Hopkins Summary

Hi Ms. Dunbar,

Thank you very much for turning up this interesting state of affairs. I believe this will be OK for our purposes, but I do have one question. You say that in 1925 a 3 hour course was worth 6 points. But if points are like semester hours at other institutions and if 125 are needed to graduate, it looks more like 3 points would be for 3 hours (assuming hours are counting just in-class time and not homework time), not 6. A minor typo perhaps? Or have I missed something?

In any case, thank you for the work you have done for the Cajori Two Project.

Walter Meyer

On Jul 9, 2008, at 5:22 PM, Joy Dunbar wrote:

Prof. Meyer.

Although time consuming, this has been an interesting investigation into old JHU catalogs and commencement programs here in the Office of the Registrar. I was hoping to have a better answer for the early years, but here is what I've found.

G

There are no catalogs prior to 1925 at which time the Bachelor's degree was awarded based on "points" with a note in the catalog that said this was "semester hours at other institutions". The requirement was 125 points, where basically the 3 hr course was 6 points. (There were exceptions for some courses and labs in some Courses of Study.)

By 1935 there was no more referral to "points", but only to satisfying a Course of Study as outlined by the major department. Looking at the Course of Study for many years, it was fairly consistent.

1945 and 1955 continued to grant the degree based upon the satisfactory completion of the outlined Course of Study.

Hopkins

By 1965 a course was assigned semester credits with the Bachelor's degree requiring a minimum of 120 credits.

This remained consistent though the next 40 years.

No records or reports referred to the terms as anything but semesters.

I hope this is the information that you needed.

Joy

Joy W. Dunbar
Assistant Registrar for Data Management and Institutional Research
Office of the Registrar
Phone: (410) 516-8745
Fax: (410) 516-6477
E-mail: jdunbar1@jhu.edu

Johns Hopkins University
75 Garland Hall
3400 N. Charles Street
Baltimore MD 21218

Walter Meyer <meyer1@adelphi.edu> 7/9/2008 3:23 PM >>>
Hi Ms. Dunbar,

J. Hopkins 1975-76

programs such as the Danforth, Fulbright, and Rhodes. The office also is the focal point for committee recommendations for students applying to law and health professions schools.

Undergraduate Manual

This publication is issued annually as a supplement to the catalog for undergraduates. The manual contains both academic and non-academic information, rules, and requirements in more detail than contained in the catalog. All undergraduates should be familiar with this publication. It is available at registration for the fall term.

Honor System

Formally adopted in 1913, the honor system is an outgrowth of the concept of "a gentleman and a scholar." A self-imposed code of moral standards, the honor system is consistent with the idea of academic freedom in trusting students not to abuse their freedom whether during an unproctored exam or when submitting independent work. The Honor Commission, a group of students elected by their fellow students, is charged with maintaining the ideals of the honor system, and is responsible for acting upon all academic violations that are brought to its attention.

Grades and Grade Reports

The scale of marks for official grade reports is as follows: A—Excellent; B—Good; C—Satisfactory; D—Passing; E—Conditional failure; F—Failure; I—Incomplete; P—Passing, for pass-fail grading only; S—Satisfactory completion; for freshman first semester only. Detailed information on the use of conditional marks is contained in the Undergraduate Manual.

Grade reports are prepared shortly after the conclusion of each term for all undergraduates in the Division of Arts and Sciences. Rather than covering just the work of the most recent term, these reports take the form of a restatement of the student's entire academic record of courses, credits, and grades.

Consistent with the University's policy of treating its undergraduates as young adults, the reports are sent to the student rather than the parents. It is expected that each student in turn will inform his parents or guardian of his progress and standing. The reports are addressed to the student's campus address in January, and to the home address in June.

Students in Academic Difficulty

The records of students in academic difficulty are reviewed at the end of each term, and all known facts bearing on their problems are considered. A student whose term or cumulative average is below C may be warned or placed on probation, and a letter of warning or probation is sent to the student. Copies also are sent to the parents and to the faculty adviser. Continued inability to maintain a C average normally results in dismissal for academic failure. No student is dropped without prior warning or probation unless it is found that he has lost interest and has ceased to make even a minimum effort to keep up his studies.

Students with serious academic problems are asked to consult with the Dean of Undergraduate and Graduate Studies and/or the Director of Advising and Counseling.

Credit and Residence Requirements

The Bachelor of Arts degree requires a minimum of 120 credits, and no program may require more than 120 credits. The Bachelor of Engineering Science degree requires a minimum of 120 to 130 credits, depending upon the major, but no program may require more than 130 credits.

1) No more than 18 credits of D work may be applied toward the minimum credit requirements.
2) No more than five courses completed in the Johns Hopkins Evening College may be applied toward the minimum credit requirements. The Dean of Undergraduate and Graduate Studies may waive this limitation for students who wish to take courses in education in preparation for teaching, or are in an approved business program, or have transferred to Arts and Sciences from the Evening College.
3) No more than five one-term courses completed in summer sessions at Johns Hopkins or in summer sessions at other accredited colleges or universities after enrollment in the Division of Arts and Sciences may be applied toward the minimum credit requirements.

Except as otherwise specified, credits earned for courses offered by any school or division of The Johns Hopkins University, or approved for transfer from another college or university, or awarded as advanced standing, may be applied toward the minimum credit requirement for an undergraduate degree.

Residence Requirements

A candidate for a baccalaureate degree must complete a minimum of four semesters as a full-time student in the Division of Arts and Sciences, and must accumulate no less than 60 degree credits while a student in the Division.

Credits earned in other divisions of the University or in other accredited colleges and universities or approved foreign institutions, may be used to satisfy degree requirements but may not be used to reduce the minimum residence requirement as defined above.

Graduation

To be approved for graduation you must accomplish the following:

Complete the requirements of the departmental major or area major in which enrolled.

Achieve a C (2.0) average in the area of the major.

Earn the minimum number of credits required for the degree.

Fulfill the minimum residence requirement. Normally, a student is expected to be enrolled as a full-time student in the Division of Arts and Sciences

J. Hopkins 1975-76 U.

mixed; extremal distribution; IFR and IFRA distributions; optimal design, inspection, repair, and replacement of systems. Prerequisite: 24.324.
3 hours weekly

24.659 Sequential Analysis
Wald's sequential probability ratio test; operating characteristics, sample size, and optimal properties; fundamental identity of sequential analysis; Bayes and minimax sequential decision rules; invariant sequential decision problems; sequential estimation; sequential design of experiments. Prerequisite: 24.324.
3 hours weekly

24.661 Stochastic Processes in Continuous Time
Theory of stochastic processes: measurability, separability, sample path properties. Brownian motion and diffusion processes. Continuous time martingales. Markov processes. Prerequisite: 24.601-602 and 24.322 or equivalent.
3 hours weekly

Potpourri

24.99(Q) Independent Study in Mathematical Sciences
Reading, research, or project work for undergraduate students as arranged individually between student and faculty. Offered both terms.

24.395(Q) Special Topics in the Mathematical Sciences
Special topics selected by the faculty for formal coursework according to the needs and interests of students in residence.

24.600 Mathematical Sciences Department Seminar
A variety of topics discussed by speakers from within and without the University. Required of all resident department graduate students. Offered both terms.
1 hour weekly

24.695 Special Topics in the Mathematical Sciences
Special topics selected by the faculty for formal coursework according to the needs and interests of students in residence.

24.699 Special Studies and Research
Reading, research, or project work for graduate students as arranged individually between student and faculty. Offered both terms.

Mathematics

The Department of Mathematics offers opportunities to students who are interested in mathematics, whether as a future career or as an adjunct to other fields. A very broad selection of courses at various levels is maintained, and over thirty courses are offered each term by a faculty of international distinction.

A great flexibility of programs is a departmental tradition, and able students are encouraged to move ahead as swiftly as possible. Students in the junior and senior years frequently take graduate-level mathematics courses, and serious students can be admitted for graduate study while still completing requirements for the B.A. degree.

Courses through the 300 level are predominantly in the domain of analysis, several of them especially designed for students in other departments. At the graduate level, most course offerings are naturally in the areas of chief importance in our graduate program, which is run by widely known experts in analysis, algebraic geometry, algebraic number theory, and topology.

The Faculty

Professor Joseph H. Sampson (Chairman): differential geometry, global analysis, algebraic geometry.
Professor John M. Boardman: algebraic and differential topology.

J. Hopkins 1975-76
U.

Professor Wei-Liang Chow: algebra, algebraic geometry, complex varieties.
Professor Philip Hartman: analysis, differential equations, differential geometry.
Professor Jun-Ichi Igusa: algebra, algebraic geometry, modular functions, number theory.
Professor Takashi Ono: algebra, algebraic groups, number theory.
Professor Joseph Shalika: algebraic groups and representations, number theory.
Associate Professor Jean-Pierre Meyer: algebraic topology, category theory.
Associate Professor Bernard Shiffman: several complex variables.
Assistant Professor Leslie Cohn: automorphic forms, representations of Lie groups.
Assistant Professor Eli Donkar: algebraic number theory.
Assistant Professor Harris Jaffee: algebraic varieties.
Assistant Professor George Kempf: algebraic geometry.
Assistant Professor Arthur Menikoff: analysis, partial differential equations.
Assistant Professor Sholom Rosen: algebraic topology.
Visiting Assistant Professor John Klemm: algebraic topology.

Undergraduate Programs

The mathematics program usually begins with calculus, which is offered at several levels to meet the needs of students with various backgrounds and goals. A one-term pre-calculus course 11.5 is offered for students with insufficient high school preparation in the elementary tools (algebra and trigonometry) used in the calculus.

The Department will not give advanced placement examinations, but will give some advanced placement and credit on the basis of Advanced Placement Examinations of the College Entrance Examination Board.

Students in the biological and social sciences are encouraged to begin with the 11.6-7 calculus sequence which aims at showing how to use the methods of calculus. This may be followed by 11.11 or 11.13 or 11.12 or 11.301. The course 11.301, taught at an elementary level, is especially designed to acquaint the students with more advanced mathematical methods of importance in the social and biological sciences.

It is suggested that students in the natural sciences begin with the 11.8-9 calculus sequence which covers material similar to 11.6-7, but with greater attention to applications in the physical sciences. This should be followed by 11.12 and 11.13. The courses 11.305 and 11.306 supply a theoretical foundation for advanced analysis courses.

The course 11.21-22 is for the qualified, mathematically oriented student who has a good working knowledge of calculus (such as 11.8-9 or an equivalent good high school course). This is a theoretical course concentrating on the foundations of calculus, and covers material somewhat similar to 11.305 and 11.12.

Beyond the first two years a considerable variety of courses is offered at the 300-level. Students with serious interests in mathematics should work towards taking advanced courses as early as possible in their undergraduate years; they are encouraged to take graduate-level courses during the senior year, and perhaps even the junior year.

J. Hopkins 1975-76

The Undergraduate Mathematics Seminar 11.391-392 is open to all students and should be particularly profitable to the more advanced undergraduate.

Departmental Requirements for the Bachelor of Arts Degree

In addition to general university requirements, a candidate for a bachelor's degree in mathematics is required to have at least six terms of mathematics at the 300 or 600 level, including at least one term of modern algebra (e.g., 11.303) and one term of topology (e.g., 11.313). One or two of these six terms may be replaced by applicable or applied mathematics (300 or 600 level) courses offered by other departments as, for example, courses in probability, statistics, or computer science in the Mathematical Sciences Department or mathematical courses in mechanics or elasticity in the Mechanics and Materials Science Department. The course 11.301 is not intended for mathematics majors and is not acceptable as part of this requirement. (Note that two overlapping courses, such as 11.311 and 11.381, cannot be offered for credit.)

Students expecting to pursue graduate studies in mathematics are advised to take 11.303-304, 11.311-312 and 11.313-314 (and, if possible, 11.605-606).

In addition to the above mathematical requirements, a candidate must have a knowledge of at least one topic involving applications of mathematics, such as, in physics, mechanics, or probability and statistics. For example, 17.3 followed by 17.303 or 17.304 or 17.601-602 would be acceptable for physics; 50.301-302, 50.305-306, 50.307-308, or 50.309-310 for mechanics; 24.321-322 or 24.324-325 for probability and statistics. (It is understood that the same courses cannot be offered as a partial fulfillment of both this requirement and the mathematical requirement above.)

Graduate Programs

Graduate study is centered around five basic courses, 11.605-606, 11.611-612, 11.615-616, 11.617-618, 11.619-620. These are built upon the foundations constituted by the fundamental 300-level courses 11.303-304, 11.311-312, 11.313-314. Some entering graduate students will need one or more of the latter as preparation, but it is expected that at least one of the basic 600-level courses will be part of the first year program.

These courses are intended to bring students abreast of current developments in the respective areas, and to prepare students to begin research study in the area of their choice. As will be seen from the course listings, the graduate programs in the mathematics department are in algebraic geometry, algebraic groups and number theory, algebraic topology, analysis, differential geometry and symmetric spaces, and closely related topics.

Departmental Requirements for Advanced Degrees

Admission to the department to do advanced study will be based on previous records, letters of recommendation and, whenever possible, personal interviews. Graduate Record Examinations are recommended but not required. The department accepts applicants who intend to become candidates for either the

J. Hopkins 1975-76
U.

natics Seminar 11.391-392 is open to all stude
ofitable to the more advanced undergraduate.

or the Bachelor of Arts Degree

sity requirements, a candidate for a bachelor
uired to have at least six terms of mathemati
ding at least one term of modern algebra (e.g.
ogy (e.g., 11.313). One or two of these six term
le or applied mathematics (300 or 600 level
rtments as, for example, courses in probabilit
e in the Mathematical Sciences Department o
anics or elasticity in the Mechanics and Materia
urse 11.301 is not intended for mathematics
s part of this requirement. (Note that two over
1 and 11.381, cannot be offered for credit.)
e graduate studies in mathematics are advised to
nd 11.313-314 (and, if possible, 11.605-606).
thematical requirements, a candidate must have
pic involving applications of mathematics, such
probability and statistics. For example, 17.
or 17.601-602 would be acceptable for physics
7-308, or 50.309-310 for mechanics; 24.321-32
and statistics. (It is understood that the same
partial fulfillment of both this requirement and
bove.)

und five basic courses, 11.605-606, 11.611-612
19-620. These are built upon the foundations
al 300-level courses 11.303-304, 11.311-312
aduate students will need one or more of the
xpected that at least one of the basic 600-level
t year program.
bring students abreast of current developments
prepare students to begin research study in the
seen from the course listings, the graduate pro-
partment are in algebraic geometry, algebraic
ebraic topology, analysis, differential geometry
sely related topics.

Advanced Degrees

do advanced study will be based on previous
on and, whenever possible, personal interviews
are recommended but not required. The de-
o intend to become candidates for either the

M.A. or Ph.D. degree. Students who expect to study mathematics beyond the B.A. degree are urged to acquire a reading knowledge of French and German.

Master of Arts In addition to the general University requirements (see page 36), the department requires the following for a M.A. degree: A thorough knowledge of algebra, complex analysis, and topology at least equivalent to what is provided in Mathematics 11.303-304, 11.311-312, 11.313-314; and a deeper knowledge, demonstrated by special examination, in two of the five fields of mathematics covered by the courses listed below as Mathematics 11.605-606, 11.611-612, 11.615-616, 11.617-618, 11.619-620. Finally, the candidate must show, by examination given by this department, that he has a reading knowledge of French or German.

Doctor of Philosophy Attention is invited to the statement on University degree requirements under Academic Information for Graduate Students. The Graduate Board Oral Examination referred to there is a final examination in the Department of Mathematics. The departmental requirements for the Ph.D. degree are as follows: (1) a reading knowledge of French and German, to be exhibited by passing examinations given in the Mathematics Department; (2) a broad knowledge of mathematics, including standard undergraduate-level mathematics and the fields covered by the five basic graduate courses 11.605-606, 11.611-612, 11.615-616, 11.617-618, 11.619-620; (3) passing the course examinations in three of these and special qualifying examinations as stipulated by the department; (4) some teaching of mathematics, usually at the undergraduate level, under the supervision of a faculty member; (5) a written dissertation based on independent research and judged acceptable by two faculty members appointed by the Department; (6) the final Graduate Board Oral Examination.

Facilities

The University library has an unusually extensive collection of mathematics literature, including all the important current journals. The stacks are open to students. The department also has a useful local reference library. Convenient places for study are provided in the main library and in departmental offices reserved for graduate students.

Fellowships

At this time University supplies a number of teaching assistantships and tuition fellowships as described at the back of the catalog, in the section on Fellowships.

UNDERGRADUATE COURSES

11.5(Q) Pre-Calculus Mathematics
This course is intended primarily for students with insufficient preparation in the elementary tools needed for calculus, and will deal principally with topics in algebra and trigonometry usually covered in high school courses. It includes a study of polynomial, rational, exponential, logarithmic and trigonometric functions, with emphasis on graphing

J. Hopkins 1975-76
U.

techniques, numerical aspects, and applications; also an introduction to analytic geometry and other topics as time permits.
4 credits

11.6-7(Q) Calculus I and II for Biological and Social Sciences
Differential and integral calculus especially intended for students in the biological and social sciences. Includes analytic geometry, functions, limits, integrals and derivatives, Taylor's theorem and applications, infinite series, complex numbers, introduction to differential equations with simple applications.
4 credits per term

11.8-9(Q) Calculus I and II for Physical Sciences
Differential and integral calculus especially intended for students in the physical sciences. This course covers substantially the same material as 11.6-7, but with greater attention to applications to the physical sciences.
4 credits per term

11.11(Q) Linear Algebra for Biological and Social Sciences
Intended for students interested in the biological and social sciences, this course offers an introduction to vector spaces, matrices and linear transformations, eigenvalues and eigenvectors.
4 credits

11.12(Q) Calculus III—Calculus of Several Variables
A continuation of 11.6-7 or 11.8-9, with applications to functions of more than one variable: partial dervatives, Taylor's theorem, power series; multiple integrals, line and surface integrals; an introduction to vector analysis. Prerequisite: Calculus I-II.
4 credits per term

11.13(Q) Linear Algebra for Physical Sciences
Vector spaces, matrices and linear transformations. Eigenvalues, eigenvectors, triangulation and diagonalization of matrices. Intended for students in mathematics and the physical sciences.
4 credits

11.14(Q) Elementary Number Theory
The student is provided with many historical examples of topics each of which serves as an illustration of and provides a background for many years of current research in number theory. This course also provides the student with concrete examples of general abstract concepts studied in 11.303-304. Primes and prime factorization, congruences, Euler's function, quadratic reciprocity, primitive roots, solutions to polynomial congruences (Chevalley's theorem), Diophantine equations including the Pythagorean and Pell equations, Gaussian integers, Dirichlet's theorem on primes. Prerequisite: A good high school background including a year of calculus. Not offered every year.
4 credits

11.21-22(Q) Honors Advanced Calculus
Theoretical foundations of calculus of functions of one and several variables for qualified, mathematically oriented students. Material covered is somewhat similar to 11.305 and 11.12. Prerequisite: Calculus I-II or equivalent good high school course. Consent of instructor required.
4 credits

11.301(Q) Analysis for Social and Biological Sciences
Mathematical models in the sciences. Differential equations. Detailed study of specific models (from ecology, economics, physiology, for example). Laplace transforms and applications to differential equations. Calculus of variations. Prerequisite: Calculus I-II. (This course is not intended for mathematics majors.)
4½ credits

11.302(Q) Elements of Differential Equations
This is an applied course in ordinary differential equations, which is primarily for students in the sciences and engineering. The purpose of the course is to familiarize the student with the techniques of solving ordinary differential equations. The specific subjects to be covered include: first order differential equations, second order linear differential equations, applications to electric circuits, oscillation of solutions, power series solutions, systems of linear differential equations, autonomous systems, Laplace transforms. Prerequisite: Calculus I-II.
4½ credits

11.303-304(Q) Introduction to Advanced Algebra
The basic notions of modern algebra; fundamental theorems on groups; fields, Galois theory (including Hilbert's theorem 90, Kummer and Artin-Schreier extensions), and

J. Hopkins U. 1975-76

applications; also an introduction to analytic geome

ogical and Social Sciences
especially intended for students in the biological a
geometry, functions, limits, integrals and derivativ
, infinite series, complex numbers, introduction to
ications.

sical Sciences
especially intended for students in the physical scienc
e same material as 11.6-7, but with greater attention
.

cal and Social Sciences
the biological and social sciences, this course offers
rices and linear transformations, eigenvalues and eig

Several Variables
3-9, with applications to functions of more than o
r's theorem, power series; multiple integrals, line i
vector analysis. Prerequisite: Calculus I-II.

l Sciences
transformations. Eigenvalues, eigenvectors, triangulati
ntended for students in mathematics and the physic

ry
y historical examples of topics each of which serves a
ackground for many years of current research in numb
the student with concrete examples of general abstra
imes and prime factorization, congruences, Euler's fu
e roots, solutions to polynomial congruences (Chevalle
including the Pythagorean and Pell equations, Gauss
imes. Prerequisite: A good high school background
ed every year.

ulus
s of functions of one and several variables for qualifi
Material covered is somewhat similar to 11.305 and 11.
ivalent good high school course. Consent of instruc

iological Sciences
nces. Differential equations. Detailed study of spec
physiology, for example). Laplace transforms and ap
Calculus of variations. Prerequisite: Calculus I-II. (
ics majors.)

Equations
ary differential equations, which is primarily for stude
The purpose of the course is to familiarize the stud
linary differential equations. The specific subjects to
rtial equations, second order linear differential equatio
cillation of solutions, power series solutions, system
omous systems, Laplace transforms. Prerequisite: Calc

nced Algebra
gebra; fundamental theorems on groups; fields, Ga
em 90, Kummer and Artin-Schreier extensions),

commutative rings (especially Noetherian Dedekind rings). Prerequisite: Linear Algebra (11.11 or 11.13).
4½ credits

11.305(Q) Analysis I
This course is a sequel to Calculus III and is designed to give a firm grounding in the basic tools of analysis. It is recommended as preparation (but may not be a prerequisite) for more advanced analysis courses. Real and complex numbers, limits, continuity, infinite sequences and series, l'Hôpital's rule, functions of bounded variation and Riemann-Stieltjes integration, sequences of functions. Prerequisite: Calculus III.
4½ credits

11.306(Q) Analysis II
Fundamental inequalities of analysis. Metric spaces: review of topology of Euclidean spaces, limits, continuity, completeness, normed and Banach spaces (with emphasis on the standard function spaces C^0, BV, L^p and on l^p); the contraction principle and applications (implicit function theorem, existence theorems for ordinary differential equations); separability; compactness in Euclidean spaces, in C^0 (Arzela-Ascoli theorem), in BV (Helly's theorems). Topics in functional analysis as time permits: Hahn-Banach theorem, strong and weak convergence, bounded operators, adjoint operators, compact operators. Prerequisite: Calculus III and Linear Algebra (11.11 or 11.13).
4½ credits

11.311-312(Q) Functions of Complex Variables
(See also 11.381)
Functions of one and of several complex variables; Cauchy's theorem and formulas; power series, analytic continuation; calculus of residues and contour integration; decomposition of meromorphic functions; domains of holomorphy; differential equations and Fourier series in the complex domain; conformal mapping; elliptic functions and integrals, Riemann surfaces. Prerequisite: Calculus III.
4½ credits per term

11.313-314(Q) Introduction to Topology
Topological spaces, metric spaces, connectedness, compactness, completeness; function spaces, the Stone-Weierstrass theorem; topological groups; covering spaces and the fundamental group; differential manifolds, differential forms, Stokes' theorem, deRham cohomology. Prerequisite: Calculus III and Linear Algebra (11.11 or 11.13).
4½ credits per term

11.317(Q) Ordinary Differential Equations
Existence and uniqueness of solutions, differential inequalities, linear systems and linear equations, adjoint equations, linear equations in the complex plane (and regular singular points), classical equations, oscillations and second order equations, Sturm-Liouville boundary value problems, stability and asymptotic integration of linear and perturbed linear systems. Prerequisite: Calculus III.
4½ credits

11.318(Q) Partial Differential Equations
Characteristics, classification of second order equations, well-posed problems, separation of variables and expansions of solutions. The wave equation: Cauchy problem, Poisson's solution, energy inequalities, domains of influence and dependence. Laplace's equation: Poisson's formula, maximum principles, Green's functions, potential theory, Dirichlet and Neumann problems, eigenvalue problems. The heat equation: fundamental solutions, maximum principles. Prerequisite: Calculus III.
4½ credits

11.339(Q) Introduction to Differential Geometry
Theory of curves and surfaces in Euclidean space: Frenet equations, fundamental forms, curvatures of a surface, theorems of Gauss and Mainardi-Codazzi, curves on a surface; introduction to tensor analysis and Riemannian geometry; theorema egregium; elementary global theorems. Prerequisite: Calculus III.
4½ credits

11.350(Q) Hilbert Spaces and Linear Operators
Introductory course to Hilbert spaces and their applications; Hilbert space, geometric properties of Hilbert space (orthogonal projections, orthogonal bases, weak and strong convergence), examples (especially, orthogonal functions), linear operators (boundedness, adjoint operators, self-adjoint operators), discussion of the spectral theorem, compact operators and the Fredholm alternative, integral operators and integral transforms (Fourier, Hilbert), introduction to differential operators. Prerequisite: Calculus III and Linear Algebra (11.11 or 11.13).
4½ credits

J Hopkins 1975-76

11.381(Q) Methods of Complex Analysis
A short course in the theory of functions of one or more complex variables with emphasis on techniques. Geometric representation of complex numbers and functions; Cauchy integral theorem and integral formula; power series and Laurent expansion; analytic continuation and multivalued functions; calculus of residues; conformal mapping; elements of potential theory. Prerequisite: Calculus III.
4½ credits

11.382(Q) Fourier Analysis
Trigonometric Fourier series (Riemann-Lebesgue lemma, convergence and summability, Poisson's formula). Complete orthonormal systems, Parseval's relation, completeness. Fourier transforms of L^1-functions, L^2-functions (Plancherel theorem); Fourier transforms and derivatives, convolutions, distributions. The material will be illustrated by applications to partial differential equations. Prerequisite: Calculus III.
4½ credits

15.341(H,Q) Axiomatic Set Theory
An introduction to the fundamental results in set theory, including the development of the theory of natural and real numbers, and transfinite ordinals and cardinals. Some attention will be paid to alternative systems.
3 credits

GRADUATE COURSES

11.605-606(Q) Real Variables
Measure and integration on abstract and locally compact spaces (extension of measures, decompositions of measures, product measures, integrals, term-by-term integration, L^p spaces); introduction to function analysis; integration on groups; Fourier transforms. Prerequisite or corequisite: General Topology (e.g., 11.313).

11.611-612(Q) Complex Varieties
Complex spaces, analytic local rings, Weierstrass preparation theorem, sheaves and cohomology on analytic spaces, Stein manifolds, Theorems A and B and their applications to Chow's theorem and the Riemann-Roch theorem. Prerequisite: 11.311-312, 11.313-314, or equivalent.

11.615-616(Q) Algebraic Topology
Polyhedra, simplicial and singular homology theory, products and cohomology, the Lefschetz fixed-point theorem. Poincaré and Alexander duality theorems, homotopy groups, the Hurewicz theorem, fiber bundles. Prerequisite: 11.313-314.

11.617-618(Q) Fundamental Number Theory
Topics in advanced algebra and number theory, including local fields and adeles, Iwasawa-Tate theory of zeta-functions and connections with Hecke's treatment, semi-simple algebras over local and number fields, adele geometry. Prerequisite: 11.303-304.

11.619-620(Q) Lie Groups and Symmetric Spaces
Differentiable and analytic manifolds, connections in vector bundles, Lie groups and Lie algebras, classification of complex semi-simple Lie algebras, compact forms, representations and Weyl formulas, symmetric Riemannian spaces. Prerequisite: 11.303-304, 11.311-312, 11.313-314.

11.621-622(Q) Hilbert Space and Linear Operators
11.623-624(Q) Topics in Automorphic Functions
11.627-628(Q) Topics in Algebraic Topology
11.631-632(Q) Partial Differential Equations
11.633-634(Q) Topics in Algebraic Number Theory
11.643-644(Q) Algebraic Geometry
11.651-652(Q) Topics in Group Representations

Mechanics and Materials Science

The Department of Mechanics and Materials Science offers undergraduate, graduate, and postdoctoral programs for instruction and research in a variety of areas. In addition to general mechanics and general materials science, programs are available in acoustics, applied mathematics, biomechanics, engineering