

Textbook “Theory of processes and signals” for students of telecommunication, electronic and other study directions

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Abstract – In this paper it is written about problems and contents of educational materials of textbook about theoretical bases of electronic signal transformation processes

Keywords – processes, transformation, random, determined, signals, modulated, correlated, functions

I. INTRODUCTION

Ukraine enters European educational area. That's why our higher educational establishments modernize educational processes, and there is held work of practical attaching to Bolon process.

There must be developed one agreed educational program for European educational area in Ukrainian higher educational establishments, due to build one European educational area and broaden access to higher education and to increase mobility of students in European universities. That's why in National technical university of Ukraine “Kyiv polytechnic institute” and in Electronic department as well, credit-module system of knowledge estimation of students have been applied for past 3 years. New educational and working programs of the discipline are creating and existing ones are remaking. Tasks for current testing, individual tasks are creating and improving. Estimation of students is approbated and applied. The course structure is changing. There will be less lectures, and more time for self preparation, practice and laboratory works of students.

That is the reason why authors want to supply students with new textbooks that will help young people to gain appropriate knowledge. One of such textbooks from NTUU “KPI” and National Aviation University is named as a discipline “Theory of processes and signals”. It consists of two books “Determined processes” [1] and “Random processes” [2]. They are described further.

III. MATERIALS GIVEN IN THE TEXTBOOK

First book consists of 5 chapters. They are

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about modern theory of determined processes. In these chapters you will find about main notions and contents of theoretical bases of electric determined signals transformation processes.

Chapter 1 is about mathematical model of process and system and systems, processes and signals classification.

Chapter 2 is about spectral and energetic characteristics of periodical determined processes. Also here is described common estimation and energetic characteristics of periodical processes, also in this chapter it is explained principles of making spectral analysis of periodical signals, how does power division in specter is made and main characteristics of periodical processes form.

The **3rd chapter** describes spectral and energetic characteristics of non periodical determined processes. Here is viewed harmonic analysis and non periodical processes syntheses, typical properties of spectral density of complex amplitudes and relations of spectral and energetic characteristics of non periodical processes.

In **4th chapter** determined signals analysis is described; such notions as correlation, correlation function of periodic signal and its functions are determined. Related correlating functions of periodic and non periodic processes are explained. Integrate transformation of Furje is also determined.

Chapter 5 has information about modulated processes, about amplitude-modulated (AM) transformation signals processes, mathematical model and main parameters of one- and multitone AM processors and its capacity. Also about AM processes with oppressed carrying frequency and unceasing one band processes. Here are described common principles of unceasing corner modulation (CM), mathematical models of one tonal CM processes and its spectral analysis, correlation characteristic of one tonal narrowband CM process. You will learn about spectral analysis processes with CM with any modulation index and energetic characteristics of one and multitone CM processes. Also there is a comparative characteristics of AM and CM. Here are described processes with linear frequency modulation.

Second Book consists of 8 chapters. It is about theory of random processes (RP).

In **1 chapter** it is described in details about probability characteristics of (RP) and its mathematical model. Considered one dimension, two dimension and multi dimension integral and differential laws of probability division, characteristic function is explained.

In **chapter 2** it is described time

characteristics of RP and common characteristics of one dimension moment functions (MF) of the first and second order. Methods of one dimension moment functions by their characteristic functions are shown. It is explained how does renewing of characteristic functions by MF happens and how does spread laws determine by characteristic functions.

In the **3rd chapter** correlation characteristics of random processes, types of static dependence, two dimension moment functions of the 2nd order, features of correlation characteristics, normalized correlated functions, one and two dimension integration and differential moment functions are described.

Chapter 4 is about stationary random processes (RP). It is made determination of stationary RP in narrow and broad ways. It is shown special properties of auto correlated functions of stationary processes, stationary tied and mutual correlation functions of stationary RP and its practical importance. It is also considered ergodic processes and its characteristics.

The **5th chapter** contains information about spectral characteristics of RP: features of spectral analysis of random stationary and non stationary processes, properties of spectral power density, physical and mathematical specters, relations of spectral and correlative characteristics of stationary processes, specter width and its correlation interval.

In **chapter 6** there is estimation of static characteristics of RP, empiric moments and its calculation, there is described sequence of spread determination by observation data, given mark to correlated function and spectral density.

The **7th chapter** is about analysis of RP transformation by linear systems in time zone by the means of correlation analysis. It is formulated and explained terms of mathematical reaction wait, average reaction square, reaction correlation function, correlation of input and output signals.

Chapter 8 describes static evaluation of characteristics of random values and processes. Point and interval values of undefined parameters are described. Empiric moments and its calculations, determination of values sharing by observing data. Here is given static evaluation of average dispersion of correlation function, and also here is described elements of hypothesis theory.

III. CONCLUSIONS

The textbook uses new and traditional ways of giving material in order to learn bases of the theory of processes and signals. Chapters of both books contain lots of examples that illustrate features of the problems of process and signals analysis, preferably in electronic systems, modern technical problems and approaches are given for its salvation that gives this textbook opportunity to be a helper for a student in the case of student's self education. Content of the textbook is on the one level with world analogs. Both books are correspondent to modern science and technique conditions; they can be used in modernization of educational process. It is correspondent to all European requirements of practical attaching to Bolon process. It can also be useful in passing tests of the discipline and to help to prepare students of technical universities.

REFERENCES

1. Теорія процесів і сигналів: У 2 –х кн. Кн. 1. Детерміновані процеси: Підручник / Гумен М. Б., Гуржій А. М., Співак В. М., Богдан О.В. - К.: Аверс, 2007.— 175 с.
2. Гумен М. Б., Гуржій А. М., Співак В. М. Теорія процесів і сигналів: У 2 –х кн. Кн. 2. Випадкові процеси: Підручник.— К.: Аверс, 2007. —254 с.