COURSE SYLLABUS

University	**Alexandru Ioan Cuza University of Iaşi**	**Course title**	
Faculty	**Physics**	**QUANTUM THEORIES OF SOLID STATE**	
Department	**Physics**		
Domain	**Physics**	**Course category** (FC/SC/CC[1]): FC	**Term** (1-4): 2
Level	**Postgraduate (MA)**	**Course type** (Co/El/F[2]): Co	

I. Course structure

Number of hours/week				Credits	Total class hours/ semester	Total hours of individual activity	Examination type (C/Ex/CE[3])	Teaching language
Course	Seminar	Lab.	Project	**6**	**56**	**126**	**Ex**	**English**
2	**2**							

II. Instructors

	Academic degree[4]	Scientific degree	Name and surname	Faculty position (tenure/ associate - organization)
Course	Prof.	Ph.D.	Marina-Aura Dariescu	Tenure/Al. I. Cuza University
Seminar	Prof.	Ph.D.	Marina-Aura Dariescu	Tenure/Al. I. Cuza University
Laboratory				

III. Prerequisites

Functional Analysis, Mathematical Physics Equations, Quantum Physics, Statistical Physics, Solid State Physics.

IV. Course objectives

It intends to supply good knowledge on special elements of Quantum Mechanics, Quantum Statistics and Quantum Field Theories, with major applications in most important chapters of physics. It offers the bunch of ideas, notions and mathematical methods that proved their usefulness in modern technologies.

V. Course content

Course	Schrodinger's Equation: significant models of potential wells, potential barriers, periodic potentials, energy bands. Time-dependent Perturbation Theory. Applications. Scattering Theory: Cross sections. Many-Particle Systems: Born-Oppenheimer approximation, Hartree-Fock Equation. Quantum Statistics. Applications. Basics of Quantum Field Theories. Elements of Quantum Dynamics in mesoscopic systems. Basics of Quantum Information.
Seminar	Applications to the topics presented at the course; A range of useful mathematical ideas and tools, with direct applications in solid state physics.
Laboratory	

VI. Minimal required references

[1] FC – fundamental course, SC – specialty course, CC – complementary course
[2] Co – compulsory, El – elective, F – facultative
[3] C – colloquium, Ex – exam, CE – colloquium AND exam
[4] Professor / Associate professor / Lecturer / Assistant professor / Teaching assistant

C. Kittel, *Introduction to Solid State Physics*, 8-th Ed. (Wiley Press, 2005).
P.J.E.Peebles, *Quantum Mechanics* (Princeton University, Press, New Jersey, 1992).
L. D. Landau, E. M. Lifshitz, *The Classical Theory of Fields*, IV-th Edition, Reed Educational and Professional Publ. 2000.

C.Dariescu, Marina-Aura Dariescu, I. Gottlieb, *Capitole de baza in Mecanica Cuantica.*

Microparticule si Campuri (Ed. Venus, Iasi, 2007).
C. Dariescu, I.Gottlieb, Marina-Aura Dariescu, *Campuri Cuantice Libere* (Ed. BIT, Iasi, 1998).
S. Datta, Electronic transport in mesoscopic sistems (Cambridge Univ. Press, 2003).
I.Gottlieb, C.Dariescu, M. A. Dariescu. *Fundamentarea Mecanicii Cuantice* (Tehnica, Chisinau, 1994).
M. Ignat. *Termodinamica si fizica statistica*. (Editura Universitatii Al. I. Cuza Iasi, 1983-1984).
B.H. Bransden, C.J. Joachain. *Introducere in Mecanica Cuantica*. (Ed. Tehnica, Bucuresti, 1985).

VII. Didactic methods

Lectures,
Thematic Debates,
Applications.

VIII. Assessment

Pre-conditions	Attendance, Active participation to class activities, Free presentation of a project, Obtaining the minimal grade 5 for each ongoing assessment	
Exam dates	**1st Assessment**	April
	2nd Assessment	June

	Assessment means and methods	**Percentage of the final grade**
Exam/Colloquium	written	50%
Seminar	oral	50%
Laboratory		