富山高等専門学校	開講年度	平成29年度 (2017年度)	授業科目	シミュレーション工学特論

科目基礎情報

科目番号	0096	科目区分	専門 / 選択
授業形態	授業	単位の種別と単位数	学修単位: 2
開設学科	エコデザイン工学専攻	対象学年	専1
開設期	前期	週時間数	2
教科書/教材			
担当教員	石黒 農		

到達目標

In this lecture, you will learn the outline of various numerical analysis method for understanding simulation engineering based on the computer program. And then, you will learn the finite differences method as a concrete numerical analysis method. And you will learn two dimensional heat transfer analysis as a solution of partial differential equation. It is aimed to be able to derive partial differential equations, and convert it to a differential expression, and convert it as a practical technique as a computer program, and visualize the result further.

ルーブリック

	Ideal Level of Achievement (Very Good)	Standard Level of Achievement (Good)	Unacceptable Level of Achievement (Fail)
Evaluation 1: It is evaluated that you can derive the some partial differential equations or not.	You can derive some differential equations.	You can derive only fundamental differential equations.	You can not derive fundamental differential equations.
Evaluation 2:It is evaluated that you can express partial differential equations using a difference method or not.	You can expand a few kinds of type partial differential equations using difference method.	You can expand fundamental partial differential equations using difference method.	You can not expand fundamental partial differential equations using difference method.
Evaluation 3:It is evaluated that you can express appropriate answer about boundary condition or not.	You can explain theory of boundary condition, and how to implement boundary condition into computer program.	You can explain theory of boundary condition.	You can not explain theory of boundary condition.
Evaluation 4:It is evaluated that you can implement difference equations into computer program or not.	You can solve some partial differential problems.	You can solve fundamental partial differential problems.	You can not solve fundamental partial differential problems.
Evaluation 5:It is evaluated that you can express visually some partial differential equations answer using computer graphics, or not.	You can express visually applied partial differential equations answer using computer graphics.	You can express visually fundamental partial differential equations answer using computer graphics.	You can not express visually fundamental partial differential equations answer using computer graphics.

学科の到達目標項目との関係

教育方法等

概要	In the lecture, you will learn outline of some numerical method as base of the implementation of computer programming for more good understanding the simulation engineering. And then, you will learn finite difference method as concrete of the numerical simulation. Finally, you will implement the two-dimensional heat transfer analysis as a partial differential equation problem into computer programming.
授業の進め方・方法	The subject will be performed with both of lecture and computer program practice. The lecture will be performed based on the Japanese textbook. You will become who be able to construct program of the partial differential equation about some simulation of physic phenomena. The kind of the computer program language is not limited in the lecture, but you must be able to show simulation result by computer graphics.
注意点	

授業計画

		週	授業内容	週ごとの到達目標
前期	1stQ	1週	Orientation of this lecture. Explanation of some simulation and how to formulate the model.	We will understand using simulation why we need to learn in live.
		2週	Explanation of how to solve or derive the partial differential equations using separation of variable method. Part one.	You will understand how to derive the partial differential equation using mathematical analysis.
		3週	Explanation of how to solve or derive the partial differential equations using separation of variable method. Part two.	You will understand how to derive the partial differential equation using mathematical analysis.
		4週	Explanation of how to convert the differential equation into the finite differences method.	You will understand how to convert the differential equation into the finite differences method.
		5週	Explanation of how to convert the ellipse type differential equation into the finite differences method.	You will understand how to convert the ellipse type differential equation into the finite differences method. And then, you will understand the Gauss-seidel method, the SOR method and how to construct difference equation systems.
		6週	Explanation of how to convert the ellipse type differential equation into the finite differences method. Part two.	You will understand how to convert the ellipse type differential equation into the finite differences method. And then, you will understand the Gauss-seidel method, the SOR method and how to construct difference equation systems.
		7週	Explanation about how to implement the ellipse type differential equation into computer program.	You will understand how to implement the ellipse type differential equation into computer program.

		8週	Intermediate examination.	Examination will be performed for evaluating intelligibility. The test will be based on the review of the lecture note.
	2ndQ	9週	Explanation of intermediate examination's answer. And explanation of how to convert the parabola type differential equation into finite differences method.	You will understand how to convert the parabola type differential equation into finite differences method, and explicit method on computer program, and Crank-Nicholson implicit scheme.
		10週	Explanation of how to convert the parabola type differential equation into finite differences method. Part two.	You will understand how to convert the parabola type differential equation into finite differences method, and explicit method on computer program, and Crank-Nicholson implicit scheme. Part two.
		11週	Explanation of how to convert the parabola type differential equation into finite differences method. Part three.	You will understand how to convert the parabola type differential equation into finite differences method, and explicit method on computer program, and Crank-Nicholson implicit scheme. Part three.
		12週	Explanation of how to convert the two-dimensional parabola type differential equation into finite differences method.	You will understand how to convert the two-dimensional parabola type differential equation into finite differences method, and explicit method on computer program, and Crank-Nicholson implicit scheme.
		13週	Explanation of how to convert the two-dimensional parabola type differential equation into finite differences method. Part two.	You will understand how to convert the two-dimensional parabola type differential equation into finite differences method, and explicit method on computer program, and Crank-Nicholson implicit scheme. Part two.
		14週	Explanation of how to implement the two-dimensional parabola type differential equation into computer program.	You will understand how to implement the two-dimensional parabola type differential equation into computer program.
		15週	Explanation of how to implement the two-dimensional parabola type differential equation into computer program. Part two.	You will understand how to implement the two-dimensional parabola type differential equation into computer program. Part two.
		16週	Final examination.	Examination will be performed for evaluating intelligibility. The test will be based on the review of the lecture note.

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	Report	合計
総合評価割合	80	0	0	0	0	20	100
Basic Ability	40	0	0	0	0	0	40
Technical Ability	40	0	0	0	0	20	60
Interdisciplinary Ability	0	0	0	0	0	0	0