Symmetry in Physics 2013/14

week	Lectures	Tutorials
1.	3. 10. Role of symmetry in physics; examples. Definition of a group, group properties. Examples: discrete groups (point groups, C2, C3, D3, D3h; permutation group, S3; continuous groups, R2, R3). Isomorphism, subgroup, direct product; conjugate elements, classes, examples of classes.	
2.	10. 10. Invariant subspaces, irreducibility, equivalent representations. Maschke theorem, inequivalent irreducible representations. Orthogonality properties of irreducible representations, Schur lemmas, orthogonality relations, examples.	7. 10. *(lectures)* Induced transformation of functions, examples. Group representations, matrix representations.
3.	17. 10. Characters of representations, orthogonality relations for characters of irreducible representations, reduction of representations, irreducibility criterion. Regular representation. Construction of character table.	14. 10. *(lectures)* Orthogonality relations, examples. Tutorials: Maschke's theorem (F. Kozarski)
4.	24. 10. Subduction. Projection operators. Wigner-Eckart theorem. Tutorials: Tilings by regular polygons (Ž. Kos), wallpaper group (M. Medenjak).	21. 10. Orthogonality of basis functions for irreducible representations, direct product of representations.
5.	31. 10. *(holiday)*	28. 10. Clebsch-Gordan coefficients in reduction of direct product of 2D representations of D3 (M. Ličen), kaleidoscope (J. Srpčič).
6.	7. 11. Symmetry in quantum mechanics: variational solution of quantum-mechanical problems, perturbation theory. Tutorials: Spherical patterns (M. Gomilšek).	4. 11. Symmetry in quantum mechanics: labelling and degeneracy of wave functions; selection rules for electric and magnetic dipolar transitions; conservation laws.
7.	14. 11. Molecular vibrations: classical vibration modes, classification of normal modes, vibration patterns, vibrational levels and wave functions (ground state, fundamental states, combined states).	11. 11. Aperiodic tilings (A. Bregar), Penrose tiling (B. Jenčič).
8.	21. 11. Crystallographic point groups: stereogram, proper groups, improper groups, class structure of point groups. Point and translational symmetry. Crystal systems. Irreducible representations.	18. 11. Landau theory (B. Kavčič).
9.	28. 11. Spin and double-valued representation; double group. Splitting of atomic levels in weak and moderate crystal field.	25. 11. Random square-triangle tilings (T. Verbovšek), spiral tilings (L. Černe), magnetic groups (A. Horvat).
10.	5. 12.	2. 12. Irreducible representations of frieze groups (M. Krnel), quasicrystals as projections of higher-dimensional lattice (T. Parkelj), molecular vibration patterns (M. Mrvar).
11.	12. 12.	9. 12.
12.	19. 12.	16. 12.
13.	26. 12. *(holiday)*	23. 12.
14.	2. 1.	30. 12. *(holiday)*
15.	9. 1.	6. 1.
16.	13. 1.	16. 1.