Course Description

Algebra (1)
This course covers basic properties of group, ring, field, additive group, Category and Functor.
Algebra (2)
This course covers some topics of algebra including vector space, homology, structure of ring, Galois theory.
Real Analysis (1)
Topics of this course are real number system, Lebesgue measure and integral, absolute continuity and differentiation, Banach space, Hahn-Banach theorem, Closed graph theorem.
Real Analysis (2)
This course covers abstract measure and integration, Fubini theorem, Signed measure and Radon-Nikodym theorem.
Complex analysis
Topics of this course are spherical representation, linear mapping, complex integral, Cauchy integral formula, harmonic function, entire function, Dirichlet problem, Riemann mapping, Weierstrass theorem, Picard theorem.
Fourier Analysis
This course covers theory and applications of Fourier series, boundary value problem, Bessel equation.
Harmonic Analysis
Topics of this course are complete space, complex measure, convolution, unitary representation, character group, duality theorem, Haar integral, Haar measure.
General Topology
This course covers topological space, net and filter, continuity, metric space, metrization, simplicial complex, cell complex, homology algebra, cohomology of homogeneous space.
Functional Analysis
Topics of this course are seminorm and local convexity, quotient space, Baire category theorem, Banach-Steinhaus theorem, bilinear mapping, Fourier transform, Banach algebra, spectral theory, normed ring, spectral representation, spectral resolution, expansion theorem.

Differential Geometry
This course covers tensor, reduction theorem, holonomy theorem, affine connection, geodesic, Riemann metric and connection, sectional curvature, Gauss-Codazzi equation, affine holonomy group.
Modern Geometry
Topics of this course are basic concepts and theories of curvature and tensor, curvature tensor, Euler-Lagrange equation.
Applied Mathematics
This course covers Weierstrass E-function, Hamilton-Jacobi theory, Lagrange problem, Pontryagin maximum principle, Feedback system, Hilbert space control theory, Tonelli theorem.
Probability Theory
Topics of this course are measure theory, random variables, distribution function, expected value, central limit theorem, martingale theory.
Measure and Probability
This course covers probability measure over abstract topological space, Gaussian probability measure, stable probability measure, Wiener probability measure.
Group Theory
Topics of this course are additive group, properties of p-group, transfer theorem, Frattini subgroup, fitting subgroup, simple group.
Ring Theory
This course covers primitive ring, density theorem, Wedderburn theorem, simple ring, division ring, Noetherian ring.
Lie Algebra
Topics of this course are Lie algebra, Weyl group, simple Lie algebra, Chevalley group.
Commutative Algebra
This course covers projective module, flat module, localization of projective module, valuation ring, Dedekind ring, normal ring.
Topological vector spaces

In this topological vector spaces, we cover seminorm, quotient space, locally convex vector space, metrizable topological vector space, Frechet space, C, H normable space, Banach space, Hilbert space, Partitions of unity, Distribution space, Mackey theorem, Tensor product.
Algebraic Topology
This course covers Homotopy theory, singular and simplicial homology, fiber bundle homology, cohomology and duality, Cech homology, sheaf theory, Thom cobordism, CW-complex homotopy group.
Differential Manifold
Topics of this course are R^n affine and differentiable structure, variety of functions on E^n, germs, projective space, Tangent bundle, Whitney imbedding theorem, Kaehler manifold.
Topological Group
This course covers topological group and isomorphic function, completeness of topological group, profinite and prop group, projective profinite group, Pontryagin duality.
Banach Algebra
Topics of this course are normal representation theory, spectrum, radical, primitive Banach algebra, semi-simple Banach algebra, structure space, Galfand representation theorem.
Topics in Category
This course covers monad and monadic functor, equational class on universal algebra, algebraic functor, Cartesian closed Category, topological algebraic functor.
Seminar (1)
Topics will be selected in the seminar.
Seminar (2)
Topics will be selected in the seminar.
Ordinary Differential Equations
Topics of this course are existence and uniqueness theorem of ordinary differential equations, near singular points, eigenvalue problem, Poincare-Bendixon theorem.
Partial Differential Equations

This course covers numerical methods of partial differential equations, heat equations, wave equations, Poisson equations, reaction-diffusion equations, separation of variables, convergence of Fourier series, Fourier method, convergence, consistency, stability.
Linear Programming
Topics of this course are LP problem using simplex method, LP theory, dual problem, transportation problem, optimal solution.
Numerical Analysis
This course covers solutions of equations, interpolation and polynomial approximation, numerical differentiation and integration, direct methods for solving linear systems, iterative techniques in matrix algebra, approximation theory, approximating eigenvalues.
Operator Algebra
Topics of this course are spectral theorem, spectral resolution, perturbation theory, moment theorem, operational calculus, spectrum of spectral operator, decomoposable operator.
Stochastic Process
This course covers additive stochastic process, Poisson stochastic process, Gaussian stochastic process, Wiener stochastic process, Markov chain, Markov stochastic process.
Mathematical Statistics
Topics of this course are probability, random variable, moment generating function, random vector, special probability distribution, sampling distribution, point estimate, hypothesis testing.
The Theory of Combinatorics
This course covers Eulerian walks and the idea of graphs, Trees, Isomorphism and search trees, Digraphs, Coloring, Graphs and matrices, Groups acting on sets, Polya's enumeration theorem.
Group Representation Theory
This course introduces group representations and character theory, Modular representations, Integral representations.
Cryptography
Topics of this course are simple Cryptosystems, Cryptanalysis, Shannon's Theory, The RSA system, Other Public-key Cryptosystems, Signature Schemes, Hash Functions, Key Distribution, Identification schemes,

Authentication Codes, Secret sharing Schemes, Zero-Knowledge.
Advanced Linear Algebra
This course covers vector space, linear transformation, module, eigenvalue and eigenvector, inner space, Hilbert space, tensor product, affine geometry.
Function Theory of Several Variables
Topics of this course are differentiation and integration of functions of several variables, divergence theorem, Stokes theorem, Green theorem, integral manifold.
Programming-Methodology
This course will discuss the how to programming for a non-major. Students in this course are expected to understand how to programming using programming utilities based on graphic.
Coding Project
This course will discuss the how to programming using a various open source progamming tools. Students in this course write a high-performance program using a mainstream programming tools.
Arduino Project
This course will discuss the how to programming using arduino. Students in this course interpret a digital system mathematically.
Mathematical Modeling
Students in this course are writing and modeling a basic program mathematically. Mathematical model is created by algorithm and applied to the program.
Mathematical Programming
This course covers both theoretical and practical aspects of linear programming, nonlinear programming, network theory, integer programming, and game theory, etc.