富山高等専門学校	開講年度	平成31年度 (2019年度)	授業科目	応用物理学特論

科目基礎情報

科目番号	0022	科目区分	専門 / 必修
授業形態	授業	単位の種別と単位数	学修単位: 2
開設学科	海事システム工学専攻	対象学年	専1
開設期	前期	週時間数	2
教科書/教材	reference：「量子力学・統計力学入門」星野公三・岩松雅夫 共著（裳華房）		
担当教員	大竹 由記子		

到達目標

The course treats the basis of quantum mechanics and statistical mechanics. On completion of the course the student shall be able to:
1. calculate energy, wave function and existence probability of particles confined in potential wells by solving Schrödinger's equation.
2. calculate transmission and reflection probability of particle incident to step-wise potential barriers by solving Schrödinger's equation.
3. caluculate entropy, temperature and pressure by using microcanonical ensemble.
4. caluculate energy and pressure by using canonical ensemble.

ルーブリック

	Ideal Level of Achievement (Very Good)	Standard Level of Achievement (Good)	Unacceptable Level of Achievement (Fail)
Evaluation 1	One can calculate energy, wave function and existence probability of particles confined in potential wells by solving Schrödinger's equation when the well walls have finite height.	One can calculate energy, wave function and existence probability of particles confined in potential wells by solving Schrödinger's equation when the well walls have infinite height.	One cannot calculate energy, wave function and existence probability of particles confined in potential wells by solving Schrödinger's equation.
Evaluation 2	One can calculate transmission and reflection probability of particle incident to potential barriers of finite width by solving Schrödinger's equation.	One can calculate transmission and reflection probability of particle incident to step-wise potential barriers by solving Schrödinger's equation.	One cannot calculate transmission and reflection probability of particle incident to step-wise potential barriers by solving Schrödinger's equation.
Evaluation 3	One can caluculate entropy, temperature and pressure by using microcanonical ensemble in various cases.	One can caluculate entropy, temperature and pressure by using microcanonical ensemble in the cases of free particles and harmonic oscillators.	One cannot caluculate entropy, temperature and pressure by using microcanonical ensemble.
Evaluation 4	One can caluculate energy and pressure by using canonical ensemble in various cases.	One can caluculate energy and pressure by using canonical ensemble in the cases of free particles and harmonic oscillators.	One cannot caluculate energy and pressure by using canonical ensemble.

学科の到達目標項目との関係

教育方法等

概要	The course treats the basis of quantum mechanics and statistical mechanics which are essential to understand modern technology such as nanotechnology and cryogenic technology.
授業の進め方・方法	The schedule of this lecture might be slightly changed so that students can easily follow. Student masters this course through lectures and seminar.
注意点	The final grade will be calculated according to the following process: reports(40%) and term-end examination(60%). The recognition of credit requires 60 points or more rating.

授業計画

		週	授業内容	週ごとの到達目標
前期	1stQ	1週	Wave–particle duality	guidance, Compton scattering, photons, de Broglie waves, double-slit experiment
		2週	Framework of quantum mechanics 1	wave function, Hermitian operator, commutation relation, Schrödinger's equation
		3週	Framework of quantum mechanics 2	superposition principle, uncertainty principle
		4週	Schrödinger's equation 1	particles confined in potential wells (lecture)
		5週	Schrödinger's equation 2	particles confined in potential wells (seminar)
		6週	Schrödinger's equation 3	particle incident to step-wise potential barriers (lecture)
		7週	Schrödinger's equation 4	particle incident to step-wise potential barriers (seminar)
		8週	Schrödinger's equation 5	particle incident to potential barriers of finite width, harmonic oscillator (lecture)
	2ndQ	9週	Statistical mechanics 1	microcanonical ensemble (lecture)
		10週	Statistical mechanics 2	microcanonical ensemble (seminar)
		11週	Statistical mechanics 3	canonical ensemble (lecture)
		12週	Statistical mechanics 4	canonical ensemble (seminar)
		13週	Statistical mechanics 5	grandcanonical ensemble (lecture)
		14週	Statistical mechanics 6	grandcanonical ensemble (seminar)
		15週	Term-end examination	
		16週	Checking the final grade	

モデルコアカリキュラムの学習内容と到達目標

分類	分野	学習内容	学習内容の到達目標	到達レベル	授業週

評価割合

	Examination	Presentation	Mutual Evaluations between students	Behavior	Portfolio	Other	合計
総合評価割合	60	0	0	0	40	0	100
Basic Ability	60	0	0	0	40	0	100
Technical Ability	0	0	0	0	0	0	0
Interdisciplinary Ability	0	0	0	0	0	0	0