



The University of Southern Queensland

Course Specification

Description: Quantum and Solid State Physics

Subject	Cat-Nbr	Class	Term	Mode	Units	Campus
PHY	3301	10394	1, 2002	ONC	1.00	TWMBA

Academic Group:	FOSCI
Academic Org:	FOS002
HECS Band:	2
ASCED Code:	010301

STAFFING

Examiner: Alfio Parisi

Moderator: John Mainstone

PRE-REQUISITES

Pre-requisite: PHY 2202 and MAT 1102 and PHY 1911 or PHY 1103

RATIONALE

This course provides firstly a knowledge of quantum physics necessary to explain the behaviour of atoms and sub-atomic particles and secondly a description of the physics of solids.

SYNOPSIS

The first part of this course discusses topics necessary for the student to gain an understanding of the experimental foundations of quantum physics along with the necessary theory to explain the behaviour of atoms and sub-atomic particles and how this relates directly to larger scale phenomena and applications. The second section of this course examines the properties of matter in the solid state and seeks to understand them in terms of the concepts of physics that students will have encountered in their previous studies. A series of practical exercises are undertaken to demonstrate some of the principles involved.

OBJECTIVES

On successful completion of this course students will be able to:

- demonstrate an understanding of current concepts and results of quantum theory and the physics of solids;
- display knowledge on the application of the theories;
- demonstrate skills and knowledge required to perform laboratory experiments safely with appropriate equipment.

TOPICS

Description	Weighting (%)
1. Quantum Physics Experimental Foundations - Black body radiation - Planck's constant - Photoelectric effect - Compton Effect Wave Equation - Schrodinger's equation - Free particle - Particle in a box - Penetration of a potential barrier - Linear harmonic oscillator - Operators and expectation values - Uncertainty Principle Applications - Hydrogen atom - Optical spectra - X-Ray spectra - Lasers and Holography - Scanning Tunnelling Microscope	50.00
2. Solid State Physics Structure of Crystalline Solids Theories of Conduction and Magnetism Energy Bands in Solids Quantum Theory of Conduction Semiconductor Devices	50.00

TEXT and MATERIALS required to be PURCHASED or ACCESSED:

Books can be ordered by fax or telephone. For costs and further details use the 'Book Search' facility at <http://bookshop.usq.edu.au> by entering the author or title of the text.

Laboratory Manual for Quantum and Solid State Physics, USQ Publication.

Rudden, M.N. & Wilson, J., 1993 *Elements of Solid State Physics*, 2nd edn, John Wiley, Chichester, NY.

Serway, R.A., Moses, C.J. & Moyer, C.A. 1997 *Modern Physics*, 2nd edn. Saunders College Publishing, Forth Worth.

REFERENCE MATERIALS

Reference materials are materials that, if accessed by students, may improve their knowledge and understanding of the material in the course and enrich their learning experience.

Reviews of Modern Physics.

Park, D., 1992 *Introduction to Quantum Theory*, McGraw-Hill, NY.

STUDENT WORKLOAD REQUIREMENTS

ACTIVITY	HOURS
Examinations	4
Laboratory or Practical Classes	20
Lectures	26
Private Study	71
Report Writing	36
Tutorial	13

ASSESSMENT DETAILS

Description	Marks Out of	Wtg(%)	Required	Due Date
CONTINUOUS LAB REPORTS	999.00	30.00	Y	04 Mar 2002 (see note 1)
2 HR RESTRICTED TEST	999.00	35.00	Y	01 May 2002
2 HR RESTRICTED EXAM	999.00	35.00	Y	END S1 (see note 3)

NOTES:

1. Examiner to advise due dates of the Continuous Lab Reports
3. Examination dates will be available during the Semester. Please refer to the examination timetable when published.

OTHER REQUIREMENTS

- 1 Attendance Requirements It is the students' responsibility to actively participate in all classes scheduled for them, and to study all material provided to them or required to be accessed by them to maximise their chance of meeting the objectives of the course and to be informed of course-related activities and administration.
- 2 Requirements to Satisfactorily Complete Each Assessment Item\ To ensure that students can satisfy the objectives of the practical component of the course, they must attend at least 80% of the practical classes, including submission of the assessment items and obtain at least half of the marks available for each item submitted. To satisfactorily complete the examinations in the course, students must obtain at least half of the marks available for each examination.
- 3 Minimum Requirements to Pass the Course To be assured of a pass in this course, students must: obtain an overall mark of at least 50%; obtain at least 50% of the marks available in the examination(s); obtain an overall mark of at least 50% in the other assessments.
- 4 Grading Final grades for students will be determined by the addition of the marks obtained in each assessment item, weighted as in the Assessment Details and by considering the students' level of achievement of the objectives of the course.
- 5 Supplementary and Deferred Examinations Students who obtain an overall passing mark, but who do not perform satisfactorily in an examination, may, at the discretion of the examiner, be granted a supplementary examination Students will be granted a deferred examination only if they perform satisfactorily in all other assessment items. Any supplementary or deferred examinations of this course will be held during the examination period at the end of the semester of the next offering of this course.
- 6 Assignments The due date for an assignment is the date by which a student must despatch the assignment to the USQ. The onus is on the student to provide proof of the despatch date, if requested by the Examiner. Students must retain a copy of each item submitted for assessment. This must be produced within 48 hours if required by the Examiner. In accordance with University's Policy on Assignments (Regulation 5.6.1), the Examiner of a course may grant an extension of the due date of an assignment in extenuating circumstances. This policy may be found in

the USQ Handbook, the Distance Education Study Guide and the Faculty of Sciences' Orientation handbook for new on-campus students. All students are advised to study and follow the guidelines associated with this policy. An assignment, submitted after the due date without an extension approved by the Examiner, will attract a penalty of 20 percent of the assigned mark for each day (or part thereof) that the assignment is late.

- 7 Examinations Candidates should be aware that the University has policies and regulations (Regulation 5.6.2.2) about the use of unfair means and electronic devices in an examination and they should refer to them to determine whether or not actions they intend to take are acceptable to the University. Restricted Examination: Candidates will be allowed access only to specific materials in a restricted examination. The only materials that candidates may use in the restricted examination for this course are: (a) writing materials (non-electronic and free from materials which could give the student an unfair advantage in the examination); (b) calculators which cannot hold textual information (students must indicate on their examination paper the make and model of any calculator(s) they use during the examination). With the approval of the Examiner, candidates may take an appropriate non-electronic translation dictionary into the examination. This will be subject to perusal and may be removed from the candidate's possession until appropriate disciplinary action is completed if found to contain material that could give the candidate an unfair advantage. A list of the materials candidates may access in the restricted examination will be on the frontispiece of the examination paper.
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