Course name:	**Course code:**
Supply Chain Management	II 502

Location in curricular map:
Specialization Axis

Course description:
This course seeks to develop in the student, an integral vision of supply chain management, under a strategic focus, in an international operations environment. The student will be able to incorporate the supply chain management focus on the optimization of the global functions of the business. The student will get to know the various functions and activities that are related to supply chain management and comprehend the relationship that exists between planning processes and inventory management. The student will be exposed to practical tools and contemporary cases that allow for the application of knowledge to select suppliers, logistics, outsourcing, global buying, contracts, negotiation for supply processes that have higher potential according to the business environment. Lastly, the student will determine how to apply the supply chain management focus to his or her company as a competitiveness factor.

Course learning outcomes:
At the end of the course, the student will: Determine the necessary strategies to incorporate supply chain management into an organization, and will design and implement an application project to optimize supply chain management. Know and comprehend the transformation of the buying function to the supply chain management focus. Identify the various functions of supply chain management, as well as the primary roles and responsibilities. Examine the planning processes related to supply chain management. Suggest criteria and strategies for the selection and development of suppliers and decisions regarding supply chain management. Plan negotiations with suppliers based un cost and price analysis. Identify the essential characteristics that a supplier contract must have. Describe the advantages and disadvantages of the strategic alliances in an international context. Comprehend and demonstrate the advantages of the use of information technologies in supply chain management. Analyze the opportunities in an organization and sugges strategies for the implementation of a supply chain management focus.

Course content:	Hours
1. Introduction to supply chain management 1.1. Transformation of the buying function 1.2. Elements for buying effectiveness supply chain management	2
2. Supply chain management activities 2.1. Buying 2.2. Transportation 2.3. Quality control 2.4. Reception and warehousing 2.5. Materials and inventory control 2.6. Order processing 2.7. Planning and scheduling 2.8. Sending 2.9. Client services	4
3. Planning 3.1. General forecasting models 3.2. Master planning and MRP 3.3. Inventory fundamentals and their relationship with supply chain management 3.4. Buying strategies based on forecasting	6
4. Strategic supply management 4.1. Selection and evaluation of suppliers 4.2. Supplier development 4.3. *Outsourcing*: Do or buy 4.4. Buying logistics 4.5. Global buying 4.6. Legal considerations	8
5. Strategic costs 5.1. Price analysis 5.2. Cost analysis 5.3. Negotiation 5.4. Contract	8 4
6. Strategic alliances 6.1. International aspects of supply chain management 6.2. Coordinated design for supply chain management	
7. Information technologies and decision systems	4

Learning activities guided by professor:	Hours 36
1. Thematic exposition by professor	16
2. Case study analysis and discussion	8
3. Presentation and/or discussion plenary guided by professor	4
4. Exercises and activities in small groups guided by professor	8
5. Individual activities guided by professor	OP

Independent learning activities:	Hours 60
1. Reading of materials selected by professor. • The student must do individual reading to know and comprehend the topics covered throughout the course, in relation to the texts recommended by the professor. These include cases in the course text for class discussion. • The reading materials must include support materials suggested by APICS and ISM with regards to the topic under discussion.	20
2. Writing of an article, essay or reading summary. • This activity will not be done in this course.	
3. Solution of problems selected by the professor. • This activity will not be done in this course.	
4. Field practices. • Based on the experience of the student, research by colleagues and experts, bibliographical references or company sources, the student will develop a diagnostic and current state analysis with regards to supply chain management which will be used in the final project for the course.	10
5. Research and development of a topic assigned by the professor. • The student will do a bibliographical research report, where he or she obtains current articles from recognized and specialized sources, relating to supply chain management applications. The student will take a topic covered in class as a reference point to go deeper in the selection of references. The student will do a general review of the literature and suggest general application recommendations.	10
6. Integral course project. • The student must do an integral course project and give progress reports to the professor. The project consists in the selection and application project in his or her company or in another company he or she selects. The student will do a diagnostic of a situation where areas of opportunity may be identified, to implement supply chain management, as well as implementation strategies.	20

Evaluation procedures and instruments:

The evaluation procedures and instruments for the course are the following:

1. Oral or written exam.
    a. The student must prove to the professor either in a written or oral form, the understanding and comprehension of the topics covered throughout the course.
2. Deliverables.
    a. Organizational diagnostic tool for supply chain management.
    b. Research report.
    c. The student must deliver a progress report for each of the stages of the project, as well as a final report for the project.
3. Presentations.
    a. The student must present to the professor and group the proposed project, demonstrating the expected results and explaining the implementation strategies.
4. Participation in discussion sessions.
    a. Active participation in all class sessions is expected; this means that the student must do previous readings and provide valuable comments in the discussion of cases and examples.

Evaluation criteria:

1. The evaluation instruments and procedures will be centered on the guided and non guided learning activities.
2. The professor will evaluate and assign a grade to each of the evaluation instruments. The grade must be within 0 and 100.
    - Oral or written exam 25 points.
    - Final project 75 points.
3. The professor will report to the Graduate College the grade average for all the evaluation instruments obtained by each student.
4. The minimum passing grade is 80 points.
5. A student may not obtain a failing grade due to accumulated non attendance.

Bibliography

	Type	Title	Author	Publisher	Year
	Text	World Class Supply Chain Management	David N. Burt, Donald Dobler, Donald W. Dobler, Stephen L. Starling, Stephen Starling	McGraw-Hill/Irwin	2002
	Text	Purchasing and Supply Chain Management	Michiel R. Leenders, Harold E. Fearon, P. Fraser Johnson, Harold Fearon, Anna E. Flynn	McGraw-Hill/Irwin	2001
	Text	Purchasing and Supply Chain Management	Robert M. Monczka, Robert J. Trent, Robert B. Handfield	Thomson	2004

Course name:	**Course code:**
Inventory Management	II 503

Location in curricular map:
Specialization Axis

Course description:
This course provides the student with the theoretical fundamentals of inventory management that allow for the intervention from the design and implementation phases to the improvement of inventory management systems. The course contemplates a practical focus and the application that comes from the knowledge of inventory models including technical and statistical fundamentals, to provide the student a complete understanding that allows him or her to evaluate and decide with regards to the inventory systems used in the company. The course emphasizes the importance of having reliable and opportune information, that indicates quantities, amounts, location and exact identification of inventories, that allows the company to have higher value. The use of a computer is contemplated, to work on inventory models. Also, an emphasis on new technologies, including e-commerce and its impact on inventory model tendencies, particularly independent demand systems. The course provides knowledge and abilities to establish adequate control of inventories, through processes that allow the implementation of systems for classification, monitoring and control, that allow for reliable and opportune information. Lastly, the necessary knowledge to understand the interface between inventory management and the MRP and JIT focuses. The course methodology uses practical examples and spreadsheets, to focus the student towards analysis and interpretation of information for decision making in a business environment.

Course learning outcomes:
At the end of the course, the student will: Understand and apply inventory models and implement improvements to the inventory management process, that allow for decrease in inventory levels, and increase in material velocity flow to increase the value of a business unit. Identify and describe elements of inventory management processes, as well as the requirements of essential information for the operation of the process. Know, comprehend and use inventory models with the aid of a computer. Apply inventory classification, monitoring and control models. Demonstrate the impact of technology in supply chain management and identify areas of opportunity in its use. Differentiate between the dependant and independent demand models and explain their relationship with MRP and JIT. Suggest strategies to decrease inventories in an organization. Suggest strategies for the improvement of service levels in an organization, related to the adequate management of inventories.

Course content:	**Hours**
1. Introduction to inventory management 1.1. The context and importance of inventory management 1.2. The production environment and inventory control 1.3. Information requirements for inventory control	4
2. Independent method demands 2.1. Economic quantity of the order 2.2. Known demand models 2.3. Unknown demand models	12
3. Inventory control information 3.1. Information sources 3.2. Forecasts and demand 3.3. Planning and reserves	8
4. Independent demand methods 4.1. Material requirements planning (MRP) 4.2. Just in time (JIT)	12

Learning activities guided by professor:	**Hours** **36**
1. Thematic exposition by professor	16
2. Case study analysis and discussion	4
3. Presentation and/or discussion plenary guided by professor	4
4. Exercises and activities in small groups guided by professor	12
5. Individual activities guided by professor	OP

Independent learning activities:	Hours 60
1. Reading of materials selected by professor. The student must do individual reading to know and comprehend the topics covered throughout the course, in relation to the chapters and texts the professor recommends. These include cases from the course texts for class discussion, as well as articles. The reading materials must consider support materials from the APICS knowledge base.	16
2. Writing of an article, essay or reading summary. This activity will not be done in this course	
3. Solution of problems selected by the professor. The student will deliver reports of application problems and exercises with the aid of the software defined for the course.	
4. Field practices. Based on his or her experience, research by colleagues and experts, bibliographical references or company sources, the student will develop a scheme for the inventory management process in an organization, describing each of the phases of the process, the models to be used, the focus or environment (MRP, JIT), and the software to be used.	16 8
5. Research and development of a topic assigned by the professor. This activity will not be done in this course	
6. Integral course project. The student must do an integral course project and give progress reports to the professor. The project consists in the selection and application project in his or her company or in another company he or she selects. As an input, the use of the information generated in the field practices is recommended. The student will do a diagnostic of a situation where areas of opportunity are identified for the improvement of an inventory management process for a company. The current status as well as the implementation of improvements or modifications to the process must be presented. The implications of the improvements (for example, the introduction of new technologies, re-engineering) as well as required investments must be indicated. The current effectiveness must be evaluated, as well as the estimation of the quantitative benefits of the implementation of the project.	20

Evaluation procedures and instruments:

The evaluation procedures and instruments for the course are the following:

- Oral or written exam.
    - The student must prove to the professor either in a written or oral form, the understanding and comprehension of the topics covered throughout the course.
- Deliverables.
    - Reports of exercises.
    - Field practices reports.
    - The student must deliver a progress report for each of the stages of the project, as well as a final report for the project.
- Presentations.
    - The student must present to the professor and group the proposed project.
- Participation in discussion sessions.
    - Active participation in all class sessions is expected; this means that the student must do previous readings and provide valuable comments in the discussion of cases and examples.

Evaluation criteria:

1. The evaluation instruments and procedures will be centered on the guided and non guided learning activities.
2. The professor will evaluate and assign a grade to each of the evaluation instruments. The grade must be within 0 and 100.
    - Oral or written exam 25 points.
    - Final project 75 points.
3. The professor will report to the Graduate College the grade average for all the evaluation instruments obtained by each student.
4. The minimum passing grade is 80 points.
5. A student may not obtain a failing grade due to accumulated non attendance.

Bibliography

	Type	Title	Author	Publisher	Year
	Text	Manufacturing Planning and Control for Supply Chain Management	Thomas E. Vollmann, F. Robert Jacobs, William Berry, William Lee Berry, David Clay Whybark	McGraw-Hill	2004
	Text	Master Scheduling	John F. Proud	Wiley, John & Sons	1999
	Text	Inventory Control and Management	Donald Waters	Wiley, John & Sons	2003
	Text	Production and Inventory Control Handbook	James H. Greene	McGraw-Hill Companies	1997
	Text	Inventory Management and Production Planning and Scheduling	Edward A. Silver, Rein Peterson, David F. Pyke	Wiley, John & Sons	1998
	Text	The IOMA Handbook of Logistics and Inventory Management	Institute of Management and Administration (IOMA)	Wiley, John & Sons,	2002

Course name:	**Course code:**
Forecast and Planning Models	II 504

Location in curricular map:
Specialization Axis

Course description:
This course covers master resource planning in the context of the business planning process, considering demand management, sale and operations planning, and master scheduling. The course contemplates a general vision of the planning hierarchy in an organization, as well as the interrelationship with the supply chain. The course provides the student the tools for demand management, via forecast models applied to various business environments. The student will be able to determine the appropriate models for each situation and understand the functioning of these models, and use the computer to implement them to real situations. Also, monitoring tools for forecasting precision and validation, are studied. The course provides the student a complete understanding of the planning and operation processes in a manner in which they can be used to manage the business in a strategic manner to achieve a sustainable competitive via the integration of markets and development of new products to the supply chain. Lastly, the student will know, comprehend and apply the master programming process with different variations and focuses depending on the organization type.

Course learning outcomes:
At the end of the course, the student will: Comprehend and apply forecasting models and implement a planning process for a business, from sale and operations planning to master production scheduling. Know, comprehend and use forecasting models for demand with the aid of the computer. Apply forecasting monitoring and evaluation methods. Identify and describe elements for business planning, demand management, sales and operations planning, as well as master resource planning in an organization. Examine the differences in planning models for various business environments. Describe and explain the sales and operations planning process and its relationship with master resource planning. Describe, analyze and explain the master programming process, as well as its elements. Apply decision strategies and criteria to optimize the master programming process.

Course content:	Hours
1. Introduction to manufacturing planning and control 1.1. Review of the business planning process 1.2. Demand forecasting 1.3. Demand management 2. Sales and operation planning 2.1. Resource planning (ERP) 2.2. Inventory management in the supply chain 3. Master production planning 3.1. The mechanics of master scheduling 3.2. Master scheduling management 3.3. “Make-to-Stock” environment 3.4. Continuous flow environment 3.5. “Make-to-Order” environment 3.6. "Custom-Product” environment 4. Management of the master scheduling process 5. Measurement and evaluation systems for the plan	4 6 8 12 6

Learning activities guided by professor:	Hours 36
1. Thematic exposition by professor	16
2. Case study analysis and discussion	4
3. Presentation and/or discussion plenary guided by professor	4
4. Exercises and activities in small groups guided by professor	12
5. Individual activities guided by professor	OP

Independent learning activities:	Hours 60
1. Reading of materials selected by professor. The student must do individual reading to know and comprehend the topics covered throughout the course, in relation to the texts recommended by the professor. These include cases in the course text for class discussion. The reading materials must consider support materials from the APICS knowledge base.	16
2. Writing of an article, essay or reading summary. This activity will not be done in this course	
3. Solution of problems selected by the professor. The student will deliver written reports of application problems and exercises with the aid of specialized software.	16
4. Field practices. Based upon his or her experience, research done by colleagues and experts, bibliographical references and company sources, the student will develop a scheme for the planning process in an organization, describing each of the phases of the process.	12
5. Research and development of a topic assigned by the professor. This activity will not be done in this course	
6. Integral course project. The student must do an integral course project and give progress reports to the professor. The project consists in the selection and application project in his or her company or in another company he or she selects. As an input, the use of the information generated in the field practices is recommended. The student will do a diagnostic of a situation where areas of opportunity are identified for the improvement of a planning process in a company. The current status as well as the implementation of improvements or modifications to the process must be presented. The current effectiveness must be evaluated, as well as the estimation of the quantitative benefits of the implementation of the project.	16

Evaluation procedures and instruments:

The evaluation procedures and instruments for the course are the following:

5. Oral or written exam.
    a. The student must prove to the professor either in a written or oral form, the understanding and comprehension of the topics covered throughout the course.
6. Deliverables.
    a. Reports of exercises.
    b. Field practices reports.
    c. The student must deliver a progress report for each of the stages of the project, as well as a final report for the project.
7. Presentations.
    a. The student must present to the professor and group the proposed project.
8. Participation in discussion sessions.
    a. Active participation in all class sessions is expected; this means that the student must do previous readings and provide valuable comments in the discussion of cases and examples.

Evaluation criteria:

1. The evaluation instruments and procedures will be centered on the guided and non guided learning activities.
2. The professor will evaluate and assign a grade to each of the evaluation instruments. The grade must be within 0 and 100.
    - Oral or written exam 25 points.
    - Final project 75 points.
3. The professor will report to the Graduate College the grade average for all the evaluation instruments obtained by each student.
4. The minimum passing grade is 80 points.
5. A student may not obtain a failing grade due to accumulated non attendance.

Bibliography

	Type	Title	Author	Publisher	Year
	Text	Manufacturing Planning and Control for Supply Chain Management	Thomas E. Vollmann, F. Robert Jacobs, William Berry, William Lee Berry, David Clay Whybark	McGraw-Hill	2004
	Text	Master Scheduling	John F. Proud	Wiley, John & Sons	1999

Course name:	**Course code:**
Production Control	II 505

Location in curricular map:
Specialization Axis

Course description:
This course includes the principles, focuses and techniques required for the programming, control, measurement and evaluation of the effectiveness of the production operations. The topics that are covered are related to the control of production under various environments, such as workshops, continuous processes and high volume; all this is studied in the work environment and the physical organization of the facilities. The student will be exposed to various techniques in which a plant can assure feedback regarding the execution of its operations and provide information to its clients and suppliers regarding works in process. The course is comprised of the three large stages that constitute floor operations control, which are: a) priorities and sequencing, b) execution of plans, implementation of floor control and activity results reports, c) evaluation of performance and feedback.

Course learning outcomes:
At the end of the course, the student will: Comprehend and apply techniques and tools for the execution and control of production operation in each of its stages. Know, comprehend and use interfaces for adequate flow of information in the process, from planning to execution. Know and describe the various production environments (for example, continuous process, manufacturing cells) and specify the implications that the environment has in the control of the production floor. Know, comprehend and use techniques and tools for operations scheduling. Know, comprehend and use techniques for the authorization and report of "push" and pull activities. Know, comprehend and use production status reports. Know, comprehend and describe materials control methods. Implement quality and continuous improvement initiatives in operations. Know, comprehend and apply the quality management process. Design strategies and initiatives for the monitoring and performance of suppliers, production operations and costs.

Course content:	Hours
1. Introduction to manufacturing planning and control	4
2. Priorities and sequencing 2.1. Planning process 2.2. System interfaces 2.3. Production environments 2.4. Operations programming	8
3. Plan execution, physical controls and results report 3.1. "Push" systems 3.2. "Pull" systems” 3.3. Production status reports 3.4. Communication and information flow 3.5. Resource control 3.6. Implementation of quality initiatives	16
4. Evaluation of performance and feedback 4.1. Evaluation of the quality management process 4.2. Monitoring supplier performance 4.3. Evaluation of production operations performance 4.4. Cost management	8

Learning activities guided by professor:	Hours 36
1. Thematic exposition by professor	16
2. Case study analysis and discussion	4
3. Presentation and/or discussion plenary guided by professor	4
4. Exercises and activities in small groups guided by professor	12
5. Individual activities guided by professor	OP

Independent learning activities:	Hours 60
1. Reading of materials selected by professor. The student must do individual reading to know and comprehend the topics covered throughout the course, in relation to the texts recommended by the professor. These include cases in the course text for class discussion. The reading materials must consider support materials from the APICS knowledge base.	16
2. Writing of an article, essay or reading summary. • This activity will not be done in this course	
3. Solution of problems selected by the professor. • The student will deliver written reports of application problems and exercises with the aid of specialized software.	16
4. Field practices. • Based upon his or her experience, research done by colleagues and experts, bibliographical references and company sources, the student will develop a scheme for the operations control of an organization, describing each of its components.	12
5. Research and development of a topic assigned by the professor. • This activity will not be done in this course	
6. Integral course project. • The student must do an integral course project and give progress reports to the professor. The project consists in the selection and application project in his or her company or in another company he or she selects. As an input, the use of the information generated in the field practices is recommended. The student will do a diagnostic of a situation where areas of opportunity are identified for the improvement of an operations control system for a company. The criteria for defining the strategies to follow must be demonstrated as well as the specific profiles of the projects to be done.	16

Evaluation procedures and instruments:

The evaluation procedures and instruments for the course are the following:

1. Oral or written exam.
    a. The student must prove to the professor either in a written or oral form, the understanding and comprehension of the topics covered throughout the course.
2. Deliverables.
    a. Reports of exercises.
    b. Field practices reports.
    c. The student must deliver a progress report for each of the stages of the project, as well as a final report for the project.
3. Presentations.
    a. The student must present to the professor and group the proposed project.
4. Participation in discussion sessions.
    a. Active participation in all class sessions is expected; this means that the student must do previous readings and provide valuable comments in the discussion of cases and examples.

Evaluation criteria:

1. The evaluation instruments and procedures will be centered on the guided and non guided learning activities.
2. The professor will evaluate and assign a grade to each of the evaluation instruments. The grade must be within 0 and 100.
    a. Oral or written exam 25 points.
    b. Final project 75 points.
3. The professor will report to the Graduate College the grade average for all the evaluation instruments obtained by each student.
4. The minimum passing grade is 80 points.
5. A student may not obtain a failing grade due to accumulated non attendance.

Bibliography

	Type	Title	Author	Publisher	Year
	Text	Manufacturing Planning and Control for Supply Chain Management	Thomas E. Vollmann, F. Robert Jacobs, William Berry, William Lee Berry, David Clay Whybark	McGraw-Hill	2004
	Text	Planning and Control of Manufacturing Operations	John Kenworthy	Wiley, John & Sons	1998
	Text	World-Class Warehousing and Material Handling	Ed H. Frazelle, Edward Frazelle.	McGraw-Hill	2001
	Text	Gaining Control: Capacity Management and Scheduling	James G. Correl, Norris W. Edison	Wiley, John & Sons	1998
	Text	Inventory Control and Management	Donald Waters	Wiley, John & Sons	2003

Course name:	**Course code:**
Lean Manufacturing	MF 509

Location in curricular map:
Specialization Axis

Course description:
This course develops an integral vision of lean manufacturing detailing the steps and requirements for its implementation in an company. Via the use of cases, an deep understanding may be developed, regarding the implications of lean manufacturing, and its benefits for the company. The student will know and apply traditional lean manufacturing tools, such as mapping of the value chain, rapid change methods, total productivity maintenance, problem solving techniques, pulls systems and the visual plant. The course has a strong orientation towards the comprehension and application of the lean manufacturing implementation process in industrial environment.

Course learning outcomes:
At the end of the course, the student will: Plan, direct, execute and evaluate a lean manufacturing implementation project that involves various areas of the organization, as well as the use of various techniques for this focus. Develop diagnostics for the current situation and the needs for the implementation of lean manufacturing. Know, comprehend and use techniques for establishing measurement standards for the effectiveness of operations. Develop proposals for the implementation that demonstrate the benefits and convenience of these initiatives. Know, comprehend and use process mapping techniques. Know, comprehend and use traditional lean manufacturing techniques. Identify software that may be applied to the implementation process, as well as to the tools of lean manufacturing. Determine organizational structure and equipment that are the most appropriate to do an implementation project according to the organizational environment. Comprehend the management of change and its use in the implementation of lean manufacturing in its various stages.

Course content:	Hours
1. Fundamentals of lean manufacturing	4
1.1. Process flow	
1.2. Performance measures	
2. Lean manufacturing implementation	12
2.1. Value chain mapping	
2.2. Implementation proposal development	
2.3. Change management	
2.4. Implementation process by stages	
2.5. Human and organizational aspects	
3. Lean manufacturing tools	16
3.1. Implementation deployment politics	
3.2. Work teams	
3.3. The visual plant	
3.4. Trial and error process design	
3.5. Rapid changes	
3.6. Total productivity management	
3.7. Problem solving	
3.8. Pull systems	
3.9. Contemporary topics relating to lean manufacturing	
4. Implementation cases	4

Learning activities guided by professor:	Hours 36
1. Thematic exposition by professor	16
2. Case study analysis and discussion	4
3. Presentation and/or discussion plenary guided by professor	4
4. Exercises and activities in small groups guided by professor	12
5. Individual activities guided by professor	OP

Independent learning activities:	Hours 60
1. Reading of materials selected by professor. • The student must do individual reading to understand the fundamentals of lean manufacturing. • The student must do reading to know and comprehend the primary components for implementation. • The student must do individual reading to know and comprehend the application of lean manufacturing tools. • The student must do individual reading to know and comprehend implementation cases. 2. Writing of an article, essay or reading summary. • This activity will not be done in this course. 3. Solution of problems selected by the professor. • For each of the lean manufacturing tools, the student must do application exercises. 4. Field practices. • The group will do a field practice where the tools covered throughout the course will be applied in a company. 5. Research and development of a topic assigned by the professor. • The student will elaborate a research project where he or she identifies a software with specific application to lean manufacturing with a concrete focus on its tools, explaining the general characteristics and benefits. 6. Integral course project. • The student must do an integral course project and give progress reports to the professor. The project consists in the selection and application project in his or her company or in another company he or she selects. The student will do the diagnostic of a situation where areas of opportunity are identified to implement lean manufacturing, and suggest an implementation plan to upper management where the various stages, times and necessary resources are specified.	16 16 8 4 16

Evaluation procedures and instruments:

The evaluation procedures and instruments for the course are the following:

- Oral or written exam.
    - The student must prove to the professor either in a written or oral form, the understanding and comprehension of the topics covered throughout the course.
- Deliverables.
    - Reports for exercises relating to the application of lean manufacturing tools.
    - Field practices reports.
    - Research report.
    - The student must deliver a progress report for each of the stages of the project, as well as a final report for the project.
- Presentations.
    - The student must do a presentation to the professor and group of the project where he or she suggests an implementation of lean manufacturing in an organization, clearly specifying the stages, strategies, resources, times and expected benefits, as well as the specific tools to be used.
- Participation in discussion sessions.
    - Active participation in all class sessions is expected; this means that the student must do previous readings and provide valuable comments in the discussion of cases and examples.

Evaluation criteria:

1. The evaluation instruments and procedures will be centered on the guided and non guided learning activities.
2. The professor will evaluate and assign a grade to each of the evaluation instruments. The grade must be within 0 and 100.
    - Oral or written exam 25 points.
    - Final project 75 points.
3. The professor will report to the Graduate College the grade average for all the evaluation instruments obtained by each student.
4. The minimum passing grade is 80 points.
5. A student may not obtain a failing grade due to accumulated non attendance.

Bibliography

	Type	Title	Author	Publisher	Year
	Text	Lean Manufacturing: A Plant Floor Guide	John Allen, Charles Robinson, David Stewart	Society of Manufacturing Engineers	2001
	Text	Lean Thinking: Banish Waste and Create Wealth in your Corporation	James P. Womack, Daniel T. Jones	Simon & Schuster	2003
	Text	Lean Manufacturing	William M. Feld	CRC Press	2000
	Text	Lean Manufacturing Implementation: A Complete Execution Manual for Any Size Manufacturer	Dennis P. Hobbs	Ross, J. Publishing	2003
	Text	Value Stream Management: Eight Steps to Planning, Mapping and Sustaining Lean Improvements	Don Tapping, Tom Shuker, Tom Luyster	Productivity Press	2002

Course name:	**Course code:**
Logistics and Distribution	II 506

Location in curricular map:
Specialization Axis

Course description:
This course provides the student with the theoretical fundamentals of logistics and practical application models that allow, with the aid of a computer, to intervene from the design and implementation phase to the improvement of the logistics and distribution systems with a focus that includes the whole organization and supply chain. The course contemplates a practical and application focus that is based on the knowledge of logistic models, including technical fundamentals to provide the student a complete comprehension that allows for evaluation and decision making regarding supplying, warehousing, distribution and transportation. The course provides the participant with a complete view of modern tendencies in this discipline and how to use these information technologies for system optimization. The course seeks to expose the student to situations where he or she must design, decide and determine strategies for the improvement of the system.

Course learning outcomes:
At the end of the course, the student will: Comprehend and apply logistics models for the solution of warehousing, distribution and materials transport problems, and in general, to systems that guarantee that the indicated materials are in the required place at the required time, while maximizing the performance of the system under certain restrictions. Know, comprehend and describe the functioning of logistic systems. Know, comprehend and use logistic design models and solve location problems. Know, comprehend and use techniques for the design and operation of warehouses. Determine the most adequate transport systems for each situation. Use mathematical models with the aid of a computer, to solve transport problems, including route planning, load assignment, size and use of the fleet, as well as load consolidation. Suggest strategic actions and tactics for the optimization of a logistics system. Demonstrate the advantages of information technologies for the improvement of logistics systems. Know, comprehend and use tools that allow for decision making and optimization of logistics systems and processes.

Course content:	Hours
1. Introduction to logistics systems 1.1. How logistic systems work 1.2. Logistics and management 1.3. Tendencies in logistics 1.4. Decisions in logistics	2
2. Design of logistics networks 2.1. Classification of location problems 2.2. Localization models	4
3. Design and operation of warehouses 3.1. Elements to consider 3.2. Design of facilities and mechanisms 3.3. Product location 3.4. Lots and routes	6
4. Planning and management of long distance transport 4.1. Transport modes 4.2. Relevant costs 4.3. Classification of transport problems 4.4. Fleet composition 4.5. Load assignment 4.6. Consolidation and deployment 4.7. Design and operation of transport terminals 4.8. Vehicle assignment	6
5. Planning and management of short distance transport 5.1. Planning and routes 5.2. The "traveling salesman" problem 5.3. The problem of planning for routes with nodes 5.4. Route planning and real time deployment 5.5. Integral planning of routes and localization 5.6. Inventory routes managed by the supplier	6
6. Stretegic decisions regarding logistics 6.1. Strategic vs. tactical decisions 6.2. Reduction of capital 6.3. Cost reductions 6.4. Service level improvements	6
7. Logistics tendencies 7.1. Application of information technologies 7.2. E-Commerce	6

Learning activities guided by professor:	Hours 36
1. Thematic exposition by professor	16
2. Case study analysis and discussion	4
3. Presentation and/or discussion plenary guided by professor	4
4. Exercises and activities in small groups guided by professor	12
5. Individual activities guided by professor	OP

Independent learning activities:	Hours 60
• Reading of materials selected by professor. o The student must do individual reading to know and comprehend the topics covered throughout the course, in relation to the chapters and texts the professor recommends. These include cases from the course texts for class discussion, as well as articles. • Writing of an article, essay or reading summary. o This activity will not be done in this course • Solution of problems selected by the professor. o The student will deliver reports of application problems and exercises with the aid of the software defined for the course. • Field practices. o Based upon his or her experience, research done by colleagues and experts, bibliographical references and company sources, the student will develop a scheme for a logistics system in an organization, describing each of its elements. • Research and development of a topic assigned by the professor. o This activity will not be done in this course • Integral course project. o The student must do an integral course project and give progress reports to the professor. The project consists in the selection and application project in his or her company or in another company he or she selects. As an input, the use of the information generated in the field practices is recommended. The student will do a diagnostic of a situation where areas of opportunity are identified for the improvement of a logistics system in a company. The current status, as well as the implementation proposal and modification to the system must be presented. The implications of the improvements (for example, the introduction of new technologies, re-engineering) as well as required investments must be indicated. The current effectiveness must be evaluated, as well as the estimation of the quantitative benefits of the implementation of the project.	16 16 8 20

Evaluation procedures and instruments:

The evaluation procedures and instruments for the course are the following:

- Oral or written exam.
    - The student must prove to the professor either in a written or oral form, the understanding and comprehension of the topics covered throughout the course.
- Deliverables.
    - Reports of exercises.
    - Field practices reports.
    - The student must deliver a progress report for each of the stages of the project, as well as a final report for the project.
- Presentations.
    - The student must present to the professor and group the proposed project.
- Participation in discussion sessions.
    - Active participation in all class sessions is expected; this means that the student must do previous readings and provide valuable comments in the discussion of cases and examples.

Evaluation criteria:

1. The evaluation instruments and procedures will be centered on the guided and non guided learning activities.
2. The professor will evaluate and assign a grade to each of the evaluation instruments. The grade must be within 0 and 100.
    - Oral or written exam 25 points.
    - Final project 75 points.
3. The professor will report to the Graduate College the grade average for all the evaluation instruments obtained by each student.
4. The minimum passing grade is 80 points.
5. A student may not obtain a failing grade due to accumulated non attendance.

Bibliography

	Type	Title	Author	Publisher	Year
	Text	Introduction to Logistics Systems Planning and Control	Gianpaolo Ghiani, Gilbert Laporte, Roberto Musamanno	Wiley, John & Sons	2004
	Text	World-Class Warehousing and Material Handling	Edward Frazelle	McGraw-Hill	2001
	Text	Manufacturing Planning and Control for Supply Chain Management	Thomas E. Vollmann, F. Robert Jacobs, William Berry, William Lee Berry, David Clay Whybark	McGraw-Hill	2004
	Text	The IOMA Handbook of Logistics and Inventory Management	Institute of Management and Administration (IOMA)	Wiley, John & Sons,	2002

Course name:	**Course code:**
Systems Simulation	II 507

Location in curricular map:
Specialization Axis

Course description:
This course is focused on developing system design, analysis and synthesis abilities in the student. The systems which will be the object of study are those of human activity, which are fundamentally characterized for including the human element in their components and presenting a stochastic and dynamic behavior. The needs to model this type of systems may be many, such as understanding its behavior and describing it in objective terms, seeking the design that optimizes the functioning of the system or suggest the design for a system that only exists as a project. Another stage in the planning is not only the proposal with regards to design techniques, but also the technologies for implementation.

Course learning outcomes:
At the end of the course, the student will : Model the stochastic and dynamic behavior of systems, via the use of a methodology for discrete system simulation and classic statistical models.

Course content:		Hours
1	**Introduction to discrete simulation**	
1.1	Introduction	
1.2	Simulation as a process	10
1.3	Nature of discrete simulation	
1.4	Advantages and limitations of discrete simulation	
1.5	Applications of discrete simulation	
1.6	Study 1: Introduction to Promodel	
2	**Methodology for discrete simulation**	
2.1	The concept of a random, dynamic and discrete system	
2.2	The concept of discrete simulation	10
2.3	The concept of problem	
2.4	Methodology to conduct a discrete simulation project	
2.5	Phase 1: Identification of the system and project planning	
2.6	Study 2: Promodel components	
3	**Application of the methodology for discrete simulation**	
3.1	Phase 2: Construction of the conceptual simulation model	
3.2	Phase 3: Validation of the conceptual model	10
3.3	Phase 4: Construction and verification of the model with a computer	
3.4	Phase 5: Validation of the coded model	
3.5	Phase 6: Experimentation of the coded model	
3.6	Phase 7: Analysis of results and conclusions for the project	
3.7	Study 3: Promodel modeling elements	
4	**Simulating with Promodel.**	
4.1	Simulating queues with Promodel	6
4.2	Construction, execution and verification of the simulation model with Promodel	
4.3	Entity transference in Promodel	
4.4	IF-THEN-ELSE-END logic in Promodel	
4.5	Experimental test design in Promodel	
4.6	Interpretation and results reports in Promodel	

Learning activities guided by professor:	Hours **36**
1. Thematic exposition by professor	20
2. Lab practices and/or workshop guided by the professor	12
3. Presentation and/or discussion plenary guided by professor	4
4. Small group activities guided by professor	OP
5. Individual activities guided by professor	OP

Independent learning activities:	**Hours** **60**
1. Reading of materials selected by professor. • The student must do individual reading to know and comprehend in detail systems simulation.	10
2. Writing of an article, essay or reading summary. • The student must write a technical article where a problem relating to decision making in a company environment is presented, as well as the way in which to implement systems simulation to solve the problem.	10
3. Solution of problems selected by the professor.	10
4. Field practices. • This activity seeks for the student to be familiar with the use of software for the development of information systems, and therefore is optional and done according to the needs of each student's.	10
5. Research and development of a topic assigned by the professor. • The student must present a subject from a chapter of the course text.	10
6. Integral course project. • The student must develop a simulation model, working in teams.	10

Evaluation procedures and instruments:

The evaluation procedures and instruments for the course are the following:

Oral or written exam.

- The student must prove to the professor in an oral or written manner that he or she understands and comprehends the principal course topics.

Deliverables.

- The student must deliver a technical article that presents a problem relating to decision making that may be solved using the technologies covered throughout the course, and explain in detail its use.
- The student must deliver a report of the exercises done to solve each of the course text problems assigned by the professor.

Presentations.

- All students must present their final project to the group and professor on the date established by the group and the professor.

Participation in discussion sessions.

- This will not be subject to evaluation.

Evaluation criteria:

1. The evaluation instruments and procedures will be centered on the guided and non guided learning activities.
2. The professor will evaluate and assign a grade to each of the evaluation instruments. The grade must be within 0 and 100.
    - Technical article 25 points.
    - Problems and case study solutions 25 points.
    - Research and presentation of a topic 15 points.
    - Final project 35 points.
3. The professor will report to the Graduate College the grade average for all the evaluation instruments obtained by each student.
4. The minimum passing grade is 80 points.
5. A student may not obtain a failing grade due to accumulated non attendance.

Bibliography

	Type	Title	Author	Publisher	Year
	Text	Simulation and Modeling Analysis, 3E	Law Averill M. W. David Kelton	McGraw Hill	2000
	Text	Simulation using Promodel	Charles Harrell Biman K. Ghosh	McGraw Hill	2000
	Reference	Decision Support Systems and Intelligent Systems	Efraim Turban	Prentice Hall. USA	1998

Course name:	**Course code:**
Application Project	CS 501

Location in curricular map:
Terminal Axis

Course description:

Throughout the course, the student will develop pan application project that demonstrates the capacity for analysis, team work, interpretation and application of knowledge and tools acquired throughout the masters program

Course learning outcomes:
The student will be capable of applying the knowledge and abilities acquired throughout the courses of the masters program, contributing to the development of practical solutions that benefit the community.

Course Content	Hours
1. Definition of application pre-project.	**16**
2. Ethics in professional services.	**4**
3. Project presentation.	**4**
4. Follow up by professor.	**4**
5. Presentation of pre results.	**4**
6. **Presentation of final results.**	**4**

Learning activities:

- **Guided activities:** **36**
  - Presentation of subject by professor.
  - Presentation by guest researchers.
  - Discussions of subjects and cases.
  - Final project presentation.
- **Independent activities:** **60**
  - Applied research case reading.
  - Information gathering.
  - Research reports.
  - Problem analysis.
  - Solution design.

Evaluation criteria and procedures:

The evaluation instruments are the following:

Homework and research work
Final project research
Participation

The points distribution for each instrument will be established in accordance with the group in the first class session.

Bibliography

	Type	Title	Author	Publisher	Year
1	None				