Annex A

TEMPLATE FOR NEW COURSE CONTENT

New Course Code and Title	MS7073 Introduction to Quantum Physics
Details of Course	**Summary of course content** *(please note that this information provided will also be uploaded to the web for viewing at large)* Topics include: photons, the Bohr atom, de Broglie waves, and the wave-particle duality of matter and light. Introduction to wave mechanics: Schrödinger's equation, wave functions, probability amplitudes, the Heisenberg uncertainty principle. Solutions to Schrödinger's equation in one dimension: particle in a box; transmission and reflection at a barrier, barrier penetration; the simple harmonic oscillator.
	Rationale for introducing this course Increasingly more postgraduate students find themselves in situations to have to use *ab initio* methods in quantum chemistry without the benefit of having taken a stand-alone quantum physics course, thereby limiting their ability to discern the validities, or interpret the meanings, of their computational results in research projects. This course is designed to fill such a void in graduate curriculum.
	Aims and objectives The aim of this course is to introduce fundamental concepts and principles of quantum mechanics to graduate students in materials science with backgrounds of wave mechanics, and to equip them with the essential background and skills for investigations of materials properties at quantum length and time scales. At the end of this course the students will (Learning Outcomes): • Explain the postulates of quantum mechanics, the wave-particle duality and the uncertainty principle (LO 1); • Appreciate the utility of Schrödinger's equation in solving wave functions in one dimension (LO 2): • Explain the energy quantization in the one dimension problems of particle in a box and simple harmonic oscillator (LO 3).

	Syllabus Week 1: Why quantum mechanics? Week 2: Photons and de Broglie waves Week 3: Postulates of quantum mechanics Week 4: Wave-particle duality and double-slit experiment Week 5: Schrödinger's equation, wave functions, probability amplitudes Week 6: CA1 (LO 1 and LO 2) Week 7: Solutions to Schrödinger's equation in one dimension Week 8: Particle in a box Week 9: Transmission and reflection at a barrier and barrier penetration Week 10: The simple harmonic oscillator (1) Week 11: The simple harmonic oscillator (2) Week 12: CA2 (LO 2 and LO 3) Week 13: Summary and Consultation Two pre-CA consultation sessions will be held. References: Shankar, Ramamurti. *Principles of Quantum Mechanics*. Springer, 2008.
Assessment Please specify if components are individually assessed or group assessed	*Final Examination* *Individual* *50%* *CA1 (Quiz)* *Individual* *25%* *CA2 (Quiz)* *Individual* *25%*
	Total: 100 %
Hours of Contact/Academic Units	*13 hours / 1 AU*
Proposed Date of Offer	*Semester 2, AY2021-22*
Instructor and Co-instructor (if any)	A/P Zhao Yang
Class size	20
Any duplication of course School is advised to coordinate/check with the School offering the course to avoid duplication.	None.