



The University of Southern Queensland

## Course Specification

### Description: Quantum and Solid State Physics

Subject	Cat-Nbr	Class	Term	Mode	Units	Campus
PHY	3301	20395	1, 2003	ONC	1.00	TWMBA

<b>Academic Group:</b>	FOSCI
<b>Academic Org:</b>	FOS002
<b>HECS Band:</b>	2
<b>ASCED Code:</b>	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.

Parisi, A.V. & Sabburg, J. 2003, *Laboratory Manual for Quantum and Solid State Physics*, USQ Publication, Toowoomba.

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

Serway, R.A., Moses, C.J. & Moyer, C.A. 1997, *Modern Physics*, 2nd edition, 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, New York.

### **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	30.00	30.00	Y	04 Mar 2003 (see note )
2 HR RESTRICTED TEST	35.00	35.00	Y	04 Mar 2003 (see note )
2 HR RESTRICTED EXAM	35.00	35.00	Y	END S1 (see note )

### NOTES:

- . Examiner to advise due dates of the Continuous Lab Reports
- . Examiner to advise date of the 2hr Restricted Test
- . Examination dates will be available during the Semester. Please refer to the examination timetable when published.

## IMPORTANT ASSESSMENT INFORMATION

- 1 Attendance requirements:  
It is the students' responsibility to attend and participate appropriately in all activities (such as lectures, tutorials, laboratories and practical work) 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. To maximize their chances of satisfying the objectives of the practical component of the course, students should attend and actively participate in the laboratory sessions in the course.
- 2 Requirements for students to complete each assessment item satisfactorily:  
To complete the practical component satisfactorily, students must submit at least 7 of the nominated 9 practical reports and obtain at least 50% of the marks available for each report submitted.
- 3 Penalties for late submission of required work:  
If students submit assignments after the due date without prior approval then a penalty of 20% of the total marks available for the assignment will apply for each working day late.
- 4 Requirements for student to be awarded a passing grade in the course:  
To be assured of receiving a passing grade a student must attempt all of the summative assessment items, achieve at least 50% in the examination, achieve an aggregated mark of at least 50% in the total marks allocated for the assignments, and at least 50% of the available weighted marks for the summative assessment items.
- 5 Method used to combine assessment results to attain final grade:  
The final grades for students will be assigned on the basis of the weighted aggregate of the marks obtained for each of the summative assessment items in the course.
- 6 Examination information:  
In a Restricted Examination, candidates are allowed access to specific materials during the examination. The only materials that candidates may use in the restricted

examination for this course are: writing materials (non-electronic and free from material which could give the student an unfair advantage in the examination); 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 Examiner's approval, candidates may, take an appropriate non- electronic translation dictionary (but not technical dictionaries) into the examination. This will be subject to perusal and, if it is found to contain annotations or markings that could give the candidate an unfair advantage, it may be removed from the candidate's possession until the appropriate disciplinary action is completed.

- 7 Examination period when Deferred/Supplementary examinations will be held:  
Any Deferred or Supplementary examinations for this course will be held during the examination period at the end of the semester of the next offering of this course.
- 8 University Regulations:  
Students should read USQ Regulations 5.1 Definitions, 5.6. Assessment, and 5.10 Academic Misconduct for further information and to avoid actions which might contravene University Regulations. These regulations can be found at the URL <http://www.usq.edu.au/SECARIAT/calendar/Part5/> or in the printed version of the current USQ Handbook.

## **ASSESSMENT NOTES**

- 9 Students must retain a copy of each item submitted for assessment. this must be produced within 24 hours if required by the Examiner.