Coursework Overview: Jinhee Paeng

B.S. in Department of Mathematical Sciences and Statistics, March 2018 - June 2024*

Leave of Absence for Military, May 2022 - February 2024

Fall 2021
- Mathematical and Numerical Optimization
- Stochastic Differential Equations 1
- Introduction to Differential Geometry 2
- Mathematical Statistics 2
- Multivariate Data Analysis and Lab
- Artificial Intelligence and Philosophy

Spring 2021
- Topics in Mathematics 1 (Topological Combinatorics)
- Introduction to Deep Learning
- Algorithms
- Nonparametric Statistics and Lab
- Time Series Analysis and Lab
- Introduction to Bioinformatics

Fall 2020
- Modern Algebra 2
- Introduction to Topology 2
- Complex Function Theory 2
- Data Mining Methods and Lab
- Neural Prosthesis

Spring 2020
- Modern Algebra 1
- Introduction to Topology 1
- Complex Function Theory 1
- Mathematical Statistics 1
- Concepts and Applications in Probability
- Introduction to Computer Science for Biologists

Fall 2019
- Introduction to Mathematical Analysis with practice 2
- Linear Algebra 2
- Differential Equations and Practice
- Logic Design
- Automata Theory

Spring 2019
- Introduction to Mathematical Analysis with practice 1
- Linear Algebra 1
- Number Theory
- Sets and Mathematical Logic

Fall 2018
- Differential and Integral Calculus 2
- Statistical Computing and Lab
- Earth System Science & Earth System Science Lab
- Writing in Science & Technology

Summer 2018
- Biology & Biology Lab

Fall 2018
- Honor Calculus and Practice 1
- Statistics & Statistics Lab
- Physics 1 & Physics Lab 1
- Computer Application for Scientific Computation

Fall 2021

Mathematical and Numerical Optimization

Course Information	3341.454 001, Mathematics, Advanced Undergraduate(Year 4), in English
Instructor	Ernest K. Ryu
Grade	A+
References	*Convex Optimization* by Boyd and Vandenberghe
	Large-Scale Convex Optimization by Ryu and Yin
Subject Matter	Convex set and functions, Convex optimization problems, Convex duality, Primal-dual methods, Stochastic coordinate update methods, ADMM-type methods, Scaled relative graphs, Distributed and decentralized optimization

Stochastic Differential Equations 1

Course Information	M1407.001000 001, Mathematics, Advanced Undergraduate(Year 3), in English
Instructor	Gerald Trutnau
Grade	A+
References	Instructor's Notes
Subject Matter	Understanding basic ideas and results of stochastic processes and stochastic calculus. Probability theory based on Measure theory, Brownian motion, Discrete-time martingale theory, Continuous-time martingale theory.

Introduction to Differential Geometry 2

Course Information	881.304 001, Mathematics, Advanced Undergraduate(Year 3), in English
Instructor	Otto van Koert
Grade	A-
References	*Comprehensive introduction to differential geometry* by Spivak
Subject Matter	Tangent planes, Normal vector fields, Surfaces of revolution, Area of surfaces, Surface integrals, First and second fundamental form, Geodesic, Curvatures, Structure equations, Hilbert theorem, Gauss-Bonnet theorem, Hopf's theorem.

Mathematical Statistics 2

Course Information	326.312 001, Statistics, Advanced Undergraduate(Year 3)
Instructor	Jun Yong Park
Grade	A0
References	*Mathematical Statistics* by Woochul Kim (Korean Textbook)
Subject Matter	Deeper understanding of limit distributions, including the Central limit theorem, Statistical estimation, Testing statistical hypotheses, Nonparametric tests, Sufficient statistics, Statistical inferences and Normal theory.

Multivariate Data Analysis and Lab

Course Information	326.316 001, Statistics, Advanced Undergraduate(Year 3)
Instructor	Sungkyu Jung
Grade	A-
References	*Applied Multivariate Statistical Analysis* by R.A. Johnson and D. Winchern
Subject Matter	The focal point of this course is on multivariate data and its analysis. Estimation and test on means of multivariate data, Principal component analysis, Factor analysis, Cluster, Discriminant analysis.

Artificial Intelligence and Philosophy

Course Information	L0547.002800 001, Philosophy, Undergraduate(Year 1)
Instructor	Wonki Her
Grade	A+
References	*Philosophy of Mind* by Ian Ravenscroft
Subject Matter	Ontological issues on the possibility of artificial intelligence, Moral status of AI, Ethical and social issues involved in designing ethical AI systems, Problems of superintelligence, Existential risk.

Spring 2021

Topics in Mathematics 1 (Topological Combinatorics)

Course Information	3341.445 001, Mathematics, Advanced Undergraduate(Year 4)
Instructor	Woong Kook
Grade	A+
References	Instructor's Notes
Subject Matter	Graph theory, Discrete Laplace equation, Effective conductance, Information centrality, Simplicial (co)homology theory, Topological Data Analysis, Combinatorial Laplacians and combinatorial Hodge theory, Harmonic cycle and applications.

Introduction to Deep Learning

Course Information	M2177.004300 001, CSE, Advanced Undergraduate(Year 4), in English
Instructor	Hyun Oh Song
Grade	A+
References	Instructor's Notes
Subject Matter	Backpropagation techniques such as Stochastic gradient descent, Initialization techniques, Regularization techniques such as drop out, Convolutional Neural Networks (CNN), CNN architectures, Recurrent Neural Networks (RNN), RNN applications, and other applications including Reinforced learning.

Algorithms

Course Information	4190.407 001, CSE, Advanced Undergraduate(Year 3)
Instructor	Kunsoo Park
Grade	A0
References	*Introduction to Algorithms* by Cormen, Leiserson, Rivest, and Stein
Subject Matter	Correctness, Complexity Analysis, Sorting, Data Structures, Dynamic Programming, Greedy Algorithms, Graph Algorithms, String Matching, NP-Completeness.

Nonparametric Statistics and Lab

Course Information	326.414 001, Statistics, Advanced Undergraduate(Year 4)
Instructor	Sungkyu Jung
Grade	A0
References	*Introduction to Modern Nonparametric Statistics* by Higgins
Subject Matter	Nonparametric methods and distribution-free statistics. Nonparametric estimation of point and confidence intervals, Location and scale parameter estimation of two samples, Nonparametric testing problem of distribution functions.

Time Series Analysis and Lab

Course Information	326.415 001, Statistics, Advanced Undergraduate(Year 4)
Instructor	Sangyeol Lee
Grade	A-
References	*Time Series Analysis* by Sangyeol Lee (Korean Textbook)
Subject Matter	Moving average, Exponential smoothing, AR, ARMA, and ARIMA models, ARCH and GARCH models, Spectral theory, Seasonal effects.

Introduction to Bioinformatics

Course Information	3346.218 001, Biological Science, Advanced Undergraduate(Year 4)
Instructor	Martin Steinegger, Daehee Hwang
Grade	B+
References	Instructor's Notes
Subject Matter	Biological databases, Sequence analysis, Data mining and phylogeny, How to analyse data from shotgun sequencing project, EST project and other biological methods used in the present genomics and functional genomics.

Fall 2020

Modern Algebra 2

Course Information	881.302 001, Mathematics, Advanced Undergraduate(Year 3)
Instructor	Dongho Byeon
Grade	A0
References	*A first course in abstract algebra* by Fraleigh
Subject Matter	Extension fields, Sylow theorems, Free groups, PID and UFD, Factorization, Automorphisms of fields, Splitting fields, Galois Theory, Insolvability of the Quintic.

Introduction to Topology 2

Course Information	881.402 001, Mathematics, Advanced Undergraduate(Year 3)
Instructor	Cheol-Hyun Cho
Grade	A0
References	*Algebraic topology* by Hatcher
Subject Matter	Fundamental groups, Category, Brouwer fixed-point theorem, Borsuk–Ulam theorem, Van Kampen's theorem, Covering spaces, Universal covering, Deck group, Cayley complex, Homology, Chain complex, Chain homotopy, Exact sequence.

Complex Function Theory 2

Course Information	3341.301A 001, Mathematics, Advanced Undergraduate(Year 3)
Instructor	Sang-Hyuk Lee
Grade	A0
References	*Complex analysis* by Stein and Shakarchi
Subject Matter	Calculation of Fourier transforms, Weierstrass products, Hadamard factorization theorem, Gamma and zeta functions, Prime number theorem, Conformal mappings, Riemann mapping theorem, Schwarz-Christoffel integrals, Elliptic functions, Weierstrass functions, Jacobi theta functions and their applications.

Data Mining Methods and Lab

Course Information	326.413 001, Statistics, Advanced Undergraduate(Year 4)
Instructor	Taesung Park
Grade	A0
References	Instructor's Notes
Subject Matter	Preprocessing procedures (categorization and sampling), Data mining methods (linear regression, logistic regression, decision trees, neural networks, clustering and association), Evaluation methods (lift and prediction errors).

Neural Prosthesis

Course Information	430.809 001, Electrical Engineering, Graduate
Instructor	Sung June Kim
Grade	A0
References	Instructor's Notes
Subject Matter	Auditory prosthesis, Visual prosthesis, Motor Prosthesis, Deep Brain Stimulation, Cognitive Engineering, Micro-electrode arrays, Circuits and systems, Cultural Neuronal Network.

Spring 2020

Modern Algebra 1

Course Information	881.301 001, Mathematics, Advanced Undergraduate(Year 3)
Instructor	Seung Jin Lee
Grade	A0
References	*A first course in abstract algebra* by Fraleigh
Subject Matter	Isomorphism, Groups, Subgroups, Cycles, Lagrange Theorem, Group action, Rings and fields, Integral domain, Fermat's Theorem, Euler's theorem, Field of quotients, Polynomial ring, Factorization of polynomials, Prime & maximal ideal.

Introduction to Topology 1

Course Information	881.401 001, Mathematics, Advanced Undergraduate(Year 3)
Instructor	Cheol-Hyun Cho
Grade	A-
References	*Topology* by Kahn
Subject Matter	Axiom of choice, Metric space, Topological space, Product topology, Continuity, Hausdorff, Compactness, Tychonoff theorem, Connectedness, Countability, Normality, Tietze extension, Baire Category, Fundamental group.

Complex Function Theory 1

Course Information	3341.347 001, Mathematics, Advanced Undergraduate(Year 3)
Instructor	Sang-Hyuk Lee
Grade	A-
References	*Complex analysis* by Stein and Shakarchi
Subject Matter	Goursat's theorem, Cauchy theorem, Morera's theorem, Zeros and poles, Residue theorem, Singularities and argument principle, Fourier series, Harmonic function, Mean value theorem, Maximal principle, Fourier transform, Paley-Wiener's theorem, Jensen's formula, Infinite product, Factorization theorem.

Mathematical Statistics 1

Course Information	326.311 002, Statistics, Advanced Undergraduate(Year 3)
Instructor	Jun Yong Park
Grade	A0
References	*Mathematical Statistics* by Woochul Kim (Korean Textbook)
Subject Matter	Conditional probability, Central limit theorem, Stochastic independence and the distributions of random variables such as Normal, Binomial, Multinomial, Gamma, Chi-square, Poisson, and Multivariate Normal variables.

Concepts and Applications in Probability

Course Information	326.211 001, Statistics, Undergraduate(Year 2)
Instructor	Joong-Ho (Johann) Won
Grade	A+
References	*A First Course in Probability* by Sheldon M. Ross
Subject Matter	Combinatorics, Axioms of probability, Conditional probabilities, Bayes rule, Independent events, Random variables, Jointly distributed random variable, Properties of expectation, Limit theorems, Markov chains.

Introduction to Computer Science for Biologists

Course Information	3346.330 001, Biological Science, Undergraduate(Year 2)
Instructor	Daehyum Baek
Grade	A+
References	Instructor's Notes
Subject Matter	Object-Oriented Design, P value, Parametric and non-parametric tests, Multiple test correction, Biological Databases (NCBI RefSeq, UCSC Genome Browser, miRBase), Transcriptome Analysis, Microarrays, Next-generation sequencing.

Fall 2019

Introduction to Mathematical Analysis with practice 2

Course Information	M1407.000700 001, Mathematics, Undergraduate(Year 2)
Instructor	Insuk Seo
Grade	A+
References	*Introduction to Mathematical Analysis* by Kim, Kim and Kye (Korean Textbook)
Subject Matter	Uniform convergence, Differentiation and integration of sequence of functions, Power series and analytic functions, Weierstrass approximation theorem, Arzela-Ascoli theorem, Space of sequences, Improper integral, Functions defined by integrals, Gamma function, Fourier series, Lebesgue integral and Fourier series.

Linear Algebra 2

Course Information	300.206A 001, Mathematics, Undergraduate(Year 2)
Instructor	In-Sok Lee
Grade	A0
References	*Linear Algebra and Groups* by In-Sok Lee (Korean Textbook)
Subject Matter	Orthogonal and unitary operators, Spectral theorem, Isomorphisms and homomorphisms of groups, Various orthogonal groups corresponding to bilinear forms, Primary decomposition theorem, Jordan normal form.

Differential Equations and Practice

Course Information	300.204 001, Mathematics, Undergraduate(Year 2)
Instructor	Dongwoo Sheen
Grade	A0
References	*Differential Equations and Their Applications* by Martin Braun
Subject Matter	First-order linear differential equations, Separable equations, Exact equations, Existence-uniqueness theorem, Newton's method, Runge-Kutta method, Method of variation of parameters, Laplace transforms, Dirac delta function.

Logic Design

Course Information	M1522.000700 002, CSE, Undergraduate(Year 2)
Instructor	Sungjoo Yoo
Grade	A+
References	*Contemporary Logic Design* by Randy H. Katz and Gaetano Borriello
Subject Matter	Boolean Algebra, Logic functions, Multilevel combinational logic, Simplification, Regular logic (Mux, decoder), Programmable logic, Sequential logic, Latch, Flip/Flop, Register and timing issues, Finite state machine

Automata Theory

Course Information	4190.306 001, CSE, Advanced Undergraduate(Year 3)
Instructor	Kunsoo Park
Grade	B0
References	*Introduction to Automata Theory, Languages, and Computation* by Hopcroft, Motwani and Ullman
Subject Matter	Regular expression, Grammars, Finite automata, Context-free language, Turing machine, Recursive and Recursively enumerable language, Halting problem, Undecidablility, Complexities, Problem classes such as P, NP, and PSPACE.

Spring 2019

Introduction to Mathematical Analysis with practice 1

Course Information	M1407.000600 001, Mathematics, Undergraduate(Year 2)
Instructor	Insuk Seo
Grade	A+
References	*Introduction to Mathematical Analysis* by Kim, Kim and Kye (Korean Textbook)
Subject Matter	Completeness axiom, Limits of sequences, Point-set topology, Cauchy sequences, Compact and connected sets, Limit and continuity, Uniformly continuous functions, Riemann-Stieltjes integral, Fundamental theorem of calculus.

Linear Algebra 1

Course Information	300.203A 001, Mathematics, Undergraduate(Year 2)
Instructor	In-Sok Lee
Grade	A+
References	*Linear Algebra and Groups* by In-Sok Lee (Korean Textbook)
Subject Matter	Gauss elimination and Row-reduced echelon form, Linear maps, Determinants. Vector spaces, Basis change, Characteristic polynomial, Diagonalization and Triangularization, Inner product spaces, Bilinear forms, Orthogonal groups.

Number Theory

Course Information	3341.211 001, Mathematics, Undergraduate(Year 2)
Instructor	Byeong-Kweon Oh
Grade	A+
References	*Elementary Number Theory* by K. H. Rosen
Subject Matter	Prime numbers, Congruence equations, Pseudo primes, Multiplicative functions, Primitive root, Quadratic residue, Algebraic number, Diophantine equations.

Sets and Mathematical Logic

Course Information	881.313 001, Mathematics, Undergraduate(Year 2)
Instructor	Ki-Ahm Lee
Grade	B+
References	*Introduction to Set Theory, Revised and Expanded* by K. Hrbacek and T. Jech
Subject Matter	Elementary set theory, Construction of natural numbers, Integers, Rational numbers and Real numbers, Axiom of choice, Cardinals and Ordinals.

Fall 2018

Differential and Integral Calculus 2

Course Information	033.006 001, Mathematics, Undergraduate(Year 1)
Instructor	Sang-hyun Kim
Grade	A+
References	*Calculus 2+* by Hong-Jong Kim (Korean Textbook)
Subject Matter	Derivatives and integrals of several variable functions, Vector fields, Green theorem and Stokes theorem and their applications.

Statistical Computing and Lab

Course Information	033.006 001, Statistics, Undergraduate(Year 1)
Instructor	Joong-Ho (Johann) Won
Grade	A0
References	Instructor's Notes
Subject Matter	Computer programming and computer-assisted statistical data analysis, Various statistical analysis methods using programming languages such as C, Fortran, R.

Earth System Science / Earth System Science Lab

Course Information	034.040 001 / 034.041 001, Earthpoint set topology Sciences, Undergraduate(Year 1)
Instructor	Minsub Sim
Grade	A0 / A-
References	*Foundations of Earth Science* by Lutgens and Tarbuck
Subject Matter	Surface processes and internal dynamics of the Earth in Geosphere, Hydrosphere, Atmosphere and Biosphere including Crustal evolution, Environmental changes.

Writing in Science & Technology

Course Information	031.004 011, Faculty of Liberal Education, Undergraduate(Year 1)
Instructor	Sunkoo Yun
Grade	A+
References	Instructor's Notes
Subject Matter	This course offers the experience of whole process for writing an essay. All members of this class should search the topics concerned with natural science & technology and set up the own hypothesis and assertion.

Summer 2018

Biology / Biology Lab

Course Information	034.029 001 / 034.033 004, Biological Science, Undergraduate(Year 1)
Instructor	Sue-Yeon Lee
Grade	A0 / A+
References	*Campbell Biology* by Reece Taylor Simon Dickey
Subject Matter	Component materials of organisms, Oxidation and reduction, Heredity of cell, Metabolism, Reproduction and Development, Hormones, Sensory organs, Integration and Control of nervous system, Classification and Evolution of organisms.

Spring 2018

Honor Calculus and Practice 1

Course Information	033.003 003, Mathematics, Undergraduate(Year 1)
Instructor	Ja A Jeong
Grade	A+
References	*Calculus 1+* by Hong-Jong Kim (Korean Textbook)
Subject Matter	Properties of real numbers, Series, Taylor expansions, Vectors, Matrices, Determinants, and Curves.

Statistics / Statistics Lab

Course Information	033.019 003 / 033.020 003, Statistics, Undergraduate(Year 1)
Instructor	Hye-Young Jung
Grade	A+ / A+
References	*Statistics* by Woochul Kim (Korean Textbook)
Subject Matter	Binomial distribution, Normal distribution and Sample distributions, Interval estimation, Hypothesis testing, Statistical inferences, Regression analysis, Categorical data analysis and Analysis of variance.

Physics 1 / Physics Lab 1

Course Information	034.001 002 / 034.009 005, Physics, Undergraduate(Year 1)
Instructor	Wonho Jhe
Grade	A0 / A+
References	*Fundamentals of Physics* by Halliday, Resnick, and Walker
Subject Matter	Gravitation, Fundamentals on the motion of particles, Energy, Wave motion, and Thermal physics.

Computer Application for Scientific Computation

Course Information	L0444.000100 001, Mathematics, Undergraduate(Year 1)
Instructor	Changwoo Lee
Grade	A-
References	*A Primer scientific programming with python* by Hans Petter Langtangen
Subject Matter	Data Type, Functions, Visualization, GUI, Numerical computing(Numpy, apply, cellfun), Notebook(Matlab, Rstudio, Jupyter), Neural network with tensorflow.