TUNING PHYSICS SAG

filling of the planning form for the working paper
4.2.1. CREDIT ALLOCATION, STUDENT WOKLOAD AND LEARNING OUTCOMES: THE *TUNING* APPROACH

PLANNING FORM FOR AN EDUCATIONAL MODULE ©
(to be completed by the teacher)

Programme of Studies: *Physics*
Name of the module: *Quantum Physics*
Target group: *1st Cycle Physics students (and potentially engineering students)*
Level of the unit: *Introductory* (Bachelor level, 3rd year)
Entrance requirements: *Classical mechanics, Electromagnetism*
Number of ECTS credits: *8*

Competences to be developed:

Capacity for analysis and synthesis
Modelling (subject related competence, see Final Report Pilot Project Phase I, pages 294-297)
Problem solving (subject related competence, ibidem*)*
Theoretical understanding (subject related competence, ibidem*)*
Physics culture (subject related competence, ibidem*)*
Ability to solve Schroedinger equations
Composition of angular momenta
Handling the operators formalism
Familiarity with the postulates of quantum mechanics

Learning outcomes	**Educational activities** (at the institution in a class, contact hours) The unit as a whole consists of an integrated sequence of 39 hrs Lectures + 25 hrs *guided* Problem Solving = 64 hrs	**Estimated student work time in hours**	**Assessment**
Schroedinger equation	Lectures, Problem Solving (an integrated sequence, 18 L + 14 PS = 32 hrs)	*32*	*written exam*
	Private study time	*about 65*	
Operator Formalism	Lectures, Problem Solving (an integrated sequence, 8L + 5 PS = 13 hrs)	*13*	*oral exam*
	Private study time	*about 30*	
Angular Momentum	Lectures, Problem Solving (an integrated sequence, 7 L + 7 PS = 14hrs)	*14*	*written exam*
	Private study time	*about 25*	
Postulates of Quantum Mechanics	Lectures (synthesis of fundamentals, discussion cases and paradoxes, 5L = 5 hrs, each lecture at the appropriate place in the unit integrated sequence)	*5*	*oral exam*
	Private study time	*about 20*	

The total workload of the student is :

(38+26) contact hrs + (65+30+25+20) private study time hrs = 204 hrs.

This example shows that the private study time varies depending on the educational activity within the unit, ranging from less than 2 hrs per contact hour (Angular momenta) to 4 hrs per contact hour (Postulates).