ANNEX A-1
STRUCTURE AND CONTENTS OF THE FIRST YEAR AT THE "LAUREA MAGISTRALE IN INGEGNERIA GESTIONALE" (UNIVERSITA' DI PISA)

Exam	**Aim and contents**	**Credits (Italian system)**
Statistica II (Statistics II)	To provide students with knowledge, methods, interpretive skills, and programming ability with statistical software, for topics in computational statistics, such as the analysis of multivariate data and time series of interest in industrial engineer.	6
Ricerca Operativa II *(Operational Research II)*	*Ability to develop advanced optimization models for real-world applications arising in the management of complex systems, such as industrial production and service logistics. Basic optimization software tools.*	6
Gestione integrata della produzione *(Integrated manufacturing systems)*	To provide knowledge, methods and applications on modern integrated manufacturing systems, needed to carry out an efficient firm management. The following competences will be provided: 1) components of integrated manufacturing systems, 2) programming methods for the management of manufacturing systems, 3) basics of sizing and balancing of production lines, 4) examples of automated manufacturing processes	12
Strategie di business and management accounting (*Business strategy and management accounting*)	General objectives of teaching are to understand the fundamental concepts (characteristics, feasibility, introduction issues) of management control systems, processes and techniques such as enablers of strategy implementation and dynamic re-definition.	9
Modellistica e simulazione dei processi di produzione discreti (*Modeling and simulation of discrete manufacturing processes*)	- To model discrete manufacturing processes such as communication systems, traffic management systems, services management systems, event based dynamical systems; - To appropriately use simulation tools, - To use queue theory and Markov chain theory in order to model and solve various industrial issues and the associated decision making problems	6
Curriculum *Digital Product Innovation*		
Data Mining and Intelligent Systems (*Data Mining and Intelligent Systems*)	The first part of the course (Data Mining) gives a good knowledge of the main techniques used in data preprocessing, data warehouse, frequent pattern mining, frequent sequential pattern mining, graph mining, classification, prediction, clustering and outlier detection. This knowledge will allow to manage different types of aspects concerning data mining problem and to identify the most suitable technique for solving it. The second part of the course (Intelligent Systems) provides knowledge about the basic concepts of nature-inspired computational techniques, such as artificial neural networks, fuzzy systems and genetic algorithms,	12

	and their application to a wide variety of application areas.	
9 credits to be selected among those approved by the degree course board		9
Curriculum *Fabbrica digitale - Smart Industry - Digital Operations*		
Supply Chain Management and e-business (*Supply Chain Management and e-business*)	To provide knowledge and tools to design and manage the supply chain with particular reference to the strategic value of collaborative approaches and to sustainability.	9
Finanza per la supply chain (*Supply Chain Finance*)	The objectives of the course are double folded. Firstly, provide students with the financial tools for taking decisions regarding equity, debts and the firm's financial structure. Secondly, allow students to achieve skills in the use of solutions (implemented by financial institutions or technology providers) for the alignment of financial flows with product and information flows within the supply chain, in order to improve cash flow management from a supply chain perspective	6
6 credits to be selected among those approved by the degree course board		6

ANNEX A-2

STRUCTURE AND CONTENTS OF THE SECOND YEAR AT CRANFIELD UNIVERSITY – MSc Engineering Management of Manufacturing Systems (School of Applied Sciences)

Exam	**Aim and contents**	**Credits (UK system)**	**Credits (Italian system)**
Operations Management	An introduction to manufacturing and service activities. Capacity, demand and load; identifying key capacity determinant; order-size mix problem; coping with changes in demand. Standard times, and how to calculate them; process analysis and supporting tools; process simplification. What quality is; standards and frameworks; quality tools; quality in the supply chain. Scheduling rules; scheduling and nested set-ups. Roles of inventory; dependent and independent demand; Economic Order Quantity; uncertain demand; inventory management systems and measures	10	3

	Information systems – at operational, managerial, and strategic levels; bills of material; MRP, MPRll and ERP systems Ohno's 7 wastes; Just-in-Time systems (including the Toyota Production System, and Kanbans).		
Enterprise Systems	Introduction to business functions, processes and data requirements within an enterprise. Enterprise wide IT systems. Managing Enterprise through ERP. Enterprise Resource Planning (ERP): concepts, techniques and tools. ERP selection and implementation issues. An Introduction to IoT and Cyber Security. SAP based hands-on case studies. Conduct a Group Presentation on the Impact of ERP on a specialist MSc theme.	10	3
Operations Analysis	Six Sigma, Process capability, common and special cause variability, control charts, acceptance sampling. Analysis of systems to produce simple models. IDEF0 and IDEF3 and their application. Business process fundamentals and the process review. Improvement procedures, modelling methods and process models. Performance measurement. Responding to and improving reliability.	10	3
General Management	Management Accounting Principles and Systems; Personal style and team contribution, interpersonal dynamics, leadership, human and cultural diversity; Project Management: structure and tools for project management Introduction to standards: awareness of standards, relevant standards (quality, environment and H&S), value of using standards, management of the standard and audit.	10	3
Manufacturing Systems Engineering	Design of layouts. Human centred factory design. Group Technology & Cellular manufacturing. Different approaches to factory layout such as process and product layouts. Reasons for choice of cellular manufacturing and benefits. Manufacturing Systems modelling using discrete-event simulation. Analysis of manufacturing systems using simulation.	10	3
Internet of Things	IoT Concepts & Introduction to IoT. IoT-enabled innovation in products and services. Introduction to IoT project activity. Industry 4.0 technologies and Industrial Internet of things (IIoT). IoT sensing.	10	3

	Introduction to IoT architectures and platforms. Creating and working with IoT data flows. IoT-enabled data value chains. IoT-driven data analytics (edge and cloud analytics). From data to IoT-enabled products, applications and services. Cloud services, interfaces, dashboards. Overview of IoT standards. IoT Challenges (scalability, interoperability, security, privacy). IoT-enabled business ecosystems and business models.		
Supply Chain Management	Competitive manufacturing strategy concepts. Benchmarking of manufacturing system performance. Manufacturing strategy in business success. Strategy formation and formulation, leading on to system design. Structured strategy formulation and system design methodologies. Approaches to strategy formulation in differing business contexts. Realisation of new strategies/system designs, including approaches to implementation. Case study on design of competitive manufacturing strategy.	10	3
Manufacturing Strategy	Competitive manufacturing strategy concepts. Benchmarking of manufacturing system performance. Manufacturing strategy in business success. Strategy formation and formulation, leading on to system design. Structured strategy formulation and system design methodologies. Approaches to strategy formulation in differing business contexts. Realisation of new strategies/system designs, including approaches to implementation. Case study on design of competitive manufacturing strategy.	10	3
Group project	Applying taught material to a real current problem; working with an organisation and its staff (in some cases); developing interpersonal and group-working skills. Each project will be supervised by a member/s of academic staff and you will be expected to hold regular group meetings. At the end of the project each student is expected to write a report and there will also be an oral presentation of your work.	40	12
Individual thesis project	The individual thesis tests the ability of the student: (a) to define the project by reference to the scientific, technical and/or commercial literature, to undertake a critical appraisal of such literature and to provide a justification for the research. (b) to plan and manage the research	80	24

	programme. (c) to define the work to be carried out and to report the results in a clear manner. (d) to analyse the work, relate it to the work of others where appropriate and to be self critical. (e) to communicate the work, its results and analysis in a technical document.		