MIT 1925

UNDERGRADUATE COURSE SCHEDULES FOR 1925-1926

FIRST YEAR. All Courses (Except IV. Option 1)

	First Term 15 Weeks	Second Term 15 Weeks
Chemistry 5·01, 5·02	120 — 75	120 — 75
Descriptive Geometry D21, D22	45 — 10	45 — 10
English and History E11, E12	45 — 75	45 — 75
Machine Drawing Elementary D12	.. ..	45 — 0
Mathematics M11, M12	45 — 90	45 — 90
Mechanical Drawing D11	45 — 0	.. ..
Military Science MS11, MS12	45 — 0	45 — 0
Physical Training PT1, PT2	20 — 0	20 — 0
Physics 8·01, 8·02	60 — 75	60 — 75
Hours of exercise and preparation:	750 = 425 + 325	750 = 425 + 325

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FIRST YEAR. COURSE IV. OPTION 1

	First Term 15 Weeks	Second Term 15 Weeks
Architectural History 4·411, 4·412	30 — 60	30 — 60
Design I 4·712	.. ..	150 — 0
English and History E11, E12	45 — 75	45 — 75
Freehand Drawing 4·012	.. ..	60 — 0
French L63, L64	45 — 75	45 — 75
Graphics 4·06	90 — 0	.. ..
Mathematics M11, M12	45 — 90	45 — 90
Military Science MS11, MS12	45 — 0	45 — 0
Perspective 4·12	30 — 45	.. ..
Physical Training PT1, PT2	20 — 0	20 — 0
Shades and Shadows 4·11	30 — 15	.. ..
Theory of Architecture 4·311, 4·312	15 — 0	15 — 0
Hours of exercise and preparation:	755 = 395 + 360	755 = 455 + 300

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Mathematics — COURSE IX-C

First Year, Page 33. Description of Subjects of Instruction, Pages 85–179.

SECOND YEAR

	First Term 15 Weeks	Second Term 15 Weeks
English and History E21, E22	45 — 75	45 — 75
Mathematics M21, M22	45 — 90	45 — 90
Military Science MS21, MS22	45 — 0	45 — 0
Physics 8·03, 8·04	60 — 75	60 — 75
Language	45 — 75	45 — 75
Elective	195	195
Hours of exercise and preparation:	750	750

THIRD YEAR

	First Term 15 Weeks	Second Term 15 Weeks
Analytical Mechanics 8·221, 8·222	45 — 75	45 — 75
Calculus, Advanced M36, M37	45 — 90	45 — 90
Mathematical Elective	45 — 90	45 — 90
Political Economy Ec31, Ec32	45 — 45	45 — 45
Elective	180	180
General Study	30 — 30	30 — 30
Hours of exercise and preparation:	720	720

FOURTH YEAR

	First Term 15 Weeks	Second Term 15 Weeks
Least Square and Probability M26	30 — 30	.. ..
Mathematical Laboratory M54	.. ..	45 — 75
Physics, Advanced 8·231, 8·232	45—105	45—105
Elective and Thesis	450	450
General Study	30 — 30	.. ..
Hours of exercise and preparation:	720	720

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M

Math hours

2nd yr 45 - 90

3rd 45 - 75
45 - 75
45 - 90
45 - 90
45 - 90
45 - 90
270 - 510

4th yr 30 - 30
45 - 75
75 - 105

All 5
1st yr 180 - 200
2nd 45 - 90
3rd 270 510
4 75 105
670 905
+
= 1575

General Engineering IX-B

This course is designed to meet the needs of those who desire a training in fundamental engineering subjects, and who either do not wish to specialize in any particular branch of engineering to the extent demanded by one of the regular courses, or who may wish to follow out some line or lines of work not provided for by the schedule of any particular engineering course.

A schedule, except for that portion listed as elective, has been prepared and is offered as one suitable for a broad training in engineering. There is also opportunity for the election of economic and business subjects, or of courses in literature and modern languages.

In all cases the choice of electives must be approved by the Professor in charge of Course IX.

Aeronautical Engineering. Undergraduates intending to specialize later in Aeronautical Engineering may register in Course IX-B, and will choose their electives from subjects having a special bearing on aeronautical work. The choice of these electives should be made in consultation with the Faculty in Aeronautics.

Mathematics IX-C

The Institute offers exceptional opportunities for the study of mathematics particularly as applied to scientific and engineering work.

The schedule outlines a course of study leading to the Bachelor's Degree for students who desire to specialize in applied mathematics. It is a course well adapted to serve as a preparation for later specialization in pure mathematics, in mathematical-physics, or along lines of experimental physics or engineering requiring a high degree of proficiency in mathematics.

Considerable latitude in the choice of subjects is provided for in the electives of the junior and senior years in order that the student shall be able to take, if he so desires, a considerable amount of work in general studies, or in scientific and engineering subjects in which mathematics play an important part, in addition to his purely mathematical subjects. For example, he may elect courses in Thermodynamics, Mechanics, Electricity, or in Physical Chemistry.

While a definite schedule for the second year is offered, any student who has completed satisfactorily the work of the first two years in any of the professional courses of the Institute, or their equivalent, provided always that a creditable record has been obtained in mathematics and physics, may be admitted to the work of the third year in this course.

CHEMICAL ENGINEERING

The course in Chemical Engineering is designed to give the student a thorough foundation in chemistry and in the elements of mechanical and electrical engineering, followed by training in the special field of chemical engineering, *i.e.*, in the solution of the engineering problems of chemical industry. The instruction of the first two years is therefore wholly in other departments, and of the third year mainly so. The professional instruction within the department begins with industrial chemistry in the third year and is followed by chemical engineering and laboratory work in the fourth.

Because of the composite character of the course, it is impossible to include in the undergraduate instruction material other than the fundamentals required in professional work. On this account, special attention is given to post-graduate courses, and the student who hopes to attain professional leadership should plan for at least one post-graduate year leading to the Master's Degree.

Laboratory instruction in chemical engineering is carried out mainly in the School of Chemical Engineering Practice, located in seven industrial

The following subjects are offered as General Studies. For description of courses see Division of General Studies, page 171.

G821, G822. French.
G831, G832. French
G911, G912. German.
G921, G922. German.
G941, G942. German.

MATHEMATICS

Great importance is attached to the study of mathematics, both as a means of general education and as a necessary basis for further instruction in engineering and other subjects. Students in most of the regular courses study mathematics throughout the first two years, beginning with a combined course in elementary calculus and analytic geometry extending through the first year. The second year work is devoted mainly to integral calculus and elementary differential equations with systematic study of applications. From the outset, care is taken to present both underlying principles and a great variety of concrete applications, the latter connecting the mathematical instruction closely with the professional studies. The instruction is given mainly by recitations in small sections, the number of the students in a section being about twenty-five. Students having time and interest for the study of mathematics beyond the prescribed limits are given opportunity for more advanced work, and the Institute offers exceptional advantages for advanced and elective work in applied mathematics.

Undergraduates wishing to specialize in mathematics are referred to the recently adopted course (IX-C).

The department possesses an excellent library, and an extensive collection of models.

M1. Algebra (Entrance). For description see entrance requirements.

M2. Plane Geometry (Entrance). For description see entrance requirements.

M3. Solid Geometry (Entrance). For description see entrance requirements.

M4. Trigonometry (Entrance). For description see entrance requirements.

M11. Calculus. An elementary presentation of the fundamental ideas of the calculus; derivatives, differentials, maxima and minima, integration, with application to simple problems of geometry and mechanics, all confined to algebraic polynomials. Textbook: *Woods and Bailey, Elementary Calculus.*

M12. Calculus. Trigonometric, logarithmic, exponential functions, with graphical computation and applications; series, partial differentiation; methods of integration. Textbook: *Woods and Bailey Elementary Calculus.*

M21. Calculus. Continuation of integration of functions of one variable including use of tables; definite integrals; geometrical applications to areas of lengths of plane curves, volumes of solids; mechanical applications to work, pressure, centers of gravity and moments of inertia. Textbook: *Woods and Bailey, Elementary Calculus.*

M22. Differential Equations. Functions of two variables, double and triple integration with applications to areas and volumes, moments of inertia, and centers of gravity. Textbook: *Phillips, Differential Equations.*

M26. Least Squares and Probability. A brief discussion of the general principles and the more common scientific and engineering applications of the method of least squares. Textbook: *Bartlett Method of Least Squares.*

M31. Differential Equations of Electricity. Deals mainly with the equations which the student of electricity meets in his work. These equations will be discussed from the general point of view, but specific applications will be made to electrical problems.

M36, M37. Advanced Calculus. Taylor's Formula with applications to approximations in calculus and analysis, partial differentiation, complex numbers, vectors, total and partial differential equations. Bessel's functions, calculus of variations, line, surface and space integrals, elliptic integrals and functions.

M41. Calculus, Applications of. Especially adapted to the needs of students in chemical engineering.

M43, M44. Theoretical Aeronautics. Open to third and fourth year students.

M451, M452. Fourier's Series and Integral Equations. The theory of Fourier's series, Bessel's functions and their application to the solution of such problems in physics as can be expressed by certain partial differential equations.

M51, M52, M53. Engineering Science. Mechanics, hydrodynamics, and electricity, designed to illustrate the correlation between these subjects and their general application to engineering problems.

M54. Mathematical Laboratory. Practical instruction in numerical, graphical and mechanical calculation and analysis as required in the engineering or applied mathematical sciences, methods for checking the accuracy of arithmetic and logarithmic computations; numerical solution of algebraic, transcendental and differential equations; graphical methods in the processes of arithmetic, algebra, and the calculus; nomography and the construction of graphical charts; curve fitting to empirical data; approximate methods of integration, differentiation and interpolation; the use and principles of construction of instruments employed in calculation, such as slide-rules, arithmometers, planimeters and integraphs, and many kindred topics. Textbook: *Lipka, Graphical and Mechanical Computation.*

M561, M562. Theory of Functions. A study of the elementary functions, particularly the rational functions, the exponential function, the circular and hyperbolic sine, cosine, and tangent — for complex values of the variable. Extension of the differential and integral calculus to the complex plane. Development and application of the fundamental theorems of the analytic function theory. A portion of the first term will be devoted to selected topics from the theory of functions of a real variable.

M57. Theory of the Gyroscope. A mathematical discussion of the gyroscope, together with its application to torpedoes and stabilizers.

M60. Vector Analysis. Algebraic combinations of vectors, differentiation and integration of vector functions, Green's and Stokes' theorems, potential functions, applications to geometry and physics.

M62. Modern Algebra. Determinants, matrices, systems of linear equations, linear transformations, finite groups.

M631, M632. Differential Geometry. A study of n dimensional geometry with the use of the Ricci absolute calculus, theory of tensors, applications to Euclidean, non-Euclidean, and Einstein spaces.

M641, M642. Modern Analysis. Particular attention is given to analytical methods used in mathematical physics, the elements of the theory of functions, and study of important transcendental functions.

M651. Analytical Mechanics. Lagrangian and Hamiltonian systems are discussed, and their relations to a minimum principle brought out. The elements of elasticity theory and of hydrodynamics are treated.

M652. Analytical Mechanics. Continuation of the topics treated in M651. Introduction to relativistic mechanics.

M70. History of Science. Same as G1 with 30 extra hours preparation.

M72. Differential Equations. (For students from the United States Army.) A review of calculus, including differentiation, differential properties of curves, rates, maxima and minima, integration, multiple integration, geometrical, mechanical and physical problems; differential equations of the first order, special types of second order equations, linear equations with constant coefficients, variable coefficients, exact linear and simultaneous linear equations. The application of the calculus and differential equations is made to various problems, methods of computation and approximation, including Taylor's and Maclaurin's series, Simpson's rule, finite differences, use of mechanical integrator, construction and use of nomographic charts. Textbooks: *Wilson, Advanced Calculus; Phillips, Differential Equations; Lipka, Graphical and Mechanical Computation.*

M731, M732. Rigid Dynamics. The fundamental principles of the mechanics of rigid bodies.

M75. Exterior Ballistics. The calculation of the trajectories of projectiles under standard conditions, and of the differential corrections for variations from standard conditions is discussed here. The method of Siacci-Ingalls and that of numerical integration are both treated. Applications to the construction of Range Tables are given. Textbook: *Introduction to Ballistics, A. A. Bennett,* prepared in the Technical Staff of the Ordnance Department.

M77. Vector Analysis. A treatment of the vector functions and operations required in theoretical work on electricity. Preparation for 8.242.

M80. Methods in Teaching Junior High School Mathematics. Will include the observation of a demonstration class, showing actual teaching of a typical group of junior high school pupils.

M81. Methods in Teaching Senior High School Mathematics. A study of methods in teaching algebra, plane geometry, solid geometry, trigonometry, with special reference to the recommendation of the National Committee on mathematical requirements, and to the recently revised requirements of the College Entrance Examination Board.

M82. Classroom Problems of the Junior and Senior High Schools. Aims to discuss problems of particular value to the teacher, including classroom methods and technique, methods of study, rating of pupils, and the like.

The following subjects are offered as General Studies. For description of courses see Division of General Studies, pages 167, 170.

G1. History of Science.
G2. History of Science.
G75. History of Philosophy.

MILITARY SCIENCE AND TACTICS

Courses in Military Science are divided into: Basic Course, compulsory, and Advanced Course, are optional.

The Basic Course consists of the subjects given during the first and second years. Male students who enter the Institute as first-year students are required to complete satisfactorily both years of the Basic Course. Those who enter as second-year students are required to complete satisfactorily the second year of the Basic Course. Aliens, students found physically unfit for military service, and students with military training equivalent to that prescribed by the two-year Basic Course are exempt from Military Science.