Discrete Mathematics (I)
Course Introduction

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부산대학교 정보·의생명공학대학
정보컴퓨터공학부

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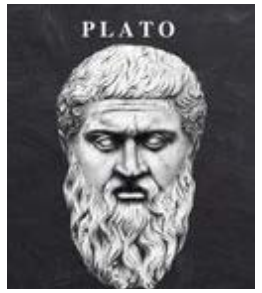
Course Info.

- Discrete Mathematics (I)
  - Course Number : CP15635, Mandatory Major, 3 Credits, Class #: 061
  - Class Hours : 09:00 ~ 10:15 (MON & WED)

- Instructor : Kim, Jongdeok
  - kimjd at pusan.ac.kr, Office: 313-311, Tel: 510-3519
  - Office Hour: 15:00 ~ 18:00 Tuesday

- Textbook
  - “Discrete and combinatorial mathematics ” (5th Ed), R.P. Grimaldi, 2004

- Course Home Page: PLATO
  - PLATO : PNU smart platform for Learning, Advanced Teaching and Open Courseware
  - https://plato.pusan.ac.kr/course/view.php?id=109272



Weekly Schedule

주	학습내용	활동사항
1	Course Introduction / Principles of Counting (1)	Homework #1
2	Principles of Counting (2)	
3	Logic : Propositional Calculus	
4	Logic : Formal Proof in Propositional Calculus	Homework #2
5	Logic : Predicate Calculus	
6	Logic : Formal Proof in Predicate Calculus	Homework #3
7	Properties of Integer and Mathematical Induction	
8	Chinese Remainder Theorem	
9	Set Theory	Homework #4
10	Relations and Functions	Homework #5
11	Properties of Relations, Relations and directed graphs	Homework #6
12	Equivalence Relations : equivalent classes partition, refinement	Homework #7
13	Ordering Relations : poset	
14	Ordering Relations : bounds, lattices	Homework #8
15	Final Exam	

평가 (Grading Policy)

Category	Points
Attendance & Attitude/Presentation	**200 (100 + 100)** -10 points per absence
Homework	**350**
Quiz	**100**
Final Exam.	**350**
Total	**1000**

❖ Final Exam. Schedule – June 14.

수학 (數學 Mathematics) - Wikipedia

❖ Mathematics (from Greek "knowledge, study, learning") is the abstract study of topics encompassing **quantity, structure, space, change** and other properties; it has no generally accepted definition. (*From Wikipedia*)

❖ Mathematicians seek out patterns and formulate new conjectures [추측].

- Mathematicians resolve the truth or falsity of conjectures by mathematical proof [수학적 증명].
- It has become customary to view mathematical research as establishing truth by rigorous deduction [연역] from appropriately chosen axioms [공리] and definitions [정의].
- When those mathematical structures are good models of real phenomena, then mathematical reasoning can provide insight or predictions about nature.

Fields of Mathematics

- Mathematics can, broadly speaking, be subdivided into the study of quantity, structure, space, and change.
  - Quantity - Arithmetic[산술]
  - Structure – Algebra[대수학]
  - Space - Geometry[기하학]
  - Change - Analysis[해석학]

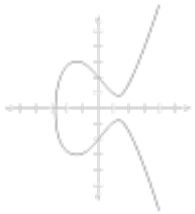
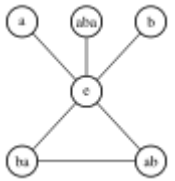
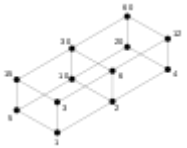
- In addition to these main concerns, there are also subdivisions dedicated to exploring links from the heart of mathematics to other fields: to logic [논리학], to set theory [집합론] (foundations[수학기초론]), to the empirical mathematics of the various sciences (applied mathematics[응용수학]), and more recently to the rigorous study of uncertainty.
  - **Foundations and Philosophy**
  - **Pure Mathematics**
    - **[1] Quantity, [2] Structure, [3] Space, [4] Change**
  - **Applied Mathematics**
    - **Statistics and Other Decision Sciences**
    - **Computational Mathematics**

Pure Mathematics

❖ Quantity – Arithmetic [산술]

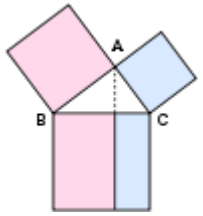
$1, 2, 3, \ldots$	$\ldots, -2, -1, 0, 1, 2 \ldots$	$-2, \frac{2}{3}, 1.21$	$-e, \sqrt{2}, 3, \pi$	$2, i, -2 + 3i, 2e^{i\frac{4\pi}{3}}$
Natural Numbers	Integers	Rational Numbers	Real Numbers	Complex Numbers
자연수	정수	유리수	실수	복소수

❖ Structure – Algebra [대수학(代數學)]

$(1,2,3)\ (1,3,2)$ $(2,1,3)\ (2,3,1)$ $(3,1,2)\ (3,2,1)$				
Combinatorics	Number Theory	Group Theory	Graph Theory	Order Theory
조합론	수론	군론	그래프 이론	순서론

Pure Mathematics

❖ Space – Geometry [기하학 (幾何學)]

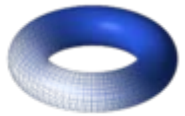


Trigonometry

삼각법/삼각함수

Differential Geometry

미분기하학



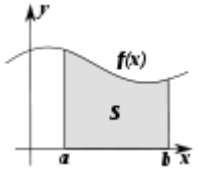
Topology

위상수학

Fractal Geometry

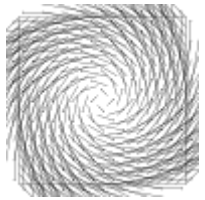
프랙탈 기하학

❖ Change – Analysis [해석학 (解析學)]



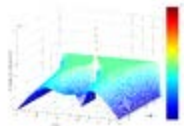
Calculus

미적분학



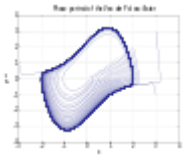
Vector Calculus

벡터 미적분학



Differential Equations

미분방정식



Dynamical System

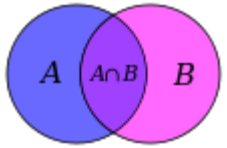
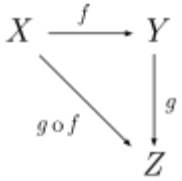
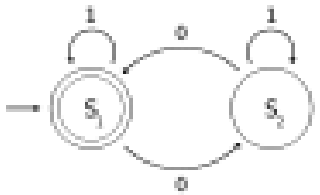
동역학계

Chaos Theory

혼돈이론

Foundations and Philosophy

❖ 수학 기초론

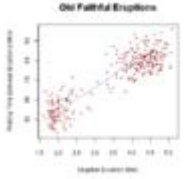
$p \Longrightarrow q$			
Mathematical Logic / Formal Logic	Set Theory	Category Theory	Theory of Computation
수리논리학 / 형식논리학	집합론	범주론	계산이론

Applied Mathematics

❖ Statistics and Decision Sciences, Computational Mathematics

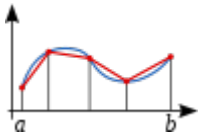
Probability Theory

확률론



Statistics

통계학

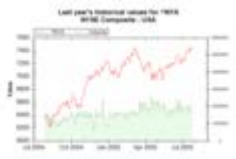


Numerical Analysis

수치해석

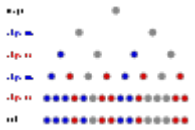
Optimization

최적화 이론



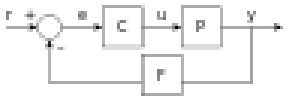
Mathematical Finance

금융수학



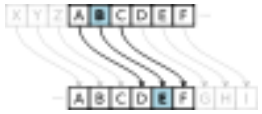
Game Theory

게임 이론



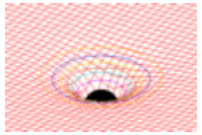
Control Theory

제어 이론



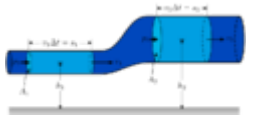
Cryptography

암호학



Mathematical Physics

수리물리학



Fluid Dynamics

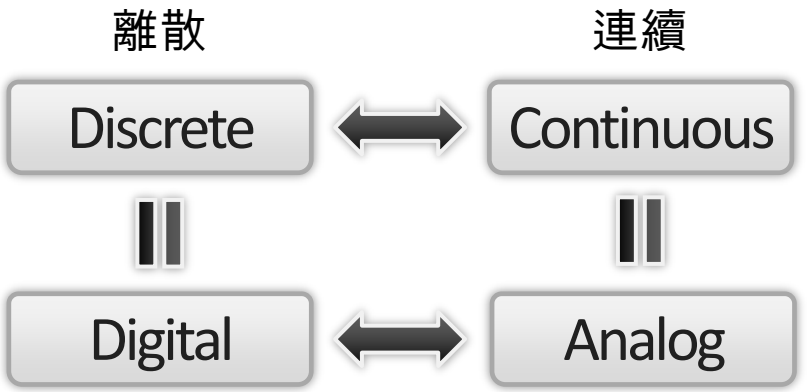
유체역학

이산수학(離散數學, Discrete Mathematics)

❖ 이산수학은 이산적인 수학 구조에 대해 연구하는 학문으로, 연속되지 않는 공간을 다룬다. 유한수학이라고도 하며, 전산학적인 측면을 강조할 때는 전산수학이라고도 한다. 주로 정수, 유한 그래프, 형식 언어 같이 가산 집합에 속하는 개념을 다룬다. 이산수학은 전산학의 기초가 되는데, 이것은 컴퓨터에서 다루는 자료형이 이산적이라는 것에서 기인한다. 이산수학에서 나온 개념과 기호는 컴퓨터 알고리즘과 프로그래밍 언어의 문제나 대상들을 연구하는 데 유용하다.

❖ 이산수학의 주제

- **조합론 : Combinatorics**
- **논리학 : Logic**
- **집합론 : Set Theory**
- **관계론 : Relation Algebra**
- 그래프 이론 : Graph Theory
- 수론 : Number Theory
  - 암호학 : Cryptography
- 오토마타 : Automata Theory



Changes in PNU CSE Curriculum