QTCA =*Quantum Theory for the Computer Age(2004)* PSDS=*Principles of Symmetry Dynamics&Spectroscopy(1993)*

Group Theory in Quantum Physics Outline for Physics 5093 *(Italics refer to optional advanced topics)*

Spectral decomposition of commutative and Abelian-group algebras	QTCA7.3, 8.1-2, 15.1a	PSDS 2
Irreducible projective idempotent algebra	QTCA 3.1b-c	PSDS 2.3
Logical connection of quantum axioms and group axioms	QTCA 2.2c	PSDS 1.1
Discrete and number-theoretic properties of Fourier analysis	QTCA 7.3	PSDS 2.7
Applications to dynamics and spectra	QTCA 9.1-3	PSDS 2.3
Homocyclic and linear moleucles of C_n symmetry:	QTCA 8.1,	PSDS 2.7
Quantum wells, dots, wires, corrals of C_m x C_n x C_p x…	QTCA 14.1-2	PSDS 2.8
Photon band-gap devices		
Spectral decomposition of non-commutative and non-Abelian-group algebras	QTCA 15	PSDS 3
Irreducible projective idempotent and nilpotent algebra	QTCA 15.1	PSDS 3.3
Algebra of the Center: Class algebra and characters, Shortcuts	QTCA 15.2	PSDS 3.2, 3.5
Applications to point group dynamics and spectra	QTCA 15.3	PSDS 3.4
Quasi-planar molecular and crystal point symmetry C_{nv}, D_n, D_{nh}, etc.		PSDS 3.6
Non-planar polyatomic molecular symmetry I, O, O_h, T_h, T_d, etc.		PSDS 4
Layered and multiply connected quantum wells, dots, and Layered photon band-gap devices		
Lab vs. Body duality : Operator classification and solution	QTCA 15.1	PSDS 3.1C, 3.4
Induced representation theory	(to be added)	PSDS 4.3
Frobenius reciprocity theorem	QTCA 25.4	PSDS 4.3C
Mackey subgroup theorem		
Spontaneous vs. Applied symmetry breaking		PSDS 4
Level clustering vs. level splitting	QTCA 25.4-5	PSDS 7.3, 7.4
Applications to atomic and molecular spectra and dynamics		PSDS 4.4, 5.8, 7.4
Spectral decomposition of Unitary U(2) and Orthogonal O(3) Lie Groups	QTCA 23.1-4	PSDS 5
Oscillators, Bosonic operators, and U(2)~O(3)>R(3) symmetry	QTCA10, 19	PSDS 5.4, 6.6
2-state systems (semiclassical theory), NMR, Rabi rot. , etc.	QTCA 19.1	PSDS 5.5, 7.5, 8.5
U(2) theory of quantum well scattering	QTCA13.3	
Rotation and quantum angular momentum states and operators	QTCA 23.1	PSDS 5.3
Lab vs. body duality for atomic and molecular spectra	QTCA 15.3, 23.2b	PSDS 5.2, 5.5E
Coupling and Tensor operators for O(3) and subgroups	QTCA 24-25	PSDS 6.1-3, 7.1-2
Wigner Eckart theorem	QTCA 25.1	PSDS 6.4, 7.2
Crystal field splitting and spectral transitions	QTCA 25.2	PSDS 5.6, 6.5, 7.3
Crystal and optical tensors	QTCA 23.4, 24.2	PSDS 6.3, 6.5, 7.4
Jahn-Teller and Renner-Teller symmetry reduction		PSDS 6.7
Ultra-high resolution spectra and super-hyperfine effects		
Spectral decomposition of intertwining m-state U(m) and n-particle S_n Groups	QTCA 25	
Young tableau calculus for fermionic and bosonic $(m)^n$ shell theory	QTCA 25.3	
Atomic and nuclear shell orbitals and correlation effects	(to be added)	
Quantum entanglement in optical or spinorial quantum computers		
Generalized tensorial operator sets		
Spectral decomposition of crystalline and floppy molecular space groups		
Symmorphic space groups and Little group induced representations		