



# UNIVERSITÀ DEGLI STUDI DI PALERMO

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| DEPARTMENT              | Ingegneria   |
| ACADEMIC YEAR           | 2023/2024  |
| MASTER'S DEGREE (MSC)   | MANAGEMENT ENGINEERING   |
| INTEGRATED COURSE       | DIGITAL TRANSFORMATION - INTEGRATED COURSE   |
| CODE                    | 22248  |
| MODULES                 | Yes  |
| NUMBER OF MODULES       | 3  |
| SCIENTIFIC SECTOR(S)    | ING-IND/16, ING-IND/35, ING-IND/17   |
| HEAD PROFESSOR(S)       | ROMA PAOLO      Professore Associato      Univ. di PALERMO   |
| OTHER PROFESSOR(S)      | ROMA PAOLO      Professore Associato      Univ. di PALERMO   |
|                         | AIELLO GIUSEPPE      Professore Associato      Univ. di PALERMO  |
|                         | LA COMMARE      Professore Ordinario      Univ. di PALERMO   |
|                         | UMBERTO  |
| CREDITS                 | 18   |
| PROPAEDEUTICAL SUBJECTS |  |
| MUTUALIZATION           |  |
| YEAR                    | 2  |
| TERM (SEMESTER)         | Annual   |
| ATTENDANCE              | Not mandatory  |
| EVALUATION              | Out of 30  |
| TEACHER OFFICE HOURS    | <p><b>AIELLO GIUSEPPE</b><br/>Monday 10:00 13:00 Dicgim Ed.9 - stanza personale</p> <p><b>LA COMMARE UMBERTO</b><br/>Monday 10:00 12:00 Stanza Docentel° piano edificio 8 - Padiglione Tecnologie Meccaniche</p> <p><b>ROMA PAOLO</b><br/>Wednesday 15:00 18:00 Ufficio docente previa comunicazione email</p> |

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| <p><b>PREREQUISITES</b></p>     | <p>Digital Marketing: Knowledge and competences gained in the Marketing class.<br/>Smart Factory: operations management, innovation management, business planning<br/>Supply Chain Management 4.0: Foundations of Statistics and Calculus, general knowledge of cost accounting methods and stock management, ability to create software routines or scripts through the most spread commercial packages and languages. knowledge of data analysis, artificial intelligence and Machine Learning methods.</p>  |
| <p><b>LEARNING OUTCOMES</b></p> | <p>Digital Marketing:<br/>Knowledge<br/>At the end of the course, the student will acquire the knowledge and methodologies to face and solve Digital Marketing problems. The student will be able to a) understand how to make the business digital and how to build digital channels, b) understand the main Digital Marketing strategies, including online segmentation, customer profiling, online positioning, c) understand search engine marketing strategies, d) understand how to manage the brand, product, pricing, and online distribution channels, e) understand how to communicate online both through online advertising tools and through social media, f) understand the dynamics of mobile marketing and the applications of artificial intelligence to marketing; g) understand how to draw up a Digital Marketing plan.<br/>Comprehension and ability to apply knowledge<br/>The student will acquire knowledge and methodologies to analyze and solve typical problems of Digital Marketing. The student will be able to develop the main Digital Marketing strategies, including online segmentation, customer profiling, online positioning, c) to apply search engine marketing strategies, d) to apply the management technique for the brand, the product, pricing, and online distribution channels, e) develop an online communication plan both through online advertising tools and through social media, f) apply mobile marketing and artificial intelligence techniques; g) apply the techniques of drafting a Digital Marketing plan.<br/>Autonomy of judgment<br/>The student will have acquired autonomy of analysis and evaluation of the main dynamics of Digital Marketing, will be able to evaluate the consistency of a digital marketing plan in relation to the online positioning of the product set up ex ante, will be able to express judgments on the efficiency and effectiveness of the usual digital marketing activities of companies.<br/>Communication skills<br/>The student will be able to communicate with competence and language properties of Digital Marketing problems even in highly specialized contexts.<br/>Learning skills<br/>The student will be able to independently address Digital Marketing problems, to deepen their knowledge on specific issues of Digital Marketing, to acquire further skills in subsequent courses in which the issues addressed require a consistent knowledge of the Digital Marketing activities of the businesses.</p> <p>Smart Factory:<br/>Knowledge and comprehension<br/>The student, at the end of the course, will capture knowledges and methodologies related to the main themes of digital transformation in I4.0 companies. The student will be able to evaluate the possible improvements in manufacturing performances after being acquainted with the basic concepts connected to digital transformation.<br/>Ability to apply knowledge and comprehension<br/>The student will capture knowledge in order to analyze problems of digital manufacturing innovation using a balanced approach between economic and technological issues. He will be able to identify critical information useful for managing innovation within companies.<br/>Making judgements<br/>The student will acquire interdisciplinary knowledge that will support his understanding of policy management of digital transformation. He will understand how to evaluate the of new technologies innovation on company Overall Equipment Efficiency.<br/>Communication skills<br/>The student will acquire proper communication skills to deal with digital transformation issues innovation issues. The team project work is the learning tool to develop these skills both in terms of communication ability and of understanding specif environments.<br/>Learning skills<br/>The aim of the course is therefore to give to the students a reference map for digital tranformation in manufacturing in the years to come. The development of the project work aims to develop specific abilities in the different enabling technologie of SMART FACTORY.</p> <p>Supply Chain Management 4.0:<br/>knowledge of:</p> |

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|                           | <ul style="list-style-type: none"> <li>• demand forecasting methods</li> <li>• aggregate planning</li> <li>• stocks management</li> <li>• logistic performance evaluation</li> </ul> <p>comprehension of the tradeoff between logistics cost and performance and capability of parroaching supply chain optimization problems</p> <p>judgmental autonomy:<br/>capability of analyzing the results and selecting the most effective strategic/tactical/operational solution</p> <p>communication:<br/>capability of properly discussing the individual evaluation to experts and nonexperts.</p> <p>Learning<br/>capability of autonomous learning from scientific books and papers, and using software tools.</p>   |
| <b>ASSESSMENT METHODS</b> | <p>Digital Marketing:<br/>The evaluation of the student's knowledge, skills and application skills takes place through the carrying out of a group project by the students by sending the instructor via email a document in pdf format according to a deadline set at the beginning of the course. The presentation and discussion of the project, on the other hand, is carried out together in one of the scheduled sessions for the course, to which the student registers.</p> <p>Method of evaluation of the GROUP PROJECT. The Digital Marketing project is evaluated according to the following criteria: Level and depth of the analysis; Quality of the analysis relating to the general aspects of the project (correct and in-depth identification of the context studied; project organization; logical consistency and completeness of the project); Quality of the analysis relating to the technical aspects (correctness of the data and information gathering strategy; quality of the data and information collected; accuracy and level of detail of the models used for the analysis of competitive scenarios, strategies and operational decisions of Digital Marketing; quality, correctness and level of detail of the statistical methodologies to support Digital Marketing for the analysis of the data and information collected). Quality of the presentation also in terms of communicative efficacy.</p> <p>The student obtains the following evaluation:<br/>Excellent 30-30 cum laude. The student shows an excellent knowledge of the topics studied, excellent language properties, excellent ability to analyze the aspects of Digital marketing, excellent ability to frame real topics in the studied contexts, excellent ability to link the topics together and develop a critical analysis in the field of Digital Marketing strategies. During the course, the student developed good autonomy and relational skills.</p> <p>Very good 26-29. The student shows a very good knowledge of the topics studied, excellent language properties, very good ability to analyze the aspects of Digital marketing, very good ability to frame real topics in the studied contexts, very good ability to link the topics between them and develop a critical analysis in the field of Digital Marketing strategies. During the course, the student developed very good autonomy and relational skills.</p> <p>Good 24-25. The student shows good knowledge of the topics studied, good language properties, good ability to analyze the aspects of Digital Marketing, good ability to frame real topics in the studied contexts, good ability to link the topics together and develop a critical analysis in the field of Digital Marketing strategies. During the course, the student has improved his autonomy and his relational skills.</p> <p>Satisfactory 21-23. The student shows satisfactory knowledge of the topics studied, satisfactory language properties, satisfactory ability to analyze the aspects of Digital Marketing, and to frame real topics in the contexts studied. The student does not show the ability to link the topics together and develop a critical analysis in the field of Digital Marketing strategies. During the course, the student did not improve his autonomy and his relational skills.</p> <p>Sufficient 18-20. The student shows sufficient knowledge of the topics studied, sufficient language properties, sufficient ability to analyze the aspects of Digital Marketing. The student does not show the ability to frame real topics in the contexts studied, nor the ability to link the topics together and develop a critical analysis in the field of Digital Marketing strategies. During the course, the student did not improve his autonomy and his relational skills.</p> <p>Insufficient. The student shows that he does not have the slightest knowledge of the topics studied in the course, expresses himself with unsatisfactory language properties, and highlights that he has not acquired sufficient ability to analyze the main aspects of Digital Marketing.</p> <p>Smart Factory:<br/>Oral exam and discussion of the project work both in classroom and during the final exam - out of 30<br/>Weight of the project work 70% weight of the oral exam 30%<br/>The selection of the topic of the project work and its structure aim to evaluate the skill level in analysing of the use of the enabling technologies of SMART</p> |

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|                         | <p><b>FACTORY.</b></p> <p>The project work consists in a report in english on innovative products, services, technologies, companies. It is the result of a team work (preferably of 4 students) of approximately 100 pages (25 pages for each member of the team). The report presents both the scientific and technological foundations and the economic and market issues of the selected innovation features. The project work will be presented in the classroom during the second module of the academic calendar and the aim of the presentation is both the evaluation by the teacher and to present the results to the class. The overall evaluation of the project work is based on 3 scores expressed out of 30 based on: a) coherence and quality of the used references and accuracy of the bibliography and sitography; b) robustness of the explaining of the relationships between the studied innovation with the performance indicators; c) quality of the classroom presentation and perceived interest of the class. The overall score is the average of the 3 scores. The oral exam includes the deepening of the contents of the project work also in relationship to the course topics. The score of the oral exam is out of 30 and evaluates the level of mastering the subjects of the course and the ability to apply them in the development of the project work. The following scores will be adopted: excellent 30 - 30 and praise, very good from 26 to 29, good from 22 to 25, sufficient from 18 to 21, insufficient. The overall evaluation of the exam is the weighted average from the score of the project work given during the oral examination (weight 70%) and the oral exam (weight 30%).</p> <p>Supply Chain Management 4.0:<br/>Practical test and written exams<br/>The practical test consists in solving a problem proposed by the teacher by creating individually developed procedures and methodologies of data analysis, machine learning and Artificial Intelligence.<br/>Oral exam<br/>Oral exam consists of an interview to evaluate the student's knowledge level about the arguments studied. At least three questions will be made, on the overall scope of the class. The evaluation will take into account the results of the written and oral exams (half and half).</p> |
| <b>TEACHING METHODS</b> | <p>Digital Marketing: Lectures; Group project.<br/>Smart Factory: Lectures, seminars, project work and classroom presentation of the project work.<br/>Supply Chain Management 4.0: class lessons and teamwork exercises, case studies</p>  |

| <b>MODULE</b><br><b>SUPPLY CHAIN MANAGEMENT 4.0</b><br><i>Prof. GIUSEPPE AIELLO</i>                       |                             |
|---|-----------------------------|
| <b>SUGGESTED BIBLIOGRAPHY</b>   |                             |
| S. Chopra, "Supply chain management Strategy Planning and Operations", Mc Graw Hill                       |                             |
| <b>AMBIT</b>  | 50368-Ingegneria gestionale |
| <b>INDIVIDUAL STUDY (Hrs)</b>   | 96                          |
| <b>COURSE ACTIVITY (Hrs)</b>  | 54                          |
| <b>EDUCATIONAL OBJECTIVES OF THE MODULE</b>   |                             |
| Foundations of Statistics and Calculus, general knowledge of cost accounting methods and stock management |                             |

### SYLLABUS

| Hrs | Frontal teaching  |
|-----|---|
| 5   | course introduction and fundamentals                                |
| 8   | data analysis, machine learning and Artificial Intelligence methods |
| 8   | time series based demand forecast                                   |
| 8   | Aggregate Planning for the supply chain                             |
| 8   | Inventory management for the supply chain                           |
| Hrs | Practice  |
| 6   | time series based demand forecasting exercises                      |
| 6   | aggregate planning exercises  |
| 6   | supply chain design and management - performance analysis           |

## MODULE DIGITAL MARKETING

*Prof. PAOLO ROMA*

### SUGGESTED BIBLIOGRAPHY

- Damian Ryan - Understanding Digital Marketing - 3rd edition - Kogan Page  
- Lecturer's Slides

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|-------------------------------|-----------------------------|
| <b>AMBIT</b>                  | 50368-Ingegneria gestionale |
| <b>INDIVIDUAL STUDY (Hrs)</b> | 96                          |
| <b>COURSE ACTIVITY (Hrs)</b>  | 54                          |

### EDUCATIONAL OBJECTIVES OF THE MODULE

Knowledge At the end of the course, the student will acquire the knowledge and methodologies to face and solve Digital Marketing problems. The student will be able to a) understand how to make the business digital and how to build digital channels, b) understand the main Digital Marketing strategies, including online segmentation, customer profiling, online positioning, c) understand search engine marketing strategies, d) understand how to manage the brand, product, pricing, and online distribution channels, e) understand how to communicate online both through online advertising tools and through social media, f) understand the dynamics of mobile marketing and the applications of artificial intelligence to marketing; g) understand how to draw up a Digital Marketing plan. Comprehension and ability to apply knowledge The student will acquire knowledge and methodologies to analyze and solve typical problems of Digital Marketing. The student will be able to develop the main Digital Marketing strategies, including online segmentation, customer profiling, online positioning, c) to apply search engine marketing strategies, d) to apply the management technique for the brand, the product, pricing, and online distribution channels, e) develop an online communication plan both through online advertising tools and through social media, f) apply mobile marketing and artificial intelligence techniques; g) apply the techniques of drafting a Digital Marketing plan. Autonomy of judgment The student will have acquired autonomy of analysis and evaluation of the main dynamics of Digital Marketing, will be able to evaluate the consistency of a digital marketing plan in relation to the online positioning of the product set up ex ante, will be able to express judgments on the efficiency and effectiveness of the usual digital marketing activities of companies. Communication skills The student will be able to communicate with competence and language properties of Digital Marketing problems even in highly specialized contexts. Learning skills The student will be able to independently address Digital Marketing problems, to deepen their knowledge on specific issues of Digital Marketing, to acquire further skills in subsequent courses in which the issues addressed require a consistent knowledge of the Digital Marketing activities of the businesses.

## SYLLABUS

| Hrs | Frontal teaching  |
|-----|---|
| 1   | Introduction to Digital Marketing   |
| 2   | Digital Economy and Digital Marketing: context and definitions  |
| 3   | Digital Marketing Strategy: Going digital and building digital channels   |
| 3   | Online Segmentation, Customer Profiling and Company Positioning   |
| 2   | Search Engine Marketing   |
| 5   | Online Brand Management, Omni-channel Management, Pricing   |
| 3   | Digital Advertising: E-mail marketing, pay-per-click, display advertising   |
| 5   | Social Media Marketing: Social Media Strategy, Customer Engagement Marketing, Company-generated and User-generated content Management, E-public relations management, Analytics and Measurement |
| 2   | Mobile Marketing  |
| 2   | Artificial Intelligence Marketing: A focus on chatbots  |
| 2   | Building a Digital Marketing Plan   |

| Hrs | Practice   |
|-----|--|
| 2   | Strategia di Marketing digitale: scegliere il digitale e costruire i canali digital Casi di studio   |
| 2   | Online Segmentation, Customer Profiling and Company Positioning: case studies  |
| 2   | Search Engine Marketing: Case studies  |
| 3   | Online Brand Management, Omni-channel Management, Pricing: Case studies  |
| 2   | Digital Advertising: E-mail marketing, pay-per-click, display advertising (case studies)   |
| 4   | Social Media Marketing: Social Media Strategy, Customer Engagement Marketing, Company-generated and User-generated content Management, E-public relations management, Analytics and Measurement (case studies) |
| 3   | Mobile Marketing: case studies   |
| 3   | Artificial Intelligence Marketing: A focus on chatbots (case studies)  |
| 3   | Building a Digital Marketing Plan (case studies)   |

**MODULE  
SMART FACTORY**

*Prof. UMBERTO LA COMMARE*

**SUGGESTED BIBLIOGRAPHY**

Notes of the course

|                               |                             |
|-------------------------------|-----------------------------|
| <b>AMBIT</b>                  | 50368-Ingegneria gestionale |
| <b>INDIVIDUAL STUDY (Hrs)</b> | 96                          |
| <b>COURSE ACTIVITY (Hrs)</b>  | 54                          |

**EDUCATIONAL OBJECTIVES OF THE MODULE**

The topics of the course and its structure have been selected looking at the learning outcomes listed in the SUA-CdS and have been designed according to the dominant employment profile.

The digital transition in manufacturing toward the paradigm Industry 4.0 is affirmed above all in the large companies. Its diffusion, above all, in the small and medium enterprises is on the contrary slowed by lack of professionals in this field. The technologies are available, the human capital no.

The aim of the course is therefore to give to the students a reference map to understand the main technologies and their potential for the SMART FACTORY.

**SYLLABUS**

| <b>Hrs</b> | <b>Frontal teaching</b>   |
|------------|---|
| 2          | The relevance of industrial production for innovation and economic growth |
| 2          | The evolution from the first to the fourth industrial revolution          |
| 2          | The basics of SMART FACTORY   |
| 2          | The connected SMART FACTORY   |
| 2          | The enabling technologies of the SMART FACTORY                            |
| 2          | Big data and Analytics  |
| 2          | Autonomous Robot  |
| 2          | Simulation and digital twins  |
| 2          | Cyber security and Cloud computing  |
| 2          | Additive manufacturing  |
| 2          | Augmented reality   |
| 4          | Financial instruments for industry 4.0                                    |
| <b>Hrs</b> | <b>Practice</b>   |
| 24         | Support to the development of the project work and classroom presentation |