



# UNIVERSITÀ DEGLI STUDI DI PALERMO

<b>DIPARTIMENTO</b>	Scienze Economiche, Aziendali e Statistiche		
<b>ANNO ACCADEMICO OFFERTA</b>	2015/2016		
<b>ANNO ACCADEMICO EROGAZIONE</b>	2015/2016		
<b>CORSO DILAUREA MAGISTRALE</b>	SCIENZE STATISTICHE		
<b>INSEGNAMENTO</b>	STOCHASTIC PROCESSES		
<b>TIPO DI ATTIVITA'</b>	B		
<b>AMBITO</b>	50608-Matematico applicato		
<b>CODICE INSEGNAMENTO</b>	16439		
<b>SETTORI SCIENTIFICO-DISCIPLINARI</b>	MAT/06		
<b>DOCENTE RESPONSABILE</b>	ADELFO GIADA	Professore Ordinario	Univ. di PALERMO
<b>ALTRI DOCENTI</b>			
<b>CFU</b>	6		
<b>NUMERO DI ORE RISERVATE ALLO STUDIO PERSONALE</b>	108		
<b>NUMERO DI ORE RISERVATE ALLA DIDATTICA ASSISTITA</b>	42		
<b>PROPEDEUTICITA'</b>			
<b>MUTUAZIONI</b>	PROBABILITY AND STOCHASTIC PROCESSES - Corso: ECONOMIC AND FINANCIAL SCIENCES PROBABILITY AND STOCHASTIC PROCESSES - Corso: SCIENZE ECONOMICHE E FINANZIARIE		
<b>ANNO DI CORSO</b>	1		
<b>PERIODO DELLE LEZIONI</b>	2° semestre		
<b>MODALITA' DI FREQUENZA</b>	Facoltativa		
<b>TIPO DI VALUTAZIONE</b>	Voto in trentesimi		
<b>ORARIO DI RICEVIMENTO DEGLI STUDENTI</b>	<b>ADELFO GIADA</b> Martedì 11:00 13:00 ex DSSM secondo piano Giovedì 11:00 13:00 ex DSSM secondo piano		

**DOCENTE:** Prof.ssa GIADA ADELFO

<b>PREREQUISITI</b>	
<b>RISULTATI DI APPRENDIMENTO ATTESI</b>	<p>Knowledge and understanding At the end of the course, students should show knowledge and comprehension of the main topics of the course. In particular they should learn the specific language of probability theory and fundamentals of stochastic processes</p> <p>Applying knowledge and understanding Students should become able to apply their knowledge and comprehension to tackle problems of uncertainty by means of suitable stochastic models. Specifically, students should be capable to: -classify a stochastic process; -interpret different forms of stochastic dependencies; -describe a time and space dependent random process with a suitable stochastic process;</p> <p>Making judgments Students should become able to recognize the significant elements of a problem of uncertainty, thereby assessing the probabilistic tools used to tackle the problem.</p> <p>Communication skills Ability to explain the characteristics of probabilistic tools, highlighting the usefulness of their application</p> <p>Learning skills Ability to read the national and international basic literature, and increase the acquired knowledge in attending higher level courses</p>
<b>VALUTAZIONE DELL'APPRENDIMENTO</b>	Prova orale
<b>OBIETTIVI FORMATIVI</b>	<p>Course objectives The course aims to provide a basic probabilistic preparation with the introduction of some useful concepts for the advanced use of probability theory and stochastic processes (SP) in discrete and continuous parameter, focusing on some of the most frequently exploited models in applied sciences. Therefore, at the end of the course, students should be able to apply the fundamental laws of the probability theory and to link them to the theory of SP. Moreover, students should be able to correctly define a SP, to distinguish between the different nature of a SP (discrete or continuous) and to understand their peculiarities and their possible applications. In particular they have to be able to get the main issues related to SPs (such as distributional properties, estimation, interpretation) and to understand also possible links among different processes.</p>
<b>ORGANIZZAZIONE DELLA DIDATTICA</b>	42 (30 lezione frontale + 12 esercitazione/lab.)
<b>TESTI CONSIGLIATI</b>	<p>S. Ross (2008) Introduction to probability models, Academic Press. G. R. Grimmett, D. R. Stirzaker (2001). Probability and Random Processes (Third Edition). Oxford University Press. G., Dall'Aglio (2001) Calcolo delle probabilita, Zanichelli. L. Daboni, Calcolo delle Probabilita' ed Elementi di Statistica, Utet; W. Feller. An Introduction to Probability Theory and Its Applications, Vol. 1, Wiley Series</p>

## PROGRAMMA

ORE	Lezioni
2	Probability measure and basic rules - Conditional Probability Bayes-theorem
2	Random variable - Independent Random variable - Probability density function – Joint distribution - Joint and marginal densities -Moment of a random variable - Covariance and correlation - Random vectors Discrete distribution Continuous distributions
2	Conditional expectation - Conditional distribution - Properties of Conditional expectation
2	Expectation of random number of r.v.'s . Inequalities Asymptotic theory: Convergences Examples of convergence in probability and a.s. Law of large numbers Central limit theorem
4	Predictable stochastic processes - Stationary Processes Discrete time processes. Definition of Markovian process, and discrete time Markov chain (DTMC). Stochastic matrix and its properties. Chapman-Kolmogorov equation.
2	State classification, class properties and irreducibility, Absorbing Markov chain Canonical Form Fundamental Matrix
2	Martingales introduction and Fair game Doob decomposition of an adapted process . Stopping times Theorem of convergence of martingales
2	Gambler's ruin problem Applications Risk insurance business, Random walk hitting probabilities
4	Continuous-time stochastic processes -Markov processes Birth-death process Queue model - Time Homogeneity (Embedded Markov Chains) The Transition Probability Function Backward and Forward Equations The Infinitesimal Generator: Stationary Distributions for CTMC

## PROGRAMMA

ORE	Lezioni
2	Gaussian noise The Wiener process / Brownian motion - Markov property of Brownian motion . Brownian motion drift and scaling
2	Ito calculus - Renewal process, Point process and Moments - K function
4	Conditional intensity functions, Papangelou, Probability generating functional, compensator, Homogeneous Poisson -Operations on PP (thinning, superposition,..) More general Processes - Marked PP, ETAS, ML estimation
ORE	Esercitazioni
2	Probability measure and basic rules - Conditional Probability Bayes-theorem
4	Moments of a random variable - Conditional expectation - Conditional distribution -
2	Markov chains and State classification Markov Chains
2	Martingales and Fair game . Examples of Martingales
2	Renewal process, Point processes