GMSI 講義
「工学リテラシーⅢ」
“Engineering Literacy III”　English Presentation & Discussion
(Course code3722-131)

講義の目的

産業界および学術界のイノベーションリーダーとなる基礎素養や専門知識に加え、リテラシー(コミュニケーション、マネージメント能力等)とコンピテンシー（リーダーシップ、強い責任感と使命感等）を涵養する。社会が求める「高い専門性と幅広い知識と応用力」を身につけることを目的とする。

概要

英語ディスカッション及び英語プレゼンテーションの授業（4回程度）に加えて、国際学会で発表をすることにより単位を付与する。

≪注意≫本講義は受講人数制限（5 名/クラス x 4 クラス程度）のため、希望しても受講できない場合があります。

講義について

Thursday, 14:45-16-25 (100min)x 4 weeks
*1st week@ Eng.Bld.No.2-lecture room 223
*2nd-4th weeks @ Eng.Bld.No.8-lecture room 324

-maximum no. of participants: 20
1st week (June 14): guidance, lectures, and self-introduction 2nd week (June 21) : 1st presentation exercise (7min presentation + 3min Q&A + 10 min discussion) 3rd week (June 28): 2nd presentation exercise　(7min presentation (improved ver.) + 3min Q&A + 10 min discussion) 4th week (July 5): presentation (7min presentation (final ver.) + 3min Q&A)

To be eligible to attend you must :
-sufficient English ability
-experience of presenting at an international conference (or workshop)　-a plan to give a presentation at an international conference during this fiscal year Submission of a lecture report and a conference report is a must.

Purpose of this Lecture

The program aims to cultivate internationally competitive young researchers equipped with Literacy and Competency to become future leaders in industry and academia. This education program will foster human resources with multidisciplinary application skills, in addition to the in-depth research in specialized fields. Based on the social requirements, graduate school students require the ability to work in a broader spectrum and apply one's skills to a multidisciplinary setting.

Out line

This course aims at providing an opportunity to learn academic presentation and public speech. In interdisciplinary research, communication with researchers in other Engineering fields is very important, and thus this course will focus on easy-to-understand presentation instead of technical discussion.

PROCEDURE

Participants need to prepare a seven-minute presentation on their research topic in advance. The participants will be divided into four groups and learn to improve their presentations and speech by having advice from native English-speaking teachers and teammates. In the last week, the participants will be divided into two groups and give presentations. The best presentation of each group will be awarded a best-presentation award.

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GMSI 講義
「拡張ナノ空間実践演習」
Extended Nanospace Laboratory “Multiscale Calculation”
(Course code3722-125)

講義の目的

産業界および学術界のイノベーションリーダーとなる基礎素養や専門知識に加え、リテラシー(コミュニケーション、マネージメント能力等)とコンピテンシー（リーダーシップ、強い責任感と使命感等）を涵養する。社会が求める「高い専門性と幅広い知識と応用力」を身につけることを目的とする。産業界との連携による講義。

概要

拡張ナノ空間とはナノ空間の現象がミクロ空間に展開する融合領域である。ナノ構造体の制御によりこの空間に誘起される現象を活用することで，これまでにない効果を発現する革新的な機械の創出を目指す上で必要となる基礎理論、基礎実験を習得することを目的とする。

＜講義の項目＞

1. 分子動力学
   原子分子の集団、多原子を扱うための技術、ニュートン運動方程式、
   固体系分子動力学法の基礎、熱活性化過程、キネティックモンテカルロ法の基礎

2. 電子状態理論
   波動関数理論、密度汎関数理論、化学結合と化学反応
   ナノワイヤの破断プロセス

3. NEMS 応用
   自己組織化、ナノヒータのバイオ応用、NEMS(ナノ機械電気システム）、バイオセンサー
   SAM（self assembled monolayer; 自己組織化単分子膜）、
   Si nanowires FET bio sensing (シリコンナノワイヤーの FET バイオセンシング）、
   nanochannel and DNA manipulation(ナノチャネルと DNA 分子の挙動分析）

4. マイクロ流体デバイス
   マイクロ化学、拡張ナノ化学、拡張ナノ流体工学

理解すべき事項

・原子と分子
・原子レベルから見た固体・液体・気体
・周期的境界条件
・温度制御
・速度スケーリング
・波動関数
・電子密度
・化学結合の生成と解裂
・最適化構造
・分子動力学法の基礎
・固体中の欠陥挙動
・活性化エネルギー
・集積化方法論
・基盤技術
・溶液物性
・半導体加工技術
・FET (field effect transistor)
・リソグラフィー

Purpose of this Lecture

The program aims to cultivate internationally competitive young researchers equipped with Literacy and Competency to become future leaders in industry and academia. This education program will foster human resources with multidisciplinary application skills, in addition to the in-depth research in specialized fields. Based on the social requirements, graduate school students require the ability to work in a broader spectrum and apply one's skills to a multidisciplinary setting.

Out line

The transitional area in which phenomena in the nanospace are extended to the microspace is called the "extended nanospace." Innovative machines will be created by utilizing and controlling the unconventional effects that emerge from phenomena at the nanoscale. The lecture offers basics in theoretical and experimental foundations which are necessary to promote the outstanding research using "extended nanospace."

1. Molecular dynamics
   Ensembles of atoms and molecules
   Computational technique for the calculation of a large number of atoms
   Newton equation of motion
   Molecular dynamics in solid systems
   Thermally activated process
   Kinetic monte carlo simulation

2. Electronic structures
   Wavefunction theory
   Density functional theory
   Chemical bonding and Chemical reactions
   Breaking processes of nanowires

3. NEMS meets Bio-sensing
   NEMS(bio sensor)
   SAM (self assembled monolayer
   Si nanowires FET bio sensing
   nanochannel and DNA manipulation

4. Microfluidic devices
   Microchemistry
   Extended-nano fluidics

Objectives

・atoms and molecules
・Solid, liquid, and gas phases in the atomistic view point
・periodic boundary conditions
・Temperature control
・Velocity scalling
・Wavefunction
・Electron density
・Bonding and bond breaking between atoms
・Optimized structures
・Fundamentals of molecular dynamics
・Defect behavior in solid systems
・Activation energy
・Integration method
・fundamental technologies
・Liquid properties
・semiconductor, IC fabrication
・FET (field effect transistor)
・Conventional optical lithography