



**Escuela de Ciencia e Ingeniería de Materiales** del 24 al 28 de Junio

Plan for Classes in Annual Course “School of Materials Science”:  
Topics/Subjects and their Brief Contents

Molecular Spin Materials Science and Implementation Molecular Quantum Computers

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1. Organic magnetic materials  
Conventional d-electron magnetisms vs. genuinely organic magnetism  
Exotic molecular functionalities arising from synthetic molecular systems  
Magnetic properties beyond d-electrons
2. High spin chemistry underlying organic/molecular magnetism  
Principles of molecular design for organic high spin molecules  
Electron exchange interactions as a key issue in magnetism  
Extremely high spin hydrocarbons in their ground state and genuinely organic ferromagnetism  
Identification of high spin states: Physical measurements of macroscopic magnetic properties  
Identification of high spin states: Physical measurements of microscopic magnetic properties  
Bird navigation/migration underlain by an interplay between Earth’s magnetic field and molecular spins  
Implementation of molecular spin batteries free from rare metals
3. Matter spin-qubit based quantum computers  
Introduction to quantum computing and quantum information processing  
What commercially available quantum computers look like?  
Implementation of scalable molecular spin quantum computers  
Molecular spin qubit based quantum computation  
Molecular spin qubits or qutrits as an emerging quantum spin technology  
Pulse microwave based spin manipulation technology  
Electronic high spin quantum computers underlain by chemistry
4. Quantum chemical calculations on quantum computers  
Quantum algorithms  
Practical applications of quantum computing to chemistry