ANALYSIS at ASU

From `http://en.wikipedia.org (v. 18:30, 23 July 2005)`:

Analysis is the generic name given to any branch of mathematics which depends upon the concepts of limits and convergence, and studies closely related topics such as continuity, integration, differentiability and transcendental functions. These topics are often studied in the context of real numbers, complex numbers, and their functions. However, they can also be defined and studied in any space of mathematical objects that is equipped with a definition of "nearness" (a topological space) or "distance" (a metric space). Mathematical analysis has its beginnings in the rigorous formulation of calculus.

Analysis is nowadays divided into the following subfields:

Real analysis, the formally rigorous study of derivatives and integrals of real-valued functions. This includes the study of limits, power series and measures.

Functional analysis studies spaces of functions and introduces concepts such as Banach spaces and Hilbert spaces.

Harmonic analysis deals with Fourier series and their abstractions.

Complex analysis, the study of functions from the complex plane to the complex plane which are complex differentiable.

p-adic analysis, the study of analysis within the context of p-adic numbers, which differs in some interesting and surprising ways from its real and complex counterparts.

Non-standard analysis, which investigates the hyperreal numbers and their functions and gives a rigorous treatment of infinitesimals and infinitely large numbers. It is normally classed as model theory.

The Mathematics Subject Classification, from `www.ams.org/msc/` (see also `ams.rice.edu/mathscinet/`):

subjects which are part of Analysis are in blue
subjects with strong connections to Analysis are in green

00-xx	General
01-xx	History and biography
03-xx	Mathematical logic and foundations
05-xx	Combinatorics
06-xx	Order, lattices, ordered algebraic structures
08-xx	General algebraic systems
11-xx	Number theory
12-xx	Field theory and polynomials
13-xx	Commutative rings and algebras
14-xx	Algebraic geometry
15-xx	Linear and multilinear algebra; matrix theory
16-xx	Associative rings and algebras
17-xx	Nonassociative rings and algebras
18-xx	Category theory; homological algebra
19-xx	K-theory
20-xx	Group theory and generalizations
22-xx	Topological groups, Lie groups
26-xx	Real functions

28-xx Measure and integration
30-xx Functions of a complex variable
31-xx Potential theory
32-xx Several complex variables and analytic spaces
33-xx Special functions
34-xx Ordinary differential equations
35-xx Partial differential equations
37-xx Dynamical systems and ergodic theory
39-xx Difference and functional equations
40-xx Sequences, series, summability
41-xx Approximations and expansions
42-xx Fourier analysis
43-xx Abstract harmonic analysis
44-xx Integral transforms, operational calculus
45-xx Integral equations
46-xx Functional analysis
47-xx Operator theory
49-xx Calculus of variations and optimal control; optimization
51-xx Geometry
52-xx Convex and discrete geometry
53-xx Differential geometry
54-xx General topology
55-xx Algebraic topology
57-xx Manifolds and cell complexes
58-xx Global analysis, analysis on manifolds
60-xx Probability theory and stochastic processes

62-xx Statistics
65-xx Numerical analysis
68-xx Computer science
70-xx Mechanics of particles and systems
74-xx Mechanics of deformable solids
76-xx Fluid mechanics
78-xx Optics, electromagnetic theory
80-xx Classical thermodynamics, heat transfer
81-xx Quantum theory
82-xx Statistical mechanics, structure of matter
83-xx Relativity and gravitational theory
85-xx Astronomy and astrophysics
86-xx Geophysics
90-xx Operations research, mathematical programming
91-xx Game theory, economics, social and behavioral sciences
92-xx Biology and other natural sciences
93-xx Systems theory; control
94-xx Information and communication, circuits
97-xx Mathematics education

Analysis is a core area of mathematics and is (also) the subject of a vast amount of current research. Some areas of analysis represented by researchers at ASU are:

Special Functions, Fluid Dynamics
Sergei Suslov

Harmonic Analysis, Fourier Analysis
Svetlana Roudenko

Functional Analysis, Operator Algebras
Steve Kaliszewski
John Quigg
Jack Spielberg

A Possible First-Year Program in Pure Math, Emphasis on Analysis:

Fall Semester
MAT 472 Intermediate Real Analysis I
MAT 442 Advanced Linear Algebra
MAT 572 Complex Analysis I or another elective

Spring Semester
MAT 473 Intermediate Real Analysis II
MAT 444 Intermediate Abstract Algebra
MAT 573 Complex Analysis II or another elective

Any choice of courses should be discussed with an advisor, especially in the case of very prepared students.

Analysis Qualifying Exam Courses:

MAT 472 Intermediate Real Analysis I (fall)
MAT 473 Intermediate Real Analysis II (spring)

Analysis Qualifying Exam References:

M. Rosenlicht, *Introduction to Analysis*, Chapters 1–7.
W. Rudin, *Principles of Mathematical Analysis*, Chapters 1–5, plus parts of 10 and 11.
F. Jones, *Lebesgue Integration on Euclidean Space*.
G. Folland, *Real Analysis* (for the Change of Variables Theorem).

Further Coursework in Analysis:

MAT 570 Real Analysis I (fall)
MAT 571 Real Analysis II (spring)
MAT 578 Functional Analysis I (selected semesters)
MAT 579 Functional Analysis II (selected semesters)
MAT 591 C^*-Algebra Seminar (fall, spring)
MAT 591 Special Functions Seminar (?)