INSTITUT TEKNOLOGI SEPULUH NOPEMBER
FACULTY OF SCIENCE AND DATA ANALYTICS
DEPARTMENT OF STATISTICS
STATISTICS UNDERGRADUATE PROGRAM

Course	Course Name	:	**Stochastic Process**
	Course Code	:	SS234414
	Credit	:	3 SKS
	Semester	:	IV

COURSE DESCRIPTION

Stochastic Processes is one of the courses parts of the field of Statistical Modeling which is aimed at developing and analyzing probability models that capture the phenomenon of the effects of event randomness in the short and long term or in a narrow or wide area. The probability model studied will involve a variety of mathematical and computational models that are equipped with applications, both quantitative and qualitative in the real world, in the fields of business, industry, environment, government, and society.

PROGRAM LEARNING OUTCOME

PLO-4	Able to apply science and mathematics to support the understanding of statistical methods
PLO-5	Able to apply statistical theory to statistical methods
PLO-7	Able to use modern computing devices to solve statistical problems
PLO-9	Able to apply statistical methods to analyze theoretical and real problems

COURSE LEARNING OUTCOME

CLO.1	Be able to explain the meaning of a stochastic process by combining information on state variables and their parameters
CLO.2	Be able to explain Markov Chain and construct a probability transition matrix of a problem
CLO.3	Be able to make n-Step probability transition matrices and be able to analyze the first step of Markov (First Step Analysis)
CLO.4	Be able to explain the properties, classification, stationarity, ergodicity, and limits of Markov chains
CLO.5	Be able to explain the properties of the Poisson process and the spatial Poisson process
CLO.6	Able to explain the concept of the input-output process (birth-death process) and its implementation in the queuing system which is often found in everyday life.

MAIN SUBJECT

1. Stochastic Processes and Markov Chains
2. Probability of transition 1 step and transition matrix
3. The Chapman-Kolmogorov equation for calculating the n-Step transition probability
4. Limit distribution, First Step Analysis with absorbing and non-absorbing states
5. Classify Markov processes, ergodicity, recurrent, aperiodic, and irreducible conditions of a Markov process

6. Poission process of outing Bernoulli process, homogeneous and non-homogeneous Poisson, Cox process, and distribution between arrivals of Poisson events
7. Spatial dimension-based Poisson process
8. Decompose and compound Poisson process.
9. Markov model with continous time and The process of birth, death, birth-death, and absorbing.
10. Distribution of waiting times for renewal events.
11. Queuing Model (input – output process, limited and unlimited capacity queuing system)

PREREQUISITE

Introduction to Probability Theory

REFERENCES

1. Karlin, S. and Taylor, H.M., 2011. An Introduction to Stochastic Modeling. 3rd edition. Academic Press.
2. Beichelt, F. 2016. Applied Probability and Stochastic Processes. 2nd edition. LLC: Taylor dan Francis Group.
3. Sheldon, M. 2019. Ross-Introduction to Probability Models. 10th edition. Amsterdam: Elsevier.