## Course Information

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|---|---|
| **Course Code** | 9700510 |
| **Course Section** | 1 |
| **Course Title** | QUANTUM CRYPTOGRAPHY |
| **Course Credit** | 3 |
| **Course ECTS** | 8.0 |
| **Course Catalog Description** | The aim of this course is to introduce the basic of quantum information theory with an emphasis on quantum cryptography and quantum algorithms. A short review of classical information theory. Basic notions of quantum mechanics: Hilbert spaces, postulates of quantum mechanics, qubits, density operator, entanglement, EPR and Bell inequality. Quantum gates, quantum circuits. Quantum Fourier transform. Quantum algorithms: Deutsch`s, Deutsch-Jozsa, Grover`s and Shor`s algorithms. Quantum cryptography: quantum key distribution, BB84, B92, and EPR protocols. |
| **Prerequisites** | No prerequisites |
| **Schedule** | Monday , 13:40 - 15:30, -<br>Tuesday , 11:40 - 12:30, - |

## Instructor Information

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|---|---|
| **Name/Title** | Prof.Dr. İBRAHİM YURDAHAN GÜLER |
| **Office Address** | Institute of Applied Mathematics, Room 204 |
| **Email** | yguler@metu.edu.tr |
| **Office Phone** | |
| **Office Hours** | Tuesdays 9:40-10:30 |

## Course Objectives

The aim of this course is to intrduce the basic concepts of  quantum mechanics and it's applications to quantum computation ,quantum cryptograhy and quantum algorithms.

## Course Learning Outcomes

1.Familiarity of students with basic concpts of quantum mechanics ,

2.Knowledge of quantum computation ,and other applications.

## Instructional Methods

Classical lecture

## Tentative Weekly Outline

| Week | Topic | Relevant Reading | Assignments |
|---|---|---|---|
| 1 | Review of quantum mechanics | | |
| 2 | Review of quantum mechanics | | Homework1 |
| 3 | Review of quantum mechanics | | |
| 4 | Review of quantum mechanics | | Homework2 |
| 5 | Review of quantum mechanics | | |
| 6 | Review of quantum mechanics | | Homework3 |

| Week | Topic | Relevant Reading | Assignments |
|---|---|---|---|
| 7 | Quantum gates | | Homework4 |
| 8 | Quantum circuits | | Homework5 |
| 9 | Quantum algorithms | | |
| 10 | Quantum algorithms | | Homework6 |
| 11 | Quantum cryptography | | |
| 12 | Quantum cryptography | | Homework7 |
| 13 | Quantum cryptography | | Homework8 |
| 14 | Quantum cryptography | | |

## Course Textbook(s)

Nielsen and Chuang,Quantum Computation and Quantum Information, Cambridge 2000.

Benenti, Casati and Strini, Principles of Quantum Computation and Information, Vol.1. World Scientific 2004.

## Assessment of Student Learning

| Assessment | Dates or deadlines |
|---|---|
| **Assignments:** Assignments are going to be in the form of home works. | |
| **Exams:** Exams will cover the topics covered in the class. | |
| **Course Evaluation:** Final examination, attendence and homework assignments | |

## Course Grading

| Deliverable | Grade Points |
|---|---|
| Final Exam | 40 |
| Homeworks | 40 |
| Attendence | 20 |
| **Total** | 100 |

## Course Policies

*Class Attendance*

Minimum % 70 attendance is required.Attendance below % 70 without excuse will cause NA letter grade.

*Late Submission of Assignments*

Late submissions are not accepted

*Make up for Exams and Assignments*

There will be no make up examinations for this class and late homework assignments will not be accepted. An exception is when there is an official medical report.In this case the contact with the instructor iş expected.

## Information for Students with Disabilities

Students who experience difficulties due to their disabilities and wish to obtain academic adjustments and/or auxiliary aids must contact ODTU Disability Support Office and/or course instructor and the advisor of students with disabilities at academic departments (for the list: http://engelsiz.metu.edu.tr/en/advisor-students-disabilities) as soon as possible. For detailed information, please visit the website of Disability Support Office: https://engelsiz.metu.edu.tr/en/

## Academic Honesty

The METU Honour Code is as follows: *"Every member of METU community adopts the following honour code as one of the core principles of academic life and strives to develop an academic environment where continuous adherence to this code is promoted. The members of the METU community are reliable, responsible and honourable people who embrace only the success and recognition they deserve, and act with integrity in their use, evaluation and presentation of facts, data and documents."*