APPENDIX A – COURSE SYLLABI

INCLUDE ONLY COURSE SYLLABI FOR THE DISCIPLINE-SPECIFIC COURSES OF THE PROGRAM FOR READINESS REVIEW

Code	INI201	Prerequisites	None
Name	Introduction to Industrial Engineering	Co-requisites	None

Credits	Contact Hours
02	22
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Sharon Schnabel

Text book
Gabriel Baca U., M. C. (2014). Introducción a la ingeniería industrial. México: Patria. Maynard, H.B. & Zandin, K.B.; (2001) Maynard's Industrial Engineering Handbook (5th edition). New York: McGraw Hill.
Other supplemental materials
Madhavan, G; (2015) Applied Minds: How Engineers Think (1st edition). New York: W.W. Norton & Company. Michalko, M. (2006). Thinker toys: A handbook of creative-thinking techniques. Berkeley, Calif: Ten Speed Press. Senge, P.M. (1990). The fifth discipline: the art and practice of the learning organization. New York :Doubleday/Currency.

Description	
The content of the subject addresses the following topics: 1. General aspects of industrial engineering, 2. Analytical, systemic and engineering thinking, 3. Nature of industrial processes, 4. Productivity and continuous improvement, 5. Quality management, 6. Operations Administration, 7. Work Study and Design, 8. Logistics, 9. Facilities Design.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Develop solutions according to the current reality, taking into account ethical and professional responsibility. 2. Assess consequences of the impact of engineering decisions in global, regional and local contexts (economic, environmental and social). 3. Identify the copyright in the particular solutions developed.

	4. Infer through the information of another the need for new knowledge. 5. Compile some sources of information and occasionally apply it to the achievement of objectives.
Student outcomes	SO4. Recognize ethical and professional responsibilities in engineering situations and makes informed judgments considering the impact of engineering solutions in global, economic, environmental and social contexts. SO7. Acquire and apply new knowledge as required, using appropriate learning strategies.

Topics
Unit I: Introduction to Industrial Engineering Unit II: Generalities of Industrial Engineering Unit III: Nature of Industrial Processes Unit IV: Logistics and Information Systems Unit V: Productivity and Continuous Improvement Unit VI: Quality Unit VII: Operations Management Unit VIII: Work Study and Design Unit IX: Facility Design

Code	INI381	Prerequisites	INI201
Name	Quality Management I	Co-requisites	None

Credits	Contact Hours
04	44
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Jessica Pamela Feliz Garrido Marie Sharon Schnabel Mercedes Alfonsina Martínez Martínez

Text book
Evan, J., Lindsay, W. (2015) Quality Management and Control, (9th Edition). Cengage Learning.
Other supplemental materials
González Ortíz, J. H., Izar Landeta, J.M. (2004). Las 7 herramientas básicas de calidad: descripción de las 7 herramientas estadísticas para mejorar la calidad y aumentar la productividad. Universidad Potosina. Guaspari, J. (1998) Erase una vez una fábrica. Norma Publisher Hay, E.J. (2002) Justo a Tiempo. Bogotá: Norma Publisher Kume. H. (1992) Herramientas estadísticas básicas para el mejoramiento de la calidad. Norma Publisher. Organización Internacional de Normalización (2001) ISO/TR 10013:2001 Directrices para la documentación de sistemas de gestión de la calidad [Data File]. Retrieved from https://www.iso.org/obp/ui#iso:std:iso:tr:10013:ed-1:v1:es Organización Internacional de Normalización (s.f.) ISO 9000: Sistemas de gestión de la calidad — Fundamentos y vocabulario [Data File]. Retrieved from: https://www.iso.org/ Pérez Fernández de Velasco, J. (2004). Gestión por procesos (1st ed.). Pozuelo de Alarcón: ESIC. UNIT. Instituto Uruguayo de Normas Técnicas (2009) Herramientas para la Mejora de la Calidad

Description
This subject from the Quality Management module will introduce the concepts and tools necessary for the student to understand the principles of quality management and develop throughout the module the ability to design, structure and administer a management system of quality based on the effective management of processes, their alignment with the strategy, continuous improvement and quality assurance. Likewise, the student will have the ability to identify, understand and apply tools for modeling, design, analysis, improvement and documentation of the processes of an organization. As a methodology for teaching and learning, the subject will be based on presentations, videos, dynamics and discussions in class, use of software and technology, as well as project-based learning. The effectiveness of said methodology for the development of competencies will be evaluated through a checklist, assessment scales, peer evaluation and objective tests.

Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Identify the causes of engineering problems using different quality tools. 2.Discriminate and apply tools to improve processes according to the problems identified through analysis. 3. Demonstrate ability to lead and participate in teams efficiently and effectively. 4. Demonstrate openness towards constructive criticism and the recognition of needs for self-improvement, participating in training and feedback activities inside and outside the classroom. 5. Establish a relationship between strategy and processes based on the planning, nature and limitations of any organization. 6. Prepare standardized documentation, ensuring a unified language of the different elements of a process.
Student outcomes	SO2. Apply and use the engineering design process to produce solutions that meet specific needs, taking into consideration public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. SO3. Communicate effectively with a variety of audiences. SO4. Recognize ethical and professional responsibilities in engineering situations and makes informed judgments considering the impact of engineering solutions in global, economic, environmental, and social contexts. SO5. Function effectively in a team whose members together provide leadership, create a collaborative and inclusive environment, set goals, plan tasks, and meet objectives.

Topics
Unit I. Quality Management Unit II. Quality Planning and Design Unit III. Process management Unit IV. Quality Tools Unit V. Quality Assurance (Standardization/Documentation of Processes)

Code	INI301	Prerequisites	INS209 CBM201
Name	Engineering Economics	Co-requisites	None

Credits	Contact Hours
04	44
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Carlos Cordero Freddy Lara Humberto Grullón

Text book
Park, C.S. (2009). Fundamentals of Engineering Economy (2nd. ed.). Pearson-Prentice Hall Publishing Vidaurri Aguirre, H.M. (2013). Basic Economic Engineering (1st. Ed.). Cengage Learning Publishers.
Other supplemental materials
Bacca Urbina, G. (2007). Fundamentals of Engineering Economics (4th ed.). Publisher McGraw Hill. Blank, L.T., & Tarquin, A.J. (2013). Engineering Economics (7th ed.). Publisher McGraw Hill. Sullivan, W., Wicks, E., & Luxhoj, J. (2004). DeGarmo's Engineering Economics (12th ed.). Pearson-Prentice Hall Publishers. White, J; Kenneth, C; Pratt, D., & Agee, M. (2001). Engineering Economics (2nd ed.). Limus Wiley.

Description	
This course combines basic knowledge of engineering with elements of economics, in order to prepare the student to analyze investment alternatives based on economic and financial comparisons, with the aim of determining which of options generates the greatest added value for thus being able to point out which is the best alternative to invest the money. In this subject the student is prepared in mathematical aspects for these purposes.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Understand the impact of engineering solutions in a global context and, based on this, performs efficient analyzes of alternatives that involve the use of money in order to determine the best financial alternative. 2. Show willingness to work as a team, even in cases where the help of other disciplines is required. 3. Show willingness to search for additional information when the cases that are presented to him require it.

	4. Demonstrate commitment to their own learning, presenting their doubts regarding the topics studied in the course. 5. Respect the established rules of coexistence and work
Student outcomes	SO1. Identify, formulate and solve complex engineering problems by applying the principles of Engineering, Science and Mathematics. SO4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments considering impact of engineering solutions in global, economic, environmental, and social contexts. SO5. Function effectively in a team whose members together provide leadership, create a collaborative and inclusive environment, set goals, plan tasks, and meet objectives. SO7. Acquire and apply new knowledge as required, using appropriate learning strategies.

Topics
Unit I. Fundamentals of Economic Engineering, value of money over time
Unit II. Cash Flow Equivalence Factors
Unit III. Nominal Interest Rate and Effective Interest Rate
Unit IV. Analysis, evaluation and comparison of alternatives
Unit V. Analysis of Multiple Alternatives, Replacement and Depreciation
Unit VI. Sensitivity Analysis

Code	INI-339	Prerequisites	None
Name	Industrial Engineering Seminar	Co-requisites	None

Credits	Contact Hours
02	22
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Layna Santana

Text book
Madhavan, G. (2016). Applied Minds: How Engineers Think. New York, USA: W. W. Norton & Co.
Other supplemental materials
Goleman, D. (1998a). What Makes a Leader? Harvard Business Review, 82–91. Hernandez, M. (2003). "Comunicacion y Trabajo Social", in Fernández García, T. and Alemán, C. (eds.). Introduction to social work. Madrid: Alliance, pp. 555-572. Nishiguchi, T., & Beaudet, A. (1998). The Toyota Group and The Aisin Fire. Sloan Management Review, 49–59.

Description	
The subject aims to develop a clear sense of industrial engineering, through the application of a first integrative project and the study of case studies, as well as to serve as a basis for the development of soft skills as a pillar in the development of future professionals. At the end of this program, the student is expected to be able to acquire and apply new knowledge, as well as present their ideas clearly and fluently in any forum.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Correctly use the techniques of negotiation and effective communication, identifying and evaluating their audience, as well as using the best practices/techniques to achieve a correct transmission of the message, and the scope of the proposed objectives. 2. Present solutions to day-to-day problems, responding to proposed challenges and using research methods to generate new knowledge/ideas based on previous studies. 3. Demonstrate a critical, purposeful and proactive attitude in the oral presentations of their projects. 4. Work collaboratively with groups of students to develop projects.
Student outcomes	SO3. Communicate effectively with a variety of audiences. SO7. Acquire and apply new knowledge, as required, using appropriate learning strategies.

Topics
Unit I. Profile of the Industrial Engineer
Unit II. Soft Skills Development
Unit III. Effective communication
Unit IV. Knowledge Management
Unit V. Professional Development

Code	INI326	Prerequisites	INI339
Name	Industrial Development Evolution	Co-requisites	None

Credits	Contact Hours
02	22
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Louis Toirac

Text book
Gillen. C. (2001). The social organization of production as a dynamic of development. Horizon Publisher. Maynard, H. (2018). Handbook of Industrial Engineering. McGraw Hill. Womack, J., Jones, D., & Roos, D. (1992). The machine that changed the world. McGraw Hill.
Other supplemental materials
Boyer, R., & Freyssenet, M. (2003). Productive models. Publisher Fundamentals. Chase, R., Jacobs, R., & Aquilano, N. (2014). Management of operations, products and supply chains. McGraw Hill. Neffa, JC (1998). The Taylorist and Fordist paradigms and their crises. Lumen/Work and Society/ PIETTE. Niebel, B. (1992). Industrial Economics and Management. Penn State University. Niebel, B. (2009). Industrial engineering. McGraw Hill. Ohno, T. (2001). The Toyota Production System. Management Editions 2000. Taylor, F. (1984). Principles of scientific management. The Athenaeum.

Description _	
The subject has the objective of taking the student through the different paradigms and productive models that have emerged after the first industrial revolution. With this, he will understand what concepts motivate these changes and what the current trend is, while developing an understanding of their professional role in the current production model. The content of the subject focuses on the detailed study of the production models: artisanal, mass and adjusted, through their characteristics and impact on the production systems, as well as in-depth analysis of the profitability strategies related to the industrial activity: quality, volume, volume and diversity, permanent cost reduction, innovation and flexibility. They are established through the study of production models based on the experience of the automotive industry: Kalmarism, Taylorism, Fordism, Sloanism, Ohnism and Hondism, and through the approaches of its main conceptualizers and executors in the industry.	
Type of course	☒ Required ☐ Elective _

Specific goals for the course

Outcomes of instruction	1. Prepare reports expressing most of the key ideas of the topic being discussed, organize and classify them coherently and with criteria. 2. Present oral messages clearly using physical gestures, facial expressions and regulation of the tone of voice. 3. Use complementary, detailed and organized information to support the ideas that you want to convey. 4. Provide evidence from reliable and up-to-date sources. 5. Participate in the planning of the objectives and the partial follow-up of their fulfillment. 6. Interact with team members appropriately, encourages and considers the ideas of other members. 7. Apply strategies to avoid and resolve conflicts.
Student outcomes	SO3. Communicate effectively with a variety of audiences. SO5. Function effectively in a team whose members together provide leadership, create a collaborative and inclusive environment, set goals, plan tasks and meet objectives. SO7. Acquire and apply new knowledge as required, using appropriate learning strategies.

Topics
Unit I. Productive models and the craft model
Unit II. Scientific Administration and work organization. Taylorism
Unit III. Mass production: Fordism and Sloanism
Unit IV. Lean production: Ohnism and Hondism
Unit V. Import substitution model in the Dominican Republic

Code	INI382	Prerequisites	INI339, CBM206
Name	Industrial Statistics	Co- requisites	INI382L

Credits	Contact hours
04	44
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Demetrio Mota

Text book
Devore, J.L. (2010). Probability and statistics for engineering and science. Thompson International.
Other supplementary materials
Montgomery, D. (1997). Statistics and Probabilities. continental publisher. Perez, Cesar. 2002. Statistics applied through Excel. Madrid: Prentice Hall. Walpole, Ronald E. & Myers, Raymond H. (2008). Probability and statistics Prentice Hall Latin America. Mexico.

Description	
This subject provides the student with the statistical tools that allow them to solve complex problems of Industrial Engineering. These tools cover both those used for Descriptive Statistics, in which the participant develops skills that allow them to characterize masses of process data, with which they can diagnose problems that Industrial Engineering must solve They will also handle the instruments of statistical inference that allow them to formulate hypotheses about the processes to solve the typical problems of these	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instructions	1. Define the problem taking into account the characteristics that it presents. 2. Choose the appropriate Tools to solve the problem. 3. Determine probable causes. 4. Apply Tools. 5. Evaluate the consequences of the decisions that result from the solution. 6. Effectively communicate proposed solutions.
Student outcomes	SO3. Communicate effectively with a variety of audiences. SO6. Develop and conduct appropriate experimentation, in which they analyze and interpret data, as well as use engineering criteria to draw conclusions.

Topics
Unit I. Descriptive Statistics
Unit II. Statistical inference
Unit III. Regression
Unit IV. Anova
Unit V. Non-parametric tests

Code	INI382L	Prerequisites	INI339 CBM206
Name	Laboratory of Industrial Statistics	Co-requisites	INI382

Credits	Contact Hours
01	22
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Demetrio Mota Ingrid Mordán

Text book
Minitab (2018). Introduction to Minitab 18. Minitab Inc.
Other supplemental materials
Devore, J.L. (2010). Probability and statistics for engineering and science. Thompson International Montgomery, D. (1997). Statistics and Probabilities. Continental Publishing House. Walpole, R. E., & Myers, R. H. (2012). Probability and statistics for engineering and science. Pearson Education.

Description	
This subject aims to provide the student with knowledge of the fundamental principles of inferential statistics applied to Industrial Engineering. During the course, the student receives the tools for solving complex problems from Industrial Engineering, with statistical support for decision making. The contents are divided into 5 thematic units, addressing the topics of: Introduction to Minitab, Minitab Sampling and Estimation, Minitab Hypothesis Testing, Minitab Regression and Correlation and Analysis of Variance (ANOVA) in Minitab.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. It expresses statistical results of its analyzes responsibly. 2. Applies knowledge of mathematics and statistics in the analysis of industrial engineering problems and the resolution of them. 3. Analyzes and interprets data from your environment using statistical methods. 4. Participates in teams for the development and execution of engineering projects and research formulation, contributing to the achievement of established goals. 5. It uses specialized software for presentation, inferences and statistical data analysis.
Student outcomes	SO1. Identifies, formulates and solves complex Engineering problems through the application of Engineering, Science and Mathematics principles.

	SO4. Recognizes ethical and professional responsibilities in engineering situations and makes informed judgments considering the impact of engineering solutions in global, economic, environmental and social contexts. SO5. Function effectively in a team whose members together provide leadership, create a collaborative and inclusive environment, set goals, plan tasks, and meet objectives. SO6. Develops and conducts appropriate experimentation, analyzes and interprets data, and uses engineering criteria to draw conclusions.

Topics
Unit I. Introduction to Minitab Unit II. Sampling and Estimation in Minitab Unit III. Minitab Hypothesis Test Unit IV. Analysis of Variance Unit V. Regression and Correlation

Code	INI383	Prerequisites	CBQ208 ING217
Name	Materials Science and Engineering	Co-requisites	INI383L

Credits	Contact Hours
04	44
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Vesselina Radeva

Text book
Ashby, M. F., Shercliff, H., & Cebon, D. (2014). Materials: engineering, science, processing and design. (3rd Ed.), Elsevier, Butterworth-Heinemann (BH). Askeland, D., and Wright, W. (2017). Materials science and engineering. (7th Ed.) Mexico City: Cengage Learning Editors. CES Edupack Granta. (2018). Cambridge, United Kingdom: Granta Design Limited.
Other supplemental materials
Callister, W., Rethwisch, D., Molera Solaná, P. y Salá Ballesteros, N. (2016) Materials science and engineering. (2nd Ed.). Barcelona: Reverté. Shackelford, James F. (2014). Introduction to materials science for engineers. (7th Ed.). Madrid: Pearson Prentice Hall. Van Black, L. (1980). Engineering Materials. (2nd Ed.). Mexico: CECSA.

Description	
Materials Science is a scientific discipline closely related to research, which aims at basic knowledge of the internal structure, properties and processing of materials. Materials Engineering deals with the knowledge of materials at fundamental and applied levels, so that they can be converted into products needed or desired by a technological society. It is sometimes difficult to define the border between the two as there is a common area of use. What is clear is that the two must walk together.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Uses up-to-date selection and design tools and programs for the conceptualization, development and evaluation of new materials and product improvement. 2. Appropriately uses the main concepts of materials science and engineering to solve problems concerning materials and their properties.
Student outcomes	SO1. Identifies, formulates and solves complex Engineering problems by applying the principles of Engineering, Science and Mathematics. SO7. Acquire and apply new knowledge using appropriate learning strategies.

Topics
Unit I. Introduction
Unit II. Ideal crystalline structures
Unit III. Real crystalline structures
Unit IV. Movement of atoms
Unit V. Phase diagrams in equilibria
Unit VI. Control of micro-structure and mechanical properties of materials
Unit VII. Engineering Materials
Unit VIII. Protection against material deterioration and failure

Code	INI383L	Prerequisites	CBQ208 ING217
Name	Laboratory Materials Science and Engineering.	Co-requisites	INI383

Credits	Contact Hours
01	22
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Laura Ramírez

Text book
Askeland, D., and Wright, W. (2017). Materials science and engineering. (7th Ed.) Mexico City: Cengage Learning Editors. Shackelford, James F. (2014). Introduction to materials science for engineers. (7th Ed.). Madrid: Pearson Prentice Hall. Callister, W., Rethwisch, D., Molera Solski, P. y Salá Ballesteros, N. (2016) Materials science and engineering. (2nd Ed.). Barcelona: Reverté. Ashby, M.F., Shercliff, H., & Cebon, D. (2014). Materials: engineering, science, processing and design. (3rd Ed.), Elsevier, Butterworth-Heinemann (BH). Lasheras, J. & Carrasquilla, J. (2005). Materials science for engineering. (1st Ed.) San Sebastián: Donostiarra. Kalpakjian, S., Schmid, S., Murrieta Murrieta, J., Sandoval Palafox, F. and Figueroa López, U. (2014). Manufacturing, engineering and technology. Naucalpan de Juárez (Spain). State of Mexico: Pearson Education of Mexico. CES Edupack Granta. (2017). Cambridge, United Kingdom: Granta Design Limited.
Other supplemental materials
Askeland, D. and Phule, P. (2011). Materials science and engineering, Thomson. Mangonon P. (1999). Materials science: selection and design, Prentice Hall. Ashby,M. (2011). Materials Selection in Mechanical Design, Elsevier. Giménez,C., Amigo,V.y Moya,M.(2009).Fundamentals of Materials Science, Volume I and II, Spain UPV. Van Vlack, L. (1980). Engineering Materials. (2nd Ed.). Mexico: CECSA.

Description	
The Materials Science and Engineering Laboratory is a basic course for understanding the relationship between the structure, properties, and processing and testing techniques of engineering materials. Various tests (tension, compression, bending, hardness, metallography, impact) are carried out on different materials following international standards, techniques or procedures. Students are expected to analyze the mechanical behavior of materials with the evaluation of faults (fracture mechanics), as well as determine the effect of composition and phases of structure on alloys with phase diagrams.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Summarizes the characteristics of the most important materials and their manufacturing processes by identifying the effects of manufacturing processes on design. 2. It describes the microstructure of materials and the latest advances in the technological development of materials processing to incorporate design improvements. 3. Interprets the test requirements and/or specifications of a product or material appropriately to assess its conformity or determine its characteristics and properties. 4. It shows willingness and collaboration to team work during the development of laboratory practice tests. 5. It organizes the data of the practices in a coherent and structured way, detailing and describing the procedure carried out to calculate design requirements or properties of the materials relating it to the theoretical foundation that supports it. 6. Appropriately uses the primary concepts of materials science and engineering for troubleshooting product materials and/or their manufacturing processes.
Student outcomes	SO1. Identifies, formulates and solves complex Engineering problems through the application of Engineering, Science and Mathematics principles. SO5. Function effectively in a team whose members together provide leadership, create a collaborative and inclusive environment, set goals, plan tasks, and meet objectives. SO6: Develops and conducts appropriate experimentation, in which they analyze and interpret data, as well as use engineering criteria to draw conclusions.

Topics
Unit I. Introduction to materials science and engineering.
Unit II. Mechanics of the fracture.
Unit III. Metalography.
Unit IV. Hardness.
Unit V. Voltage.
Unit VI. Compression.
Unit VII. Flexion.
Unit VIII. Impact.
Unit IX. Binary isomorphic phase diagrams.
Unit X. Iron-Carbon Diagram.

Code	INI384	Prerequisites	INI326
Name	Methods engineering	Co- requisites	None

Credits	Contact hours
04	44
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Jorge Miranda

Text book
Garcia Criollo, R. (2005). Estudio del Trabajo. (2nd ed.) Mexico: McGraw Hill. Krick, E. (1975). Methods engineering. Mexico: Lima. Nahmias, S. (2007). Analysis of production and operations. (5th edition). McGraw Hill. Niebel, B., Freivald, A. (2014). Niebel Industrial Engineering: Methods, Standards, and Work Design. (13th edition). Mexico: McGraw-Hill.
Other supplementary materials
Barnes, R. (1980). Time and Motion Study. (7th edition) Buffa , ES (1982). Administración y dirección técnica de la producción. (4th edn). Mexico: Lima. Chase, R.B., Aquilano, NJ (1992). Production and operations management: a life cycle approach. (6th edn). Irwin. Maynard, H.B., Zandin, K.B. (2001). Maynard's Industrial Engineering Handbook. (5th ed.). New York: McGraw Hill. International Labor Office. (1986). Introduction to work study. (3rd revised ed.). Geneva. Wheat B, Carnell M, Mills C (2007). Six Sigma: A parable about the path to excellence and a lean company. Bogota: Editorial Norma.

Description	
Methods Engineering is a theoretical-practical subject where the student will learn to analyze, improve and redesign production processes, both for manufacturing and service companies. For both cases, the student must use work study tools to solve problems that include phases from the identification of the needs of the client (person or company that requires the solution of a problem) to the creation, selection and argumentation of the solution. Proposed solution(s). It includes the study of Methods and times. Use of diagrams to analyze the movement of material, flow and support activities.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Identify the client's needs to transform them into objectives, criteria and restrictions with a high level of compatibility and using tools, methods and/or engineering systems. 2. Generate and select the best alternatives with a high level of correlation with the established criteria and restrictions, in

	accordance with engineering sciences and considering health, welfare and safety. 3. Define the problem and its causes in a systemic way, including all internal and external aspects of the problem, such as the impact on other areas, the parties interested in solving the problem, supporting roles that are needed, etc. 4. Select and justifies the best solution by using complex methods (as necessary), according to the problem definition and within the previously identified alternatives. 5. Prepare reports expressing most of the key ideas of the subject matter, organizing and classifying them coherently and with criteria. 6. Assume corresponding roles within the team based on their skills, meeting commitments within the established deadlines.
Student outcomes	SO1. Identify, formulate and solve complex engineering problems by applying the principles of Engineering, Science and Mathematics. SO2. Apply the engineering design process to produce solutions that meet specific needs, taking into consideration public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. SO3. Communicate effectively with a variety of audiences. SO5. Function effectively in a team whose members together provide leadership, create a collaborative and inclusive environment, set goals, plan tasks and meet objectives.

Topics
Unit I. Study of movements Unit II. Work measurement Unit III. Ergonomic principles

Code	INI307	Prerequisites	INI348, ING302
Name	Production Systems Design I	Co-requisites	None

Credits	Contact Hours
04	44
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Cayetano Rodríguez

Text book
Heizer, J. And Render, B. (2014). Operations Management Principles - Fifth Edition. Mexico: Pearson Education Niebel, B.W. and Freivalds, A. (2014). Industrial Engineering of Niebel, 13th edition, Mexico City: McGraw Hill
Other supplemental materials
Hernandez, J.C. and Vizán, A. (2013). Lean Manufacturing Concepts, Techniques and Implementation. Madrid: EOI Foundation Lunau, S. (2009). Design for Six Sigma + Lean Toolset Frankfurt, Germany: Springer Project Management Institute (2013). Project Management Fundamentals Guide - Fifth Edition. Newtown Square, PA: PMI Rother, M. and Harris, R. (2001). Creating Continuous Flow. Brookline, MA: The Lean Enterprise Institute Taghizadegan, S (2006). Essential of Lean Six Sigma. Oxford, UK: Elsevier Womack, J.P. and Jones, D.T. (2003). Lean Thinking - Revised and Updated. New York, NY: Free Press Carreira, B (2005). Lean Manufacturing that works. New York, NY: AMACOM Nash, M.A. and Poling, S.R. (2008). Mapping the Total Value Stream. New York, NY: CRC Press

Description	
Production Systems Design I is a theoretical-practical subject where students will learn to analyze and develop basic production systems, both for industrial and service companies, or to improve existing ones. For both cases, the student must use methods of design and problem solving that include phases or steps that range from identifying the needs of the client (person or company that requires the solution of a problem) to the creation, selection and argumentation of the proposed solution(s). It should be added that, within each of the phases of these methods mentioned above, there are tools designed to: identify customer needs, define problems, analyze their causes, design, present and plan the implementation of solutions, among other types of tools. The student will then learn to identify and apply the appropriate tool for each type of problem that is presented and in the corresponding sequence.	
Type of course	☒ Required ☐ Elective

Specific goals for the course

Outcomes of instruction	1. Identifies customer needs to transform them into objectives, criteria and constraints with a high level of compatibility and making use of tools, methods and / or engineering systems. 2. It generates sufficient alternatives with a high level of correlation with established criteria and restrictions, in accordance with engineering sciences and taking into account health, welfare and safety. 3. Select the best alternative by effectively applying decision-making methodologies and based on established design constraints. 4. It defines the problem in a systemic way, including all internal and external aspects of the problem, such as impact on other areas, stakeholders in problem resolution, support roles needed, etc. 5. It determines all causes of the problem from the use of specific techniques and prioritizing among the causes found. 6. Select the best solution using complex methods (as needed), according to the problem definition and within previously identified alternatives. 7. Justifies the selected alternative based on arguments consistent with the criteria set in the problem definition.
Student outcomes	SO1. Identifies, formulates and solves complex Engineering problems through the application of Engineering, Science and Mathematics principles. SO2. Apply and use the engineering design process to produce solutions that meet specific needs, taking into consideration public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

Topics
Unit I: Overview of Production System Design Unit II: Methods and Tools for identifying customer needs and defining the problem Unit III: Methods and Tools to analyze production systems and propose design alternatives Unit IV: Methods and Tools for planning and sustainability of production systems

Code	INI388	Prerequisites	INI381 INI382 INI382L
Name	Quality Management II	Co-requisites	None

Credits	Contact Hours
04	44
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Alfonsina Martínez

Text book
Dominican System for Quality (SIDOCAL) Law 166-12. National Congress of the Dominican Republic (2012).
Other supplemental materials
International Organization for Standardization (2015). ISO 9000:2015 Quality management systems — Fundamentals and vocabulary. https://www.iso.org/ International Organization for Standardization (2015). ISO 9001:2015 Quality management systems — Requirements. https://www.iso.org/ International Organization for Standardization (2009). ISO 9004:2009 Management for the sustained success of an organization. Quality management approach. https://www.iso.org/ International Organization for Standardization (2018). ISO 31000:2018 Risk management. Guidelines. https://www.iso.org/ International Organization for Standardization (2011). ISO 19011:2018 Guidelines for the audit of management systems. https://www.iso.org/ QMS auditing topics for ISO 9001:2015. https://committee.iso.org/sites/tc176/home/page/iso-9001-auditing-practices-grou.html

Description	
This subject of the Quality Management module will introduce the concepts and tools necessary for the student to understand and collaborate in the implementation of a quality management system; developing in the subject the ability to design, implement, manage, evaluate and improve a quality management system. They will also acquire the ability to identify, understand and apply tools for the implementation of good practices and models of excellence in an organization. Likewise, the student will know the basic concepts of metrology as a basis for the development of future competences.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Identifies needs and converts them into goals, criteria and design constraints. 2. Generates alternatives supported in engineering sciences, social sciences, economics among others, selecting the best.

	3. Create design specifications, prototypes or other communication media. 4. Develop solutions according to the current reality, taking into account ethical and professional responsibility. 5. Evaluates the consequences of the impact of engineering decisions in contexts (economic, environmental and social) at global, regional and local levels. 6. Recognizes copyright in the particular solutions developed. 7. Plan strategies for meeting goals. 8. Interacts with team members, open to the opinions of others. 9. Identifies your role as a member of the work team for the achievement of the objectives. 10. Identifies the need to acquire new knowledge, relating it to a learning strategy. 11. Uses various methods and tools to obtain information relevant to new knowledge.
Student outcomes	SO2. It applies the engineering design process to produce solutions that meet specific needs taking into account public health, safety and welfare, as well as global, cultural, social, environmental and economic factors. SO4. Recognizes ethical and professional responsibilities in engineering situations and makes informed judgments considering the impact of engineering solutions in global, economic, environmental and social contexts. SO5. It works effectively on teams whose members together provide leadership, create a collaborative and inclusive environment, set goals, plan tasks, and meet goals. SO7. Acquire and apply new knowledge as required, using appropriate learning strategies.

Topics
Unit I. Standardization and standardization bodies
Unit II. ISO standards
Unit III. Implementation of the quality management system
Unit IV. ISO 9001 standard
Unit V. Evaluation of management systems
Unit VI. Standardization, improvement and risk management
Unit VII. Models of Excellence
Unit VIII. Introduction to Metrology

Code	INI389	Prerequisites	INI383
Name	Materials selection	Co- requisites	None

Credits	Contact hours
04	44
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Laura Ramirez

Text book
Ashby, M.; Shercliff, H. & Cebon , D. (2018). Materials: engineering, science, processing and design. (4th Ed.) Elsevier, Butterworth-Heinemann (BH). Ashby, M. (2013) Materials and the Environment. Eco-Informed Material Choice. (2nd Ed.) Elsevier, Butterworth-Heinemann (BH). Askeland, D., & Wright, W. (2017). Materials science and engineering. Mexico, DF: Cengage Learning Publishers. Kalpakjian, S. & Schmid, S. (2014). Manufacturing, engineering and technology (7th Ed.) Naucalpan de Juárez (State of Mexico): Pearson Educación de México. Ashby, M. and Johnson K. (2014) Materials and Design: The Art and science of Material Selection in Product Design (3rd Ed.) Elsevier, Butterworth-Heinemann (BH).
Other supplementary materials
CES Edupack Great. (2018). Cambridge, UK: Granta Design Limited. grantadesign.com. (2019). great Design: Education. [online] Available at: http://www.grantadesign.com/education/ [Accessed April 22, 2019]. Ports Rafales, J., Rios Jordana, R. & Castro Corella, M. (2016). Materials Technology in Engineering. Madrid: Synthesis The Institute of Materials, Minerals and Mining. (2019). IOM3 The Institute of Materials, Minerals and Mining. [online] Available at: https://www.iom3.org/ [Accessed April 23, 2019].

Description	
Materials selection is a subject that trains the student in a theoretical and practical way in the selection of materials according to the design requirements of a product and the designer's objectives (improvement of environmental impact, reduction of production costs, better performance, etc.). This is a basic course to understand the relationship between the properties of materials and the design requirements to ensure their proper functioning. The different approaches to design are exposed (strength, stiffness, flexibility, weight, elasticity, plasticity, yield, ductility, crushing, wobble, fatigue, limited fracture, fracture toughness, optical quality, wear, slip, conductors, insulators, dielectrics). , magnetism, durability) and the properties of the materials with which these approaches are associated.	
Type of course	☒ Required ☐ Elective

Specific goals for the course

Outcomes of instruction	1. Identify, formulate and solve product performance problems related to materials and/or their manufacture. 2. Design components or manufacturing processes of a product to respond to demands or needs taking into account realistic limitations, as well as economic, environmental, social, political, ethical, health and safety, manufacturing and sustainability. 3. Communicate effectively by discussing the general aspects of the properties and characteristics of materials, as well as their manufacturing processes. 4. Design and conduct experiments, applying data analysis and interpretation to evaluate use and extreme conditions following scientific methodologies and rigorous criteria.
Student outcomes	SO1. Identify, formulate, and solve complex engineering problems by applying the principles of engineering, science, and mathematics. SO2. Apply the engineering design process to produce solutions that meet specific needs taking into account public health, safety and welfare, as well as global, cultural, social, environmental and economic factors. SO3. Communicate effectively with a variety of audiences. SO6: Develops and conducts appropriate experimentation, in which they analyze and interpret data, as well as use engineering criteria to draw conclusions.

Topics
Unit I. Introduction: materials, history and characteristics. family trees
Unit III. Strategic thinking: adapt the material to the initial design
Unit IV. Stiffness and weight: density and modulus of elasticity
Unit V. Flexing, buckling and wobbling - limited stiffness design
Unit VI. Beyond Elasticity: Plasticity, Yield, and Ductility
Unit VII. Bend and Crush: limited strength design
Unit VIII. Fracture and fracture toughness
Unit IX. Shaking, Rattle, and Wobble: Cyclic Loading, Damage, and Failure
Unit XI. Friction slide and grip: friction and wear
Unit XII. materials and heat. The use of materials in high temperature conditions
Unit XIV. Conductors, insulators and dielectrics. magnetic materials

Code	INI310	Prerequisites	INI388
Name	Quality Control	Co-requisites	None

Credits	Contact Hours
04	44
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Prof. Jessica Pamela Feliz Garrido.ME.

Text book
Barrentine, L. (2012). Concepts for R&R Studies (2nd ed.). American Society for Quality. Evan, J., & Lindsay, W. (2008). Administration and quality control (7th ed). Cengage Learning Gallardo Vázquez, S. (2015). Elements of telecommunications systems. Paraninfo Editions. ISBN:8428336636, 9788428336635 Gutiérrez Pulido, H., & De la Vara, R. (2013). Statistical quality control and Six Sigma (3rd ed.). McGraw Hill.
Other supplemental materials
Chrysler Handbook (1989). Using SPC to be the Best. Chrysler Group LLC. Montgomery, D.C. (2001). Introduction to statistical quality control (4th ed.). John Wiley and Sons. Phadke, M.S. (1989). Quality Engineering using robust design. Prentice Hall

Description	
The subject is oriented to the design of systems for quality control and assurance and implementation of statistical process control. It includes analysis of a process's capacity and techniques for process improvement, as well as the implementation of Lean Six Sigma as a project methodology.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Defines the problem by identifying all the key internal aspects of the problem and determines all causes of the problem, using some more complex techniques to find these causes or to validate them. 2. Proposes several solutions to the problem, selecting the best alternative and elaborates sufficient arguments to justify the selected solution. 3. Identifies needs, transforming them into objectives, criteria and constraints with a high level of compatibility, making use of tools, methods and / or engineering systems. 4. Generates sufficient alternatives with a high level of correlation with established criteria and restrictions and in conformity with engineering sciences.

	5. Participates in the planning of the objectives and their follow-up until the fulfillment in an efficient way, fulfilling the commitments and respecting the established deadlines. 6. Interacts with team members in an appropriate manner, encouraging and considering the ideas of other members and implementing strategies to avoid and resolve conflicts. 7. Sets the objectives of the experiment, conducts the experiment in a comprehensive manner and interprets the data and events that occurred during the experimentation. 8. Argues about the results obtained based on the evidence and the analysis of experimentation, explaining the differences between the data obtained and the experimental assumptions, recommending the application of the results and identifying possible risks.
Student outcomes	SO1. Identifies, formulates and solves complex engineering problems by applying the principles of Engineering, Science and Mathematics. SO2. Apply and use the engineering design process to produce solutions that meet specific needs, taking into consideration public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. SO5. Function effectively in a team whose members together provide leadership, create a collaborative and inclusive environment, set goals, plan tasks, and meet objectives. SO6. Develops and conducts appropriate experimentation, in which they analyze and interpret data, as well as use engineering criteria to draw conclusions.

Topics
Unit I. Introduction to Quality Control
Unit II. Planning. DMAIC Stage Defines
Unit III. Statistical Process Measurement and Control. DMAIC Stage Measure.
Unit IV. Other Quality Control Tools
Unit V. Case Analysis and Validation DMAIC Stage Analyze
Unit VI. Continuous Improvement Methodologies DMAIC Stage Improve
Unit VII. Continuous learning and sustainability. DMAIC Stage Control

Code	INI323	Prerequisites	CON213, INI301
Name	Process Cost Analysis	Co-requisites	None

Credits	Contact Hours
04	44
Categorization of credits	
Math and basic science	
Engineering topic	X
other	

Instructor's course name:	Heidi Romero Alfredo Vicious

Textbook
Horngren, CT, Datar, S., Rajan, MV, Jaime Gómez Mont Araiza, Ángel Rodríguez Gutiérrez Miguel, & Gonzalez Damian Irma. (2012). Contabilidad de Costos: Un Enfoque Gerencial. Pearson Education.
Other supplemental materials
Robinson, A. (1992). Modern Approaches to Manufacturing Management: The Shingo System. Productivity Press. Faga Héctor Alberto, & Enrique Ramos Mejia Mariano. (2006). Cómo profundizar en el análisis de sus costos para Tomar Mejores Decisiones Empresariales. Granica. María Arias Alvarez Ana, Cornejo García Beatriz, Cabezas, MA, Antonio Pérez Méndez José, Sánchez Rodríguez Pablo, & Luis Garcia Suarez Jose. (2015). Cálculo, análisis Y gestión de costes: Guía práctica para su aplicación en la empresa. Delta. Magdalena Arredondo Gonzalez Maria. (2015). Contabilidad y análisis de costos. Larousse - Patria Editorial Group. Current research articles

Description _	
The process cost analysis subject provides tools for the analysis and allocation of costs in the different production systems. At the end of the course, the student is expected to be able to calculate the costs of operations to make decisions in a timely manner, know the different costing methods and systems, and differentiate them in their practical application, and build decision-making models to decide what and how much to produce, the appropriate sales mix, pricing, and evaluation of alternatives.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Identify and apply cost accounting methods to solve engineering problems. 2. Formulate and model problems using the cost-volume-profit model. 3. Evaluate data from a mathematical model in order to propose improvement alternatives in a complex engineering problem.

	4. Design costing systems considering the characteristics of the production process. 5. Reflect on their learning experiences, identifying strengths and points for improvement to achieve continuous learning.
Student outcomes	SO1. Identify, formulate, and solve complex engineering problems by applying the principles of engineering, science, and mathematics. SO6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering criteria to draw conclusions. SO7. Acquire and apply new knowledge using appropriate learning strategies

Topics
Unit I. Fundamentals of Cost Accounting Unit II. Cost Volume Profit Analysis Unit III. Costing Systems Unit IV. Tools for planning and control

Code	INI391	Prerequisites	CBM302
Name	Operational research I	Co-requisites	INI391L

Credits	Contact Hours
04	44
Categorization of credits	
Math and basic science	
Engineering topic	
Other	

Instructor's course name:	Karl Corporán Virginia García Fernando Albaine

Text book
Bertsimas, D. and Tsitsiklis, J. (1997). Introduction to Linear Optimization (1st edition). Athena Scientific Hillier, F., Lieberman, G. (2013). Introduction to Operations Research (9th edition). McGraw Hill. Taha, H. (2012). Operations Research (9th edition). Pearson. Winston, W., Bruna, M., Sánchez, F. (2008). Operations Research: Applications and Algorithms (4th edition). Thomson
Other supplemental materials
Ifors (2017). International Transactions in Operations Research. Obtained from http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1475-3995 Report (2017). Transactions on Education reports. Obtained from http://pubsonline.informs.org/loi/ited

Description	
This subject covers the use of mathematical optimization models and optimization methods to obtain optimal results when solving these models. In addition, it studies the performance of post-optimality analysis for enriching the results obtained by applying the optimization methods.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Demonstrates punctuality in fulfilling your responsibilities as a student. 2. Integrates knowledge from the various areas of industrial engineering knowledge into the development of problem-solving proposals. 3. Criticizes and proposes improvements to the solution proposals to optimization problems made by their peers.
Student outcomes	SO2. Apply and use the engineering design process to produce solutions that meet specific needs, taking into consideration public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

	SO4. Recognizes ethical and professional responsibilities in engineering situations and makes informed judgments considering the impact of engineering solutions in global, economic, environmental and social contexts. SO7. Acquire and apply new knowledge using appropriate learning strategies.

Topics
Unit I. Introduction to Operations Research Unit II. Modeling Unit III. Optimization Methods Unit IV. Post-Optimality Analysis

Code	INI391L	Prerequisites	INI382 INI382L ING302
Name	Operations Research Laboratory I	Co- requisites	INI-391

Credits	Contact hours
01	22
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Fernando Albaine

Textbook
Frye, C (2016). Microsoft Excel 2016 Step by Step: Practice Files Ojeda, FC (2016). Microsoft Office Excel 2016 Advanced Manual. Madrid, Spain: Anaya Multimedia Winston, Wayne (2016). Microsoft Excel Data Analysis and Business Modeling 5th Ed: Microsoft.
Other supplementary materials
Edwin O. (Producer). (2016). Excel 2016. https://www.youtube.com/playlist?list=PLNXKSKL0wyTL1WgcYIoZ8tYBCQblXsvJZ Indigo Tutorial. (Producer). (2016). Excel Tutorials. https://www.youtube.com/playlist?list=PLxgQzwsFLGL2FJhmBNZ8EW7Zn7-OqBlHI

Description	
In today's world, the Industrial Engineering professional must be able to use spreadsheet tools and optimization techniques to develop efficient and effective solutions. The course is divided into an introduction to advanced spreadsheet functions and their application in Industrial Engineering, and the use of " Solver " to solve Linear Programming problems. Learning will take place mainly through the execution of practices guided by the teacher and practices executed individually by the student. The development of competencies will be evaluated with the use of checklists, rubrics, and objective tests.	
Type of course	☒ Required ☐ Elective _

Specific goals for the course	
Outcomes of instructions	1. Integrate the knowledge of the different areas of knowledge of industrial engineering in the development of proposals for the solution of problems. 2. Criticize and propose improvements to the proposals for solutions to optimization problems made by their peers

Student outcomes	SO2. Apply and use the engineering design process to produce solutions that meet specific needs, taking into consideration public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

Topics
Unit I. Pivot Tables
Unit II. Create and run macros
Unit III. Creation of Forms
Unit IV. Manipulation Modules with Variables
Unit V. Introduction to Solver
Unit VI. Solver Reports and Sensitivity Analysis
Unit VII. Transportation Model
Unit VIII. Allocation Model
Unit IX. Integer Programming Models

Code	INI392	Prerequisites	INI307
Name	Production Design Systems II	Co- requisites	INI392L

Credits	Contact hours
04	44
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Jose Gabriel Lavayen Cruz

Text book
Tompkins, J., While, J., Bozer, Y., & Tanchoco, JM (2011). Facilities Planning (4th. Edition). Cengage Learning. Meyers, FE, Stephens, MP, & Brito, JE (2006). Design of manufacturing facilities and material handling. PearsonEducation. Heizer, J. & Render, B. (2014). Principles of Operations Management – Fifth Edition. Pearson Education.
Other supplementary materials
Orozco, E.E., & Cervera, J.E. (2013). Design and Distribution of Industrial Facilities supported by the use of Process Simulation. Research and Innovation in Engineering, 1(1). Hernandez, JC and Vizán, A. (2013). Lean Manufacturing Concepts, Techniques and Implementation. EOI Foundation Lunau, S. (2009). Design for Six Sigma + Lean Toolset. Springer.

Description	
Through this subject it is intended that the student develops the ability to design a facility, applying material flow concepts for said facility (manufacturing and services) and the optimal location of the different components of the system.	
Type of course	☒ Required ☐ Elective _

Specific goals for the course	
Outcomes of instruction	1. Define the problem by identifying all its key internal aspects: objectives, metrics, process flow that contains the problem, inputs and outputs of each stage of the process, among others. 2. Select the best solution by using complex methods (as needed), according to the problem definition and within multiple previously identified alternatives. 3. Prepare sufficient arguments to justify the selected solution where a strong correlation between the arguments and the criteria established in the definition of the problem is evidenced. 4. Generate sufficient alternatives with a high level of correlation with the established criteria and restrictions, in accordance with the engineering sciences and considering health, welfare and safety.

	5. Select the best alternative by effectively applying decision-making methodologies and based on the established design constraints. 6. Create the plans, procedures, specifications, as well as other means of communication of the design, following norms or standards of engineering in general.
Student _ outcomes	SO1. Identify, formulate, and solve complex engineering problems by applying the principles of engineering, science, and mathematics. SO5. Function effectively in a team whose members together provide leadership, create a collaborative and inclusive environment, set goals, plan tasks, and meet objectives. SO6. Develops and conducts appropriate experimentation, in which they analyze and interpret data, as well as use engineering criteria to draw conclusions.

Topics
Unit I. Introduction Unit II. Design of Products, Processes and Programs Unit III. The Flow, Space and Relationships of Activities Unit IV. Personnel Requirements Unit V. Material Handling Unit VI. Design Layout Planning Models Unit VII. Warehouse Operations Unit VIII. Facility Location

Code	INI392L	Prerequisites	INI307
Name	Production Systems Design Laboratory II	Co-requisites	INI392

Credits	Contact Hours
02	22
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Ing. Cristian Rodriguez

Text book
Tompkins, J., While, J., Bozer, Y., & Tanchoco, JM (2011). Facilities Planning (4th. Edition). Cengage Learning. Meyers, FE, Stephens, MP, & Brito, JE (2006). Design of manufacturing facilities and material handling. Pearson Education. Heizer, J. & Render, B. (2014). Principles of Operations Management – Fifth Edition. Pearson Education.
Other supplemental materials
Orozco, E.E., & Cervera, J.E. (2013). Design and Distribution of Industrial Facilities supported by the use of Process Simulation. Research and Innovation in Engineering, 1(1). Hernandez, JC and Vizan, A. (2013). Lean Manufacturing Concepts, Techniques and Implementation. EOI Foundation Lunau, S. (2009). Design for Six Sigma + Lean Toolset. Springer

Description	
The Production Systems Design Laboratory II is a practical subject where students acquire the basic knowledge to develop simulation models of real and proposed situations, using Flexsim, which allow them to evaluate the performance of production processes and/or services. In it, students will acquire competencies in the identification of components of a model, knowledge of basic structures of a discrete event simulator. Similarly, students will be able to recognize steps to follow in a discrete event simulation study, understand the importance of simulation in the study of complex systems, apply basic knowledge of modeling and simulation using Flexsim, use library of objects to represent service, material handling, process flow, and manufacturing systems and perform simulation experiments using Flexsim software.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Define the problem by identifying all its key internal aspects: objectives, metrics, process flow that contains the problem, inputs and outputs of each stage of the process, among others. 2. Select the best solution by using complex methods (as needed), according to the problem definition and within multiple previously identified alternatives.

	3. Prepare sufficient arguments to justify the selected solution where a strong correlation between the arguments and the criteria established in the definition of the problem is evidenced. 4. Generate sufficient alternatives with a high level of correlation with the established criteria and restrictions, in accordance with engineering sciences and taking into account health, welfare and safety. 5. Select the best alternative by effectively applying decision-making methodologies and based on the established design constraints. 6. Create the plans, procedures, specifications, as well as other means of communication of the design, following norms or standards of engineering in general.
Student outcomes	SO1. Identify, formulate, and solve complex engineering problems by applying the principles of engineering, science, and mathematics. SO2. Apply and use the engineering design process to produce solutions that meet specific needs, taking into consideration public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. SO6. Develops and conducts appropriate experimentation, in which they analyze and interpret data, as well as use engineering criteria to draw conclusions.

topics
Unit I. Knowing Flexsim Unit II. Duplicate objects, Effects of adding more services, use of “Send to port” Unit III. Use of labels Unit IV. Use of the “Pull” System and definition of routes Unit V. Use of “Global Tables” Unit VI. Use of Operators Unit VII. Use of “Break to”

Code	INI316	Prerequisites	INM377 INI392
Name	Industrial Safety and Hygiene	Co-requisites	None

Credits	Contact Hours
02	22
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Fabio Sanchez

Text book
Asfahkl, C.R. (s/f) Industrial Safety and Health (4th edition). Prentice-Hall.
Other supplemental materials
Blake, R.P. (s/f). Industrial Safety. Edit. Diana Friar Cantalejo, D. (s/f). Safety and Health. Professional Risks (Volumes I and II). Social Service for Occupational Health and Safety. Ministry of Labor of the Dominican Republic. RD Occupational Safety and Health Regulations, 522-06. Ministry of Labor. Prevention of Occupational Risks, Master's Manuals taught by Universidad La Coruña-Intec.

Description	
This course will give the necessary tools so that the student can understand, develop and implement an Occupational Risk Prevention system in any type of business activity. Through it, the student will develop the ability to design, implement, manage, evaluate and improve Industrial Safety and Hygiene systems in search of that all employees of a company can know correctly how to face the Occupational Risks. This will motivate each employee to join the Preventive Activity, thereby reducing the Incidence Rate of Accidents and Occupational Diseases.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Identifies needs and converts them into goals, criteria and design constraints 2. Generates alternatives supported in engineering sciences, social sciences, economics among others, selecting the best. 3. Creates specifications, prototypes or other means of design communication. 4. Develops solutions according to the current reality, taking into account ethical and professional responsibility. 5. Evaluates the consequences of the impact of engineering decisions in contexts (economic, environmental and social) at global, regional and local levels. 6. Recognizes copyright in the particular solutions developed. 7. Plan strategies for meeting goals.

	8. Interact with team members, open to the opinions of others. 9. Identifies your role as a member within the work team for the achievement of the objectives. 10. Identifies the need to acquire new knowledge, relating them to a learning strategy. 11. Uses various methods and tools to obtain information relevant to new knowledge.
Student outcomes	SO2. Apply and use the engineering design process to produce solutions that meet specific needs, taking into consideration public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. SO4. Recognize ethical and professional responsibilities in engineering situations and makes informed judgments considering the impact of engineering solutions in global, economic, environmental, and social contexts. SO5. Function effectively in a team whose members together provide leadership, create a collaborative and inclusive environment, set goals, plan tasks, and meet objectives.CG4- SO7. Acquire and apply new knowledge using appropriate learning strategies.

Topics
Unit I. Conceptions of Work and Health
Unit II. Industrial Hygiene
Unit III. Prevention of Occupational Risks
Unit IV. Causes and Consequences of Accidents and Incidents
Unit V. Risks of losing health in occupations
Unit VI. Use of Personal Protective Equipment
Unit VII. Fire: Causes and Consequences
Unit VIII. Signage as a fundamental tool of preventive activity
Unit IX. Study of Manual 522-06 on Safety and Health at Work

Code	INI385	Prerequisites	INE354, INE354L, ING215, INM377, INM377L
Name	Process Automation	Co-requisites	INI385L

Credits	Contact Hours
4	44
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Prof. José Rafael Silva Archetti

Text book
Training, F., (2015), Installation of equipment and elements of industrial automation systems, IC Editorial. Perez et al, (2018), Automation systems and programmable automata 3rd edition, Marcombo. Piedrafita, R., (2004), Industrial automation engineering (2nd edition extended and updated), Spain, Ra-ma.
Other supplemental materials
Alvarez, D., (2015), Manual of hydraulics, pneumatics and PLC programming: Industrial automation, Mexico, Mexican Robotics and Mechatronics Association. D'Addario, M., (2017), Industrial Automation - Technology, Representation and Functions - Volume I, Createspace. Manufactured by: Made In Spain [TV series] (2013) Spain: Mediapro, Radiotelevisión Española.

Description	
Process automation is a project-oriented subject, where students will learn to develop control systems for the automation of industrial processes or improve existing ones. The student must employ design and troubleshooting methods to create or improve a small-scale industrial process that meets the needs, in order to manufacture a product automatically. It is important to know that the development of the project is carried out in different stages (mechanical, electrical and programming), which allows the student to develop technical skills such as: production line elaboration, design and installation of control systems, elaboration of ladder diagram and mnemonic code based on Programmable Logical Controllers (PLC) in order to automate a process.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. It defines the problem by identifying all the key internal aspects of it: objectives, metrics, flow of the process containing the problem, inputs and outputs of each stage of the process, among others. 2. It identifies all causes of the problem using complex techniques to find the causes of the problems or to validate them.

	3. Select the best solution using complex methods (as needed), according to the problem definition and within multiple previously identified alternatives. 4. It elaborates sufficient arguments to justify the selected solution where a strong correlation between the arguments and the criteria established in the definition of the problem is evidenced. 5. Identifies production needs and transforms them into objectives, criteria and constraints with a high level of compatibility, making use of engineering tools, methods and/or systems. 6. It generates sufficient alternatives with a high level of correlation with established criteria and restrictions, in conformity with engineering sciences and taking into account health, welfare and safety. 7. Select the best alternative by effectively applying decision-making methodologies and based on established design constraints. 8. Create drawings, procedures, specifications, as well as other means of design communication, following general engineering standards or norms.
Student outcomes	SO1. Identifies, formulates and solves complex Engineering problems through the application of Engineering, Science and Mathematics principles. SO2. Apply and use the engineering design process to produce solutions that meet specific needs, taking into consideration public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

Topics
Unit I. Introduction to Automation Unit II. Industrial Sensors Unit III. Industrial actuators Unit IV. Introduction to Pneumatics and Hydraulics V. PLC Based Control Unit

Code	INI385L	Prerequisites	INE354, INE354L, ING215, INM377, INM377L
Name	Process Automation Lab	Co-requisites	INI385

Credits	Contact Hours
01	22
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Prof. José Rafael Silva Archetti

Text book
Training, F., (2015), Installation of equipment and elements of industrial automation systems, IC Editorial.
Other supplemental materials
Silva, J., (2017), Laboratory Manual Industrial Automation, Santo Domingo, Dominican Republic, INTEC. Alvarez, D., (2015), Manual of hydraulics, pneumatics and PLC programming: Industrial automation, Mexico, Mexican Robotics and Mechatronics Association. D'Addario, M., (2017), Industrial Automation - Technology, Representation and Functions - Volume I, Createspace. Manufactured by: Made In Spain [TV series] (2013) Spain: Mediapro, Radiotelevisión Española.

Description	
Process automation laboratory is a practice-oriented subject where the student will develop skills to design and install multiple elements of a control system for the automation of industrial processes or improve existing ones. Each student will acquire practical knowledge about the use of devices and their individual behavior to automate small processes, using relays, electric motors, pneumatic valves, single and double effect pneumatic cylinders, industrial sensors and switches. For the automation of larger and more complex processes, the student will learn to use Programmable Logical Controllers (PLCs), developing ladder diagrams, mnemonic codes and electrical connection diagrams for the interconnection of the PLC with peripheral devices.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. It defines the problem by identifying some of the key insights. 2. It identifies some of the causes of the problem, using some complex techniques to find the causes of the problems or to validate them.

	3. It proposes solutions to the problem using basic principles and methods of engineering. 4. It develops sufficient arguments to justify the selected solution, taking into account the criteria established in the problem definition. 5. Clearly identifies needs and may set limited design objectives, criteria and constraints. 6. It generates sufficient design alternatives, with some level of correlation with established criteria and restrictions and weakly supported in engineering sciences or other sciences. 7. Please select alternatives taking into account some restrictions. 8. Communicates design in a limited way by omitting some engineering standards and norms.
Student outcomes	SO1. Identifies, formulates and solves complex engineering problems by applying Engineering, Science and Mathematics principles. SO2. Apply and use the engineering design process to produce solutions that meet specific needs, taking into consideration public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

Topics
Unit I. Fishertechnik parts Unit II. Wired Logic I Unit III. Wired Logic II Unit IV. Pneumatics Unit V. PLC unit

Code	INI393	Prerequisites	INI391 INI391L
Name	Operational Research II	Co-requisites	INI393L

Credits	Contact Hours
04	44
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Heidi Romero, Arturo del Villar

Text book
Kelton, W.D., Sadowski, R.P., Swets, N.B. (2014) Simulation with Arena. McGraw-Hill Education. Rossetti, M.D. (2015) Simulation Modeling and Arena. Willey Publishers. Shortel, J.F., Thompson, J.M., Gross, D., Harris, C.M. (2018) Fundamentals of Queueing theory. Willey Publishers. Taha, H.A. (2016) Operations Research. Pearson Prentice Hall.
Other supplemental materials
Altiok, T., Melamed, B. (2010) Simulation Modeling and Analysis with ARENA. Elsevier. Diaz Redondo, R.P., Pazos Arias, J.J., Fernández Vilas, A. (2010) Problems of Tail Theory. Andavira Editor.

Description	
At present, one of the major challenges of the industry is the need to optimize the use of resources used for the production of goods or services. This subject emphasizes the analysis and design of stochastic models to evaluate performance and propose alternatives for improvements in manufacturing processes and services, using engineering criteria to draw conclusions. The course content covers the basic concepts of system simulation, process modeling, verification and validation of results through the use of statistical tests. Finally, it includes the classification of the models of queue theories using the Kendall nomenclature, describing their characteristics and their application in solving practical problems.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Identifies and applies optimization methods to solve engineering problems using stochastic variables. 2. Formula and model problems using stochastic variables. 3. It evaluates data from a mathematical model in order to propose alternatives for improvements in a complex engineering problem. 4. Design systems, components or processes by modeling and simulating discrete events.

	5. It reflects on their learning experiences, identifying strengths and points of improvement to achieve continuous learning. 6. Interprets and evaluates the results of a simulation model through the use of statistical tests.
Student outcomes	SO1. Identifies, formulates and solves complex Engineering problems by applying the principles of Engineering, Science and Mathematics. SO6. Develops and conducts appropriate experimentation, in which they analyze and interpret data, as well as use engineering criteria to draw conclusions. SO7. Acquire and apply new knowledge using appropriate learning strategies.

Topics
Unit I. Introduction to System Simulation Unit II. Simulation Models Unit III. Queue Theory

Code	INI393L	Prerequisites	INI391 INI391L
Name	Operational Research Laboratory II	Co-requisites	INI393

Credits	Contact Hours
01	22
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Prof. Karl Corporan

Text book
Kelton, Sadowski & Sturrock (2008). Simulation with Software Arena (4th Edition) Taha, H. (2012). Operations Research 9th Edition. Pearson. Hillier, F. & Lieberman, G. (2013). Introduction to Operations Research (9th edition). McGrawHill. Winston, W. Bruna, M. & Sanchez, F. (2008). Operations Research: Applications and Algorithms (4th Edition). Thompson
Other supplementary materials
Ifors (2018). International Transactions in Operatios Research. Retrieved from http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1475-3995 Reports (2018). Reports Transactions on Education. Retrieved from http://pubsonline.informs.org/loi/ited

Description	
This course covers the use of computational models and simulation for the analysis, proposal of solutions and evaluation of the same in engineering problems based on mathematics, science and engineering criteria. This subject contains the topics of Montecarlo Simulation, Computational Simulation and Simulation of Queues. It is supported by the use of specialized software in Spreadsheets and Simulation Discreet.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Set the objectives of the experiment and select the critical factors, as well as all the answers relevant to the experiment. 2. Plan and conduct the experiment comprehensively, observing and interpreting the behavior of variables throughout the runs. 3. Argue the results obtained based on the evidence and in the analysis of experimentation, making recommendations the application of the results.
Student outcomes	SO6. Develop and conduct appropriate experimentation, analyzes and interprets data, and uses engineering criteria to draw conclusions.

Topics
Unit I. Introduction to simulation
Unit II. Basic Computer Simulation
Unit III. Running a simulation project
Unit IV. Simulation animation

Code	INI394	Prerequisites	INI310
Name	Design of Experiments	Co-requisites	INI394L

Credits	Contact Hours
4	44
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Demetrio Mota

Text book
Gutiérrez Pulido, H. (2013). Analysis and design of experiments (Third edition). McGraw Hill. Gonzalez, R. (2018). Design of Experiments: Elements (Second edition). Amazon. Montgomery, D.C. (2015). Design and Analysis of Experiments (Second Edition). Limusa Wiley Peña, D. (2010). Regression and Design of Experiments (Second Edition). Publishing Alliance Walpole, R. (2007). Probability and statistics for engineering and science (8th edition). Pearson.
Other supplemental materials

Description	
This subject provides the student with the techniques and tools of Statistics that allow them to establish a relationship between the elements of inputs of a process (critical parameters of materials and critical parameters) and the elements of output of the same (The Attributes of quality). The information generated by the use of this instrument will allow you to make decisions on fundamental topics of Industrial engineering such as product design, selection of options, design of effective processes, the search for solutions to quality problems (CAPA), quality by design (Quility by Design), through the methods of Taguchi, process validation and process efficiency through Response surface.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Know the techniques that make up the Design of Experiments. 2. Recognizes the situations in which you can apply the different tools of Experimental Design. 3. Generate sufficient alternatives to solve the problem 4. Sets the parameters that determine the responses of processes. 5. Objectively select the best solution from the solutions generated by the model. 6. Adequately communicates the appropriate arguments justifying your choice.

	7. Design control systems that ensure your solution works properly over time
Student outcomes	SO1. Identifies, formulates and solves complex Engineering problems by applying the principles of Engineering, Science and Mathematics. SO2. Apply and use the engineering design process to produce solutions that meet specific needs, taking into consideration public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. SO6. Develops and conducts appropriate experimentation, in which they analyze and interpret data, as well as use engineering criteria to draw conclusions. SO7. Acquire and apply new knowledge using appropriate learning strategies.

Topics
Unit I. Single Factor Experiments Unit II. Factorial Experiments Unit III. Regression and Experimental Design of Taguchi Unit IV. Process Optimization with Response Surface Unit V. Special Experiment Design Cases

Code	INI394L	Prerequisites	INI310
Name	Design of Experiments Laboratory	Co-requisites	INI394

Credits	Contact Hours
1	22
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Omar Aponte Contreras, M.E.

Text book
Go on, O. (2019). General instructions about the subject. Academic presentation. Gutiérrez Pulido, H., & Vara Salazar, R. d. l. (2008). Analysis and design of experiments (2nd ed. —.). McGraw Hill. Montgomery, D.C. (2005). Design and Analysis Of Experiments (2a. Ed.). Limusa Wiley.
Other supplemental materials
Minitab Inc. (2007). Meet Minitab 15 for Windows. United States. Go on, O. (2019). Basic experimentation with Minitab. Academic presentation.

Description	
Design and statistical analysis of experiments, to identify the effect on a response variable that has the change in the different levels of factors of a process. The course covers specific topics of the industrial engineering career, based on the application of statistical knowledge as a tool to optimize processes and/or systems. The content of the subject begins by addressing what is the Introduction to Design Experiments. And then we move on to the topic Statistical inference. We will perform what are Factor Experiments; Block Factor Experiment; Factorial Experiment; 2k Factorial Design; 2k Factorial Design with Block and Melt; 2k Fractional Factorial Design.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Know the techniques that make up the Design of Experiments. 2. Recognizes the situations in which you can apply the different tools of Experimental Design. 3. Generate sufficient alternatives to solve the problem. 4. Sets parameters that determine process responses 5. Objectively select the best solution from the solutions generated by the model 6. It adequately communicates the appropriate arguments justifying its choice. 7. Design control systems that ensure your solution works properly over time

Student outcomes	SO1. Identifies, formulates and solves complex Engineering problems through the application of Engineering, Science and Mathematics principles. SO2. Apply and use the engineering design process to produce solutions that meet specific needs, taking into consideration public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. SO6. Develops and conducts appropriate experimentation, in which they analyze and interpret data, as well as use engineering criteria to draw conclusions. SO7. Acquire and apply new knowledge using appropriate learning strategies.

Topics
Unit I. Introduction to the Design of Experiments.
Unit II. Statistics Review.
Unit III. Experiments manipulating a single factor.
Unit IV. Experiments designed using blocks.
Unit V. Multifactorial experiments.
Unit VI. Multifactorial experiments with two levels (2^k).
Unit VII. Fractionated multifactorial experiments (2^k-p).

Code	IIN301	Prerequisites	INI393, INI393L INI392, INI392L
Name	Supply Chain Engineering	Co-requisites	None

Credits	Contact Hours
04	44
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Layna Santana

Text book
Alfalla Lique, R. (2016). Strategic management of the supply chain. (1st ed.). Pacific University. Chopra, S., Meindl, P. (2015). Supply Chain Management: Strategy, Planning, and Operation. Pearson Education. Christopher, M. (2016). Logistics & Supply Chain Management. (5th Ed.). Publishing Financial Times. Sabria, F. (2016) Supply Chain. (3rd ed.). Marge Books.
Other supplemental materials
Pawar K, Rogers H, Potter A, Naim M (2016). Developments in Logistics and Supply Chain Management: Past, Present and Future. UK: Palgrave Macmillan. Santon, D. (2017). Supply Chain Management for Dummies. Business & Economics. Velasco, J. (2013). Gestión de la logística en la empresa: Planificación de la cadena de suministros (Economía Y Empresa). Pirámide.

Description	
Supply chain engineering aims to analyze the activities of planning, operation and control of the flow of materials and products, in order to propose strategies that reduce inventory levels and increase the level of service for the end customer. At the end of this program the student is expected to be able to evaluate, design and recommend improvements for the optimization of the supply chain. The content of this subject includes the different logistics processes that are part of the supply chain, such as: demand forecasting, statistically analyzing the behavior of demand for the operations area, maintaining a balance with the commercial area; production planning, indicating what, when and how much to produce; And storage, what should be the optimal inventory levels, and the location of storage points.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Apply the techniques and tools for the design and configuration of distribution networks.

	2. Design integrated systems that include the planning, operation and control of the flow of materials and products, using models to define the balance between logistics decisions and service levels. 3. Contrast the advantages and disadvantages of the different logistics decisions that take place in the supply chain. 4. Work collaboratively with groups of students to develop projects. 5. Show a critical, purposeful and proactive attitude in the oral presentations of their projects.
Student outcomes	SO2. Apply the engineering design process to produce solutions that meet specific needs considering public health, safety and welfare, as well as global, cultural, social, environmental and economic factors. SO4. Recognize ethical and professional responsibilities in engineering situations and makes informed judgments considering the impact of engineering solutions in global, economic, environmental, and social contexts. SO5. Function effectively in a team whose members together provide leadership, create a collaborative and inclusive environment, set goals, plan tasks, and meet objectives. SO7. Acquire and apply new knowledge using appropriate learning strategies.

topics
Unit I. Introduction to the Supply Chain Unit II. Supply chain management Unit III. Supply Chain Optimization

Code	INI378	Prerequisites	INI310, INI393, INI393L
Name	Systems Planning and Control	Co- requisites	None

Credits	Contact hours
04	44
Categorization of credits	
Math and basic science	
Engineering theme	X
Other	

Instructor's course name:	Alfredo Vicioso

Textbook
Chase, RB, Aquilano, NJ, Jacobs, FR (2006). Production and Operations Management, for a competitive advantage. (10th edition). McGraw Hill. Gaither, N., Frazier, G. (2005). Production and Operations Management. (8th edition) Thomson. Heizer, J., Render, B. (2001). Production Management: tactical decisions. (6th edition). Prentice Hall. Nahmias, S. (2007). Analysis of production and operations. (5th edition). McGraw Hill. Schroeder, R.G. (2006). Operations Management: Concepts and contemporary cases. (2nd edition). McGraw Hill. Vollmann, T. E., Berry, W. L., Whybark, D. (2005). Production Planning and Control: Supply Chain Management. (5th edition). McGraw Hill.
Other supplementary materials
YouTube audiovisual material related to the program.

Description	
The system planning and control subject provides the necessary tools for the student to be able to design, implement, manage, and control production systems for both manufacturing and services. At the end of the course, the student is expected to be able to calculate, create demand forecasting models, identify opportunities in a manufacturing and service planning and control system, design materials planning systems, make improvements to the supply chain, from the planning of each one of the elements that intervene in it.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Systemically define the problem, identify all internal and external aspects, such as: impact of the problem on other areas, interested parties and their requirements, functions required to solve the problem, among others. 2. Evaluate the effectiveness of alternatives using the appropriate information and techniques.

	3. Select the best alternative by effectively applying decision-making methodologies and based on the established design constraints 4. Identify needs and transform them into objectives, criteria, and restrictions with a high level of compatibility, using tools, methods and/or engineering systems 5. Interact with team members appropriately, encouraging and considering other members' ideas, while applying strategies to avoid, mediate, and resolve conflicts. 6. Interpret the data from the intensive use of multiple analysis tools.
Student outcomes	SO1. Identify, formulate, and solve complex engineering problems by applying the principles of engineering, science, and mathematics. SO2. Apply the engineering design process to produce solutions that meet specific needs considering public health, safety and welfare, as well as global, cultural, social, environmental and economic factors. SO5. Function effectively in a team whose members together provide leadership, create a collaborative and inclusive environment, set goals, plan tasks, and meet objectives. SO6. Develops and conducts appropriate experimentation, in which they analyze and interpret data, as well as use engineering criteria to draw conclusions.

Topics
Unit I. Introduction to Operations Planning and Control
Unit II. Forecasts
Unit III. Inventory Management for Independent Demand models
Unit IV. Manufacturing Planning
Unit V. Material Requirements Planning (MRP)
Unit VI. Just-in-Time (JIT) Production Systems

Code	INI395	Prerequisites	INM377 INM377L
Name	Design for Manufacturing	Co-requisites	None

Credits	Contact Hours
4	44
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Carlos Artílez, MEng, PMP.

Text book
Cross, N. (1999). Design methods: strategies for product design. Limusa-Noriega Editores. Ulrich, K. T. & Eppinger, S. D. (2013). Product Design and Development (5th ed.). McGraw-Hill. 434p.
Other supplemental materials
Aguayo González, F., & Soltero Sánchez, V. M. (2003). Industrial design methodology: an approach from concurrent engineering. Ra-Ma. 631 p. Lerma Kirchner, A.E. (2004). Product Development Guide: A Global Approach (3rd ed.). Thomson XIII, 230 p. Project Management Institute (2017). A Guide to Project Management Body of Knowledge (PMBOK® Guide) (6th ed.). ISBN: 978-1-62825-184-5. Thomke, S. H., & Nimgade, A. (2000). IDEO Product Development (Harvard Business School Case 9-600-143).

Description	
This subject seeks to introduce the aspiring Engineer to the process of product development, integrating several concepts and engineering tools, following a structured methodology of concurrent engineering.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Appropriately uses the main concepts of science and engineering for problem solving. 2. Summarizes the characteristics of the most important materials and their manufacturing processes knowing the effects of manufacturing processes on design. 3. Participates in the planning of objectives, the monitoring and fulfillment of these. 4. Interact with team members in a good way, considering the ideas of other members and applying strategies to avoid and resolve conflicts. 5. It uses various methods and tools to obtain relevant information and data.

	6. Interprets test results according to product specifications, assessing conformity to quality and/or competitiveness requirements.
Student outcomes	SO1. Identify, Formula, and Solve complex engineering problems by applying Engineering, Science, and Mathematics principles. SO2. It applies the engineering design process to produce solutions that meet specific needs taking into account public health, safety and welfare, as well as global, cultural, social, environmental and economic factors. SO4. Recognizes ethical and professional responsibilities in engineering situations and makes informed judgments considering the impact of engineering solutions in global, economic, environmental and social contexts. SO7. Acquire and apply new knowledge as required, using appropriate learning strategies.

Topics
Unit I. Introduction to Development Processes and Identification of Opportunities
Unit II. Product Planning
Unit III. Raising Needs
Unit IV. Product Requirements
Unit V. Concepts Generation
Unit VI. Selecting and Validating Concepts
Unit VII. Product Architecture and Industrial Design
Unit VIII. Design for X
Unit IX. Construction and Testing of Prototypes
Unit X. Intellectual Property and Product Economics

Code	IIN302	Prerequisites	None
Name	Human Management in the Industry	Co-requisites	None

Credits	Contact Hours
02	22
Categorization of credits	
Math and basic science	
Engineering topic	X
other	

Instructor's course name:	Perla Cuevas

Text book
Chiavenato, I. (2017). Human resources management. (10th ed.). McGraw-Hill. Cummings, Thomas G.; Worley, Christopher G. (2007) Organizational development and change. (8th ed. Spanish 10ed. in English). Publisher Cengage Learning Latin America. Dessler, G. (2009). Staff Administration. (11th ed.). Prentice Hall. Mondy, W., Noe, R.M. (2005). Human resources management. (9th ed.). Prentice Hall. Ulrich, David; (1997). Human Resources Champion. (1st Ed). Granica Editions, S.A. Robbins Stephen P., (2017). Organizational Behavior, Theory and Practice. (10th ed.). Publisher Prentice Hall. Spenser, Johnson; (2002). Who has taken my cheese. (41st edition). Editorial Active Company.
Other supplemental materials
Hateley, Barbara; Schmidt, Warren H.; (nineteen ninety-five). "A peacock in the world of penguins". Publisher Norm.

Description _	
The concept of human management in the industry has evolved over time from dealing with mediating between the relationship between the worker and employer until today understanding the importance of seeing a relationship of cooperation and mutual benefit and of seeing the human being beyond a resource needed to operate. Human management in industry is a theoretical subject that presents the aspects to consider for the management of people in an organization, considering relevant aspects of the processes of the human resources function, as well as the knowledge provided by Human Behavior research. in organizations, as well as the management of planned changes or Organizational Development.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Understand the role of people in the organization and the importance of managing them as people, and not just as resources, with ethical and socially responsible practices, in diverse and inclusive environments, to ensure the achievement of organizational strategies and objectives. 2. Manage processes and apply methodologies considered best practices to manage people in the work environment, and the role

	that levels of supervision and human management professionals play in organizations. 3. Promote constructive communication, practicing active listening to understand the other and clearly and timely transmitting the information required by others in order to achieve organizational objectives, build contact networks and resolve conflicts that may arise in work teams. .
Student outcomes	SO3. Communicate effectively with a variety of audiences. SO5. Function effectively in a team whose members together provide leadership, create a collaborative and inclusive environment, set goals, plan tasks, and meet objectives.

Topics
Unit I. Organizational Structures
Unit II. Job Descriptions and Performance Evaluation Systems
Unit III. Motivation and Incentive Systems
Unit IV. Organizational Culture and Work Environment
Unit V. Organizational Change and Stress
Unit VI. Constructive communication and conflict resolution
Unit VII. Leadership and teamwork
Unit VIII. Organizational learning

Code	INI319	Prerequisites	INI378 INI395 ECO322
Name	Industrial Engineering Project	Co-requisites	None

Credits	Contact Hours
04	44
Categorization of credits	
Math and basic science	
Engineering topic	X
Other	

Instructor's course name:	Jorge Miranda

Text book
Gido, J., Clements, J.P. (2007). Successful project management. (5th ed.). Mexico City: Cengage Learning. Heizer, J., Barry, R., & Isabel, Pérez de Lara Choy, María. (2014). Operations Management Principles. Pearson Education. Chain, S.N. (2000). Preparation and Evaluation of Projects - 4b: Edition (Spanish Edition). McGraw-Hill Interamericana. Chapman, M. (2006). Planification and control of the production. Pearson Education. Meyers, F.E., & Stephens, MP (2005). Manufacturing Facilities Design and Material Handling. Prentice Hall. Krick, E.V. (2005). Engineering Methods / Methods Engineering (Spanish Edition). limousine Industrial engineering: standard methods and work design. (2009). McGraw-Hill Education. Creole, R.G. (2005). Work study. McGraw-Hill Education. Zornoza, CC, & Cruz, GFR (2006a). Quality management. Pearson Education.
Other supplemental materials

Description	
This subject focuses on the development and implementation of the concepts and skills of project management in the solution of problems within the field of action of Industrial Engineering. It includes the processes of identification and selection of projects. The study material will integrate management issues, integration of work teams, so that the student develops the necessary skills to successfully solve Industrial Engineering projects.	
Type of course	☒ Required ☐ Elective

Specific goals for the course	
Outcomes of instruction	1. Define the problem and its causes, identifying all its key aspects. 2. Identify the client's needs to transform them into objectives, criteria and restrictions with a high level of compatibility and using tools, methods and/or engineering systems.

	3. Generate and select the best alternatives with a high level of correlation with the established criteria and restrictions, in accordance with the engineering sciences and considering health, well-being and safety. 4. Justify the selected alternative based on arguments consistent with the established criteria. 5. Prepare reports and transmits oral messages in a clear, coherent and judicious way, classifying the ideas of the topic it deals with, using graphics and appropriate language, fully retaining the attention of its audience. 6. Prioritize engineering decisions before the impact of their consequences in the contexts (economic, environmental and social) with local, regional or global scope. 7. Participate in the planning of objectives and their follow-up until compliance and with efficiency. 8. Interact with team members appropriately, encouraging and considering the ideas of other members while avoiding, mediating and/or resolving conflicts. 9. Assume appropriate roles within the team based on their abilities and what has been agreed upon, fulfilling commitments within the established deadlines and with adequate quality.
Student outcomes	SO1. Identify, formulate, and solve complex engineering problems by applying principles of Engineering, Science, and Mathematics. SO2. Apply the engineering design process to produce solutions that meet specific needs taking into account public health, safety and welfare, as well as global, cultural, social, environmental and economic factors. SO3. Communicate effectively with a variety of audiences. SO4. Recognize ethical and professional responsibilities in engineering situations and makes informed judgments considering the impact of engineering solutions in global, economic, environmental and social contexts. SO5. Function effectively in a team whose members together provide leadership, create a collaborative and inclusive environment, set goals, plan tasks and meet objectives.

Topics
Unit I. Theoretical Foundation Unit II. Project Progress Reports Unit III. MS Project Unit IV. Final project