

## 電気通信大学 平成20年度シラバス

授業科目名	量子エレクトロニクス特論第二		
英文授業科目名	Selected Topics in Quantum Electronics 2		
開講年度	2008年度	開講年次	
開講学期	後学期	開講コース・課程	博士前期・後期課程
授業の方法	講義	単位数	2
科目区分	電気通信学研究科-量子・物質工学専攻-専門科目		
開講学科・専攻	量子・物質工学専攻		
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<b>【主題および達成目標】</b>
<p>The concept of the density operator plays an important role in various branches of physics, such as atomic and molecular physics, optics, solid state physics, and quantum information. In this course, I present the general theory of the density operator and its applications in nonlinear optics. The basic properties of the density operator are described. The use of the density operator for two- and three-level atoms interacting with light is given. Interesting optical effects, such as absorption and emission, power broadening, coherent population trapping, dark states, and electromagnetically induced transparency, are studied.</p>

<b>【前もって履修しておくべき科目】</b>
Elementary Quantum Mechanics I.

<b>【前もって履修しておくことが望ましい科目】</b>
N/A

<b>【教科書等】</b>
<ol style="list-style-type: none"> <li>1. Quantum Mechanics, by C. Cohen-Tannoudji, B. Diu, and F. Laloe (John Wiley &amp; Sons, New York, 1977).</li> <li>2. Quantum Optics, by M. O. Scully and M. S. Zubairy (Cambridge University Press, New York, 1997).</li> </ol>

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### 【授業内容とその進め方】

#### List of Topics

1. Concept of a statistical mixture of states
2. Pure states. Introduction of the density operator
3. Statistical mixtures of states
4. Applications of the density operator
5. Optical Bloch equations
6. Absorption spectrum: saturation and power broadening
7. Field propagation
8. Susceptibility, refractive index, and absorption coefficient
9. Coherent trapping
10. Electromagnetically induced transparency

### 【成績評価方法及び評価基準(最低達成基準を含む)】

At the end of the course, each student has to write a short report (at most 2 A4 pages) on a topic from the list. In the report, the student should show his understanding of the topic.

Assessment in this class will take account of the attendance, discussion, and report at the score proportion of 20%, 30%, and 50%, respectively.

### 【オフィスアワー：授業相談】

- 1) Write email messages to me.
- 2) Come to my office, Monday through Friday, 10:00 to 12:00 and 14:00 to 17:00.

### 【学生へのメッセージ】

N/A

### 【その他】

N/A