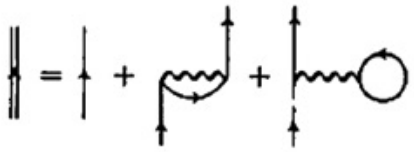
M2 – SMNO-nanomat – CMP3

Title:	Condensed Matter Physics – level 3 correlated materials physics (CMP3)	
	Apogée code: MU5PYM03 **Number of credits:** 3 **Teaching hours:** 26 h courses	

Lecturer:	Andrea GAUZZI IMPMC– 23-13 – 411 andrea.gauzzi@sorbonne-universite.fr

Objective	Exploring the rich physics of condensed matter beyond the independent electron approximation. Getting acquainted with the most notable novel phenomena, e.g. spin and mass renormalization effects and the most important electronic instabilities like magnetism and superconductivity that appear in presence of electron-electron interactions.
Content	Experimental evidence of interacting electrons. Hartree-Fock approximation and its application to metals. Second quantisation and its application to fermions and bosons. Examples: quantisation of the electromagnetic field and of the lattice vibrations. Photons and phonons. Real gases of fermions and bosons. Electron-electron interaction. Green function. Feynman diagrams. Quasiparticles. Fermi liquids. Interaction function. Renormalisation effects. Electronic instabilities. Examples: magnetism and superconductivity
Prerequisites	Fundamentals of atomic and molecular physics. Conventional band theory within the independent electron approximation. Quasi-free electron model. Tight-binding approximation. Classical description of lattice vibrations in solids.
Examination	Oral exam