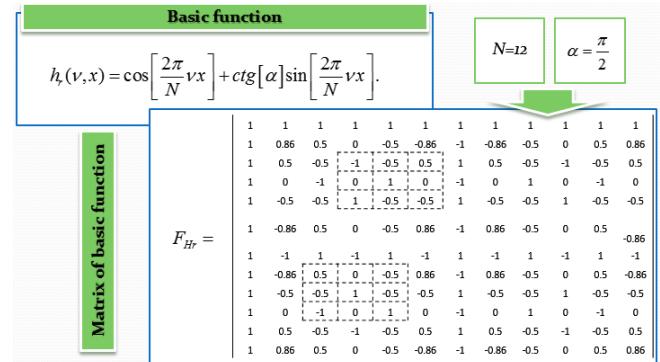forea@kpi.ua
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# *Course*: **Theory of Information and Signal Processing**

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*LANGUAGES OF EDUCATION*: Ukrainian, Russian, English

*THE SUBJECT* of educational course: basics of information theory including calculation of information amount, entropy for independent, inter-depended, equiprobable and non-equiprobable events, the informational capacity of a communication channel, the influence of the noises; optimal coding, estimation of the error rate; group and cyclic codes; spectral transforms of continuous and discrete functions (Fourier, Hartley, Walsh and other); convolution and correlation analysis; wavelet transform and new methods of spectral analysis; algorithms of data acquisition and compression.



**Basic function**

$$h_r(v,x) = \cos\left[\frac{2\pi}{N}vx\right] + ctg[\alpha]\sin\left[\frac{2\pi}{N}vx\right].$$

$N=12$    $\alpha = \frac{\pi}{2}$

Matrix of basic function

$F_{Hr} =$

*THE GOAL* of the course includes the formation of the following **abilities** of students:
Ability to calculate entropy for different forms of dependency between the elements,
❖ Ability to estimate the amount of information during transmitting via the communication channel, informational losses, influence of noises in the channel,
❖ Ability to form optimal codes for different ensembles of values, events, or elements with own probabilities,
❖ Ability to use different methods of spectral analysis for the task of processes calculation, prediction, and compression

*MAIN TASK OF EDUCATIONAL COURSE*
Following the demands of an educational-professional program, after the finishing of this course must demonstrate such learning outcomes:

**Knowledge**:                  **Skills**:
✓ the theoretical basis of information theory and signal processing methods
✓ basic algorithms of coding, decoding, error diagnostics, and correction
✓ applying error-correcting procedures
✓ estimation of redundancy for different codes
✓ applying of discrete and continuous spectral transforms
✓ using of wavelet transform to compress and analysis of the data
✓ correlation and auto-correlation analysis

**Experience**:

✓ application of the general principles of information theory and signal processing methods for choosing optimal coding algorithm including error-correction, calculation of convolutions, identification of parameters, compression, and prediction.

*COURSE DURATION:* 6,5 credits, 195 hours in total, 72 hours of lections, 36 hours of practice, 6 hours of calculation and graphical work, 81 hours for own student's work.

*REQUIREMENTS TO STUDENTS*: knowledge in the field of mathematical analysis, calculation mathematics, basic programming skills.