

<b>科目名 Course Title</b>	半導体量子情報特論 [Semiconductor Quantum Informatics]		
<b>講義題目 Subtitle</b>			
<b>責任教員 Instructor</b>	武藤 俊一 [Shunichi MUTOH] (大学院工学研究院)		
<b>担当教員 Other Instructors</b>			
<b>開講年度 Year</b>	2014	<b>時間割番号 Course Number</b>	092020
<b>開講学期 Semester</b>	2学期	<b>単位数 Number of Credits</b>	2
<b>授業形態 Type of Class</b>	講義	<b>対象年次 Year of Eligible Students</b>	～
<b>言語コード・言語 Language Code, Language Type</b>	2 日本語及び英語のバイリンガル授業、受講者決定後に使用言語(日本語又は英語)を決定する授業		
<b>補足事項 Other Information</b>			
<b>キーワード Key Words</b>			
quantum information, quantum mechanics, semiconductor, nano-structures, quantum dots			
<b>授業の目標 Course Objectives</b>			
There is a growing interest in quantum information processing, in which semiconductor nano-structures represented by quantum dots are the candidates for the practical applications. We first review the semiconductor nano-structures where quantum mechanics is the physics characterizing essential properties. A special emphasis is on the presentation by students on introduction and explanation of related scientific papers.			
<b>到達目標 Course Goals</b>			
The final goal of this course is to understand the basic physics for quantum information processing and the potential use of semiconductor nano-structures for its realization.			
<b>授業計画 Course Schedule</b>			
Introduction Quantum physics in semiconductors Schrodinger equation of electron envelope function Size quantization Tunneling phenomena Self-assembled dots by Stranski-Krastanow mode Wavepacket contraction for quantum cryptography EPR paradox and quantum teleportation for quantum repeaters Quantum computing Coherent control of single electron spins Quantum computing using electron spins in quantum dots Semiconductor spintronics			
THE HIGHLIGHTS: Introduction and explanation of related scientific papers by students			
<b>準備学習 (予習・復習) 等の内容と分量 Homework</b>			
30-60 min. for homework			
<b>成績評価の基準と方法 Grading System</b>			
20%: class participation, 40%: assignments (3 assignments are required during the term), 40%: presentation			
<b>テキスト・教科書 Textbooks</b>			
<b>講義指定図書 Reading List</b>			
Explorations in Quantum Computing / C. P. Williams, S. H. Clearwater: Springer, NY, 1998 Quantum Computation and Quantum Information / M.A. Nielsen, I.L. Chuang: Cambridge University, 2010			
<b>参照ホームページ Websites</b>			
<b>研究室のホームページ Website of Laboratory</b>			
<b>備考 Additional Information</b>			
undergraduate-level quantum mechanics and elementary solid state physics are needed to understand this lecture			