



**NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF ECONOMICS AND STATISTICAL ENGINEERING**

STATISTICAL ENGINEERING PROGRAM

ES011 – ACTUARIAL ANALYSIS

I. GENERAL INFORMATION

CODE	: ES911 Actuarial analysis
SEMESTER	: 10
CREDITS	: 3
HOURS PER HOUR	: 4
PREREQUISITES	: ES813 Statistical Decisions
CONDITION	: Mandatory

II. COURSE DESCRIPTION

Provide terminology, fundamental concepts, properties and applications of actuarial theory including theory and applications of life insurance calculation with the strict approach of actuarial science, that is, probabilistic and mathematical.

III. COURSE OUTCOMES

1. Present to the participant the actuarial theme.
2. Address probabilistic issues with notation, language and actuarial interpretation.
3. Exercise the participant in the use of language and actuarial interpretation.
4. To master the actuarial properties, their demonstration and the solution of actuarial problems.
5. To generate capacities so that the student specializes in the area if he so desires

IV. LEARNING UNITS

- Introduction: Life and non-life insurance.
- Biometric variables: distribution, interpretation, properties. Survival function. Basic probabilities of death and survival. Both instantaneous mortality. Central rate of mortality. Functions and survival models. Laws of mortality.
- Hope full and abbreviated life. Deferred, temporal and mixed half-life: complete, abbreviated, probable residual.
- Average age of death. Other summary measures. Cohorts. Biometric functions from cohorts. Deaths. So many survival and so much mortality. Census survival function. Average number of years lived. Extension of the previous two for n years. Central annual mortality rate. Both instantaneous cohort mortality

- Biometric properties for non-whole or fractional ages. Mortality tables. History. Building. Table of selected: whole and fractional ages. Deterministic interpretation.
- Biometric properties for two heads. Temporary probabilities and joint deferrals for two heads: survival; of dissolution; Non-extinction; of dissolution and non-extinction, and extinction.
- Strength of mortality and life expectancy for two heads. Residual joint life for two heads until dissolution and until extinction. Distribution Functions. Both instantaneous joint mortality for two heads. Life expectancy for two heads. Until dissolution. Until extinction. Variances.
- Biometric properties for two or more heads. Temporary probabilities and joint deferrals for three heads and for “m” heads. Actuarial actuator Z.
- Actuarial actualization factor. Definition of the benefit function. Definition of the discount function. Definition of the present value function.
- Insurance payable at the time of death.
- Insurance payable at the end of the year of death.
- Life insurance for two heads. Properties.
- Introduction. To Annuities of life. Annuities of continued life. Discrete life Annuities. Annuities of life with “m-th” payment. Introduction to the Premium-benefit. Premium continues complete. Discreet premium complete. Premiums of m-th are certain payments.

V. METHODOLOGY

Expository, participative. Discussion and problem solving in the classroom.

VI. BIBLIOGRAPHY

Newton L. Bowers Jr .; Hans U Gerber; James C. Hickman; Donald A. Jones; Cecil J. Nesbitt. Actuarial Mathematics. The Society of Actuaries 1997.
José Antonio Gil Gana, Antonio Heras Martinez, José Luis Vilar Zanón. Mathematics of the life insurance. Fundación MAPFRE Estudios, 1999. Institute of Sciences of the insurance. Editorial MAPFRE Estudios. Madrid.
M. Ayuso, H.Corrales, M. Guillén, A.M. Pérez-Marín, J.L. Red. Statistical Actuarial Life. Editions Universitat de Barcelona.