DOCTORAL STUDIES COURSE UNIT DESCRIPTION

Name of subject	Scientific Field	Center	Department
Mathematical Modelling of Physical Processes (C & C++) and Object-Oriented Programming (C++) (8 ECTS credits)	Physics N 002	Center for Physical Sciences and Technology	Physical Technology Department
Student's workload	Hours	Student's workload	Hours
Lectures		Consultations	40
Individual study	160	Seminars	

Course annotation
Main items of the course
Introductory remarks (Computer, operational system, programming languages)   *Main programming elements* (Operators, functions, program, declaration of variables, cycle)   *Functions and arguments* (Two functions program, segments of the program, small memory model, tuning the activity of functions, headers, global and local variables, result of calculations in the list of arguments of the function, variables their pointers and references).   *Important mathematical methods* (Simpson's rule, Rungr-Kuta method, algebra equation, Monte Carlo method, random process, recursion.   *Arrays and pointers* (Arrays, static and dynamic allocation, multidimensional arrays, their passing into function, text strings)   *Structural and interface improvements* (Functions as argument, projects, menu).   *Classes* (Object-oriented programming, class of complex numbers, operator overloading).   *The usage of classes* (Algebra of graphics, pixel graphics, drawing of functions, the problem of parameters, virtual functions).   *ISO/IEC standards* (Namespaces, new headers, data input and output, function template, STL (standard template library), modern programming style)   *Vectors and matrices* (vector and matrix classes with dynamical allocation, matrix decomposition)   *Programing in Windows operating system* (Survey of today computers, illustration of Visual C++ compiler)
List of literature
1. B. W. Kernighan, D. M. Ritchie, C Programming Language, (Prentice Hall, 1988)   2.   B. Stroustrup, Programming: Principles and Practice Using C++, (Addison-Wesley, 2014)   3. W. H. Press et al., *Numerical Recipes in C++* (Cambridge University Press, 1992)

Consulting teachers	Scientific degree	Pedagogical name	Main scientific works published in a scientific field in last 5 year period
Žilvinas Kancleris	habil. Dr.	Prof.	1. G. Šlekas, Ž. Kancleris, A. Urbanowicz, R. Čiegis, Comparison of full-wave models of terahertz photoconductive antenna based on ordinary differential equation and Monte Carlo method, Eur. Phys. J. Plus, Vol. 135, Issue 1, 85, (2020) 2. D. Seliuta, G. Šlekas, G. Valušis, and Ž. Kancleris, Fano resonance arising due to direct interaction of plasmonic and lattice

| | | | modes in a mirrored array of split ring resonators, *Optics Letters*, Vol. 44, No. 4, pp. 759-762 (2019) |
| | | | 3. G. Šlekas, P. Ragulis, D. Seliuta, and Ž. Kancleris, Using of Generalized Goertzel Algorithm for FDTD Calculation of the Transmission and Reflection Spectra of Periodic Structures, *IEEE Transactions Electromagnetic Compatibility,* Vol. 59, No. 6, pp. 2038-2041, December 2017 |

Certified during Doctoral Committee session 02/02/2022, protocol No. (7.17 E) 15600-KT-32

Committee Chairman prof. S. Juršėnas