



# UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2022/2023
MASTER'S DEGREE (MSC)	MANAGEMENT ENGINEERING
SUBJECT	TIME-SERIES ANALYSIS AND DESIGN OF EXPERIMENT
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	20929-Attività formative affini o integrative
CODE	22430
SCIENTIFIC SECTOR(S)	SECS-S/02
HEAD PROFESSOR(S)	LOMBARDO ALBERTO    Professore Ordinario    Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	<b>LOMBARDO ALBERTO</b> Thursday 12:00 14:00 Stanza docente

DOCENTE: Prof. ALBERTO LOMBARDO

<b>PREREQUISITES</b>	Basic knowledge of probability, including the main random variables. Basic tools of statistical inference: point and interval estimation, statistical test. Analysis of variance, linear regression, log-linear models, residual analysis
<b>LEARNING OUTCOMES</b>	<p>Knowledge and ability to understand</p> <p>At the end of the course, the student will have acquired the knowledge of statistical methodologies to analyse complex data, to face and solve in an original way a problem of planning and analysis of the experiments. Will be able to analyse, plan and evaluate industrial and business processes, evaluating also and above all the time evolution through the use of the methodologies studied regarding Survival Analysis and the study of Time Series</p> <p>Autonomy of judgment</p> <p>The course provides students with the tools to analyze and interpret a complex reality in which the phenomenon is non-deterministic. The methodologies presented will allow the student to tackle the use of quantitative methods to study complex problems - such as programming experiments to improve quality, assessing and monitoring the intensity of a random phenomenon over time - and making it scientific and fast the path towards the acquisition of new knowledge concerning business-industrial processes. The applications presented in the classroom will allow us to build an approach to the vision of modern quality.</p> <p>Communication skills</p> <p>The communication aspects of the results of a statistical risk and experimental analysis are fundamental. Particular attention will be paid to the ability to communicate to all the surrounding work environment the importance and power of the methods learned.</p> <p>Learning skills</p> <p>The course involves the formation of work groups that manage case studies mostly independently. Since the planning of the experiments is closely linked to the specific problems and being a method in constant evolution, the ability to hang untreated methods in the course is also taken care of, as is the ability to know how to relate to experts in the field.</p>
<b>ASSESSMENT METHODS</b>	the adequacy of learning is assessed on the basis of the ability to know how to identify the correct statistical methodologies to use, perform the design of the experiments, the collection of related data and the consequent analysis through software. the assessment of learning takes place through an oral test. consisting of an oral exam in which the teacher will ask the candidate to expose the statistical methodologies under study in a coherent and understandable way, deepening their formal aspects and knowing how to indicate a possible application in engineering. the candidate who shows an excellent ability to exhibit and apply statistical methodologies to engineering situations will be awarded a maximum score of 30 cum Laude; the candidate who shows a limited ability to display the topics will be assigned a mark equal to 18.
<b>EDUCATIONAL OBJECTIVES</b>	Management engineers, in their activity, use the quantitative tools, decision supports and methodological rigour typical of engineering sciences, aiming at optimizing solutions. The statistical non-deterministic vision and method, when applied to managerial and organizational problems, enable the achievement of efficient and effective solutions, contribute to a better understanding of business phenomena, facilitate the identification and control of the most significant decisional variables, set the bases for the continuous improvement of business based on measurable parameters.
<b>TEACHING METHODS</b>	Integrated class lectures and computer-aided exercitations. Some hours are devoted to experimental laboratory
<b>SUGGESTED BIBLIOGRAPHY</b>	<p>Materiale didattico predisposto dal docente in distribuzione nelle tipografie al mero costo di stampa, ulteriore materiale usato a lezione accessibile su cloud d'ateneo</p> <p>Box, Hunter, Hunter - Statistics For Experimenters: Design, Innovation, and discovery, Wiley</p> <p>Montgomery - Design and Analysis of Experiments - Wiley</p>

## SYLLABUS

Hrs	Frontal teaching
5	The design of experiment Blocks and Complete and incomplete experimental designs Latin squares
5	Complete and incomplete Two-level designs with blocks
5	Complete and incomplete Many-level designs with blocks symmetrical and asymmetrical
5	Response surface
5	Robust design Taguchi methods Alternative methods

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Hrs	Frontal teaching
5	Survival analysis. Point processes, minimal repair and renewal processes. Graphics test. Kaplan-Meyer test. Cox Models
5	Time series Modern analysis Arma and ARIMA models Box-Jenking methods
Hrs	Practice
2	Exercises and case studies to construct complete and incomplete experimental designs with blocks
2	Exercises and case studies to construct complete and incomplete experimental designs with Two-level
2	Analysis of a response surface
2	Analysis of a response surface
2	Exercises and case studies on Robust design Taguchi methods and alternative methods
2	Exercises and case studies on Survival analysis. Point processes, minimal repair and renewal processes. Graphics test. Kaplan-Meyer test. Cox Models
2	Exercises and case studies on Time series Modern analysis Arma and ARIMA models and on Box-Jenking methods