 Determinism	
2.7 Evidence of liberty	
2.8 Types of conscience	16
2.9 Formation of conscience	
Unit III: Values	
3.1. What is goodness?	
3.2 Goodness as a value	
3.3 What are values?	
3.4 Axiological subjectivism and objectivism.	
3.5 Synthetic position	
3.6 Characteristics of values	
3.7 Values and alumni characteristics	16
Unit IV: Professional Ethics and Social Responsibility.	
4.1. Professional Ethics	
4.2. Basic criteria on professional ethics.	
4.3. Code of Ethics	
4.4 Relations inside organizations.	
4.5 Society-Organization relations	
4.6 Social Responsibility	

Learning Activities:

Under Instructor supervision:

- Group discussions
- Group discussions
- Instructor presentations
- Collaborative work using diverse learning strategies.
- Student presentations
- Organizational graph elaboration.

Independent Activities:

- Conduct research
- Solve assignment exercises based on questions.
- Case solution
- Presentation preparation
- Recuperation in situations of moral court.
- Research information on-line.
- Solution of moral dilemmas
- Elaboration of their own code of ethics

Evaluation criteria and procedures:

Each of the four units of this course will have a value of 25%

In each of them, accordingly, the following elements will be observed:

a) Individual work (book reports, research, final project)
b) Group work (presentations, organizational graph elaboration, discussions, case solving)
c) Performance self-Evaluation
d) Co-Evaluation

Bibliography

	Type	Title	Author	Publisher	Year
1	Text	Ethics, theory and application	FAGOTHEY, Austin	McGraw-Hill	1994
2	Text	Ethics in Business, cases and applications	VELÁSQUEZ, Manuel G	Pearson Education	2002
3	Text	Ethical dilemmas of modern corporations.	LLANO Cifuentes, Carlos	F.C.E.	1997