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|---|---|------------|-------------------------------------|
| Course Code   | PHYS8352 (RPG)  |            |                                     |
| Title   | Quantum information   |            |                                     |
| Offering Department   | Physics   |            |                                     |
| Course Co-ordinator   | Dr W Y Wang Physics   |            |                                     |
| Course Co-ordinator Email   | wenyuanw@hku.hk   |            |                                     |
| Teachers Involved   | Name  | Department | Percentage                          |
|   | Dr W Y Wang   | Physics    | 100                                 |
| Course Objectives   | This course covers the theory of quantum information and computation and its applications in physics and computer science.  |            |                                     |
| Course Contents & Topics  | Topics include: Quantum computer; quantum algorithms; quantum error correction; quantum information processing; quantum entanglement and quantum cryptograph.   |            |                                     |
| Course Learning Outcomes (CLO)                                    | <p>On successful completion of this course, students should be able to:</p> <p>CLO 1 examine the advantage and disadvantage of quantum computing over classical computing</p> <p>CLO 2 explain the inner workings of common quantum algorithms and quantum key distribution</p> <p>CLO 3 analyze the performance of quantum algorithms and quantum error correction codes</p> <p>CLO 4 apply quantum information techniques to solve problems in physics and computer science</p>   |            |                                     |
| Pre-requisites (and Co-requisites and Impermissible combinations) | Nil   |            |                                     |
| Offer in 2021 - 2022  | Y   | 2nd sem    | Examination May                     |
| Course Grade  | Pass or Fail  |            |                                     |
| Grade Descriptors   | <p>Pass: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</p> <p>Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</p> |            |                                     |
| Course Type   | Lecture-based elective course   |            |                                     |
| Course Teaching & Learning Activities                             | Activities  | Details    | No. of Hours                        |
|   | Lectures  |            | 36                                  |
|   | Tutorials   |            | 12                                  |
|   | Reading/Self study  |            | 80                                  |
| Assessment Methods and Weighting                                  | Methods   | Details    | Weighting in final course grade (%) |

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|   | Assignments  |                     | 20 |
|   | Examination  | 3-hour written exam | 50 |
|   | Test   |                     | 30 |
| Quota   | 9999 (9999 if no quota)  |                     |    |
| Required/recommended reading and online materials | Lecture notes provided by Course Coordinator<br>M A Nielsen and I L Chuang: Quantum Computation And Quantum Information (CUP, 2000)<br>V Vedral: Introduction To Quantum Information Science (OUP, 2006) |                     |    |