

There is nothing ^{exactly} equivalent to a mathematics major. There is a standard program all cadets must do. For selected cadets there are Advanced courses which are usually deeper or faster versions of ^{topics from} standard courses. There are also elective courses going beyond what is in the standard program. There is no package of Advanced and Elective courses that confers a distinctive label such as "Mathematics Major".

Some honors courses are available.



Exemptions from courses (advanced placement) thru "validation exams" possible.

UNITED STATES MILITARY ACADEMY

CATALOGUE

1965 — 1966

ONE HUNDRED SIXTY-FOURTH YEAR

However 3 sets of elective or advanced courses have been designated

Advanced Program 1
Ad- 2
Ad 3

Adv Prog 1 \approx
Stand prog + Adv Calc (483)

Adv Prog 2 \approx
Stand prog + Adv Calc (483)
+ lin prog (481)

Adv Prog 3 \approx
Stand prog + Adv Calc (483)
+ lin prog (481)
+ complex var (485)

What is residence work? (p. 90)

Are contact hours 50 min hours?

1st yr.

2nd sem Jan

2nd yr

Jan 24 - June 2

W. Point

1st term

Sept 7 Tues to

Jan 22

minus Dec 22 to Jan 3

ACADEMIC CALENDAR 1965-66

1965

1 July	Thursday	New Fourth Class enters (Class of 1969).
4 July	Sunday	Independence Day.
5 July	Monday	Duties suspended.
29 August	Sunday	Beginning of Reorganization Week.
4 September	Saturday	End of Reorganization Week.
6 September	Monday	Labor Day. Duties suspended.
7 September	Tuesday	First Term begins.
1-3 October	Friday-Sunday	Homecoming Weekend.
11 November	Thursday	Veterans Day. Classes suspended.
22 December	Wednesday	Christmas leave begins at 12:00 noon.

1966

3 January	Monday	Christmas leave ends at 5:30 p.m.
22 January	Saturday	First term ends at 12:00 noon.
24 January	Monday	Second term begins.
2 February	Wednesday	Graduate Record Exam for 1st Class.
22 February	Tuesday	Washington's Birthday. Classes suspended.
24 March	Thursday	Spring Leave for three upper classes begins at 3:15 p.m.
28 March	Monday	Spring Leave for three upper classes ends at 6:00 p.m.
21 May	Saturday	Armed Forces Day. Classes suspended.
28 May	Saturday	Second Term ends at 12:00 noon for First Class.
30 May	Monday	Memorial Day. Duties suspended.
2 June	Thursday	Second Terms ends at 3:15 p.m. for underclasses.
5 June	Sunday	Baccalaureate Sunday.
8 June	Wednesday	Graduation.
1 July	Friday	New Fourth Class enters. (Class of 1970.)

2nd term

Jan 24

Semesters

(probably) essentially same in length

2nd sem

1st sem

8	Jan 31	219
28	Feb 28	
31	Mar 31	
30	Apr 30	
31	May 31	
2	Jun 30	
<hr/>		
130	days	
	Sept 30	24
	Oct 31	31
	Nov 30	30
	Dec 31	22
		<hr/>
		126

GENERAL PROGRAMS

Bachelor of Science Program

The Military Academy is accredited by the Middle States Association of Colleges and Secondary Schools. Its academic program provides the student with a broad foundation in the humanities, the social sciences, the natural and engineering sciences, and the military sciences. Graduates of the Academy are accepted for advanced study by the leading graduate schools of the country.

Standard Academic Program

The Standard Academic Program consists of the prescribed courses which fulfill the minimum requirements for graduation. Each cadet must satisfactorily complete each of these courses, unless, on the basis of previously completed college level work or demonstrated ability, he is qualified for enrollment in the Advanced Studies Program.

Advanced Studies Program

The Advanced Studies Program is the academic program or, more precisely, programs, pursued by cadets who validate standard courses or who are capable of taking courses of a more advanced nature. It is designed to recognize and to give credit for previous academic achievement and to permit the cadet to penetrate more deeply into one subject area or to pursue a broader field of study than is required by the Standard Academic Program.

Honors prog.
(not to be taken by
all cadets)

Validations

A cadet who has satisfactorily completed appropriate college-level work before entering the Academy, or who has acquired sufficient knowledge of the subject matter through self-study, may validate standard courses. Normally he must successfully complete validation examinations administered at the Academy by the departments concerned. In addition, candidates are encouraged to submit for validation consideration College Entrance Examination Board Advanced Placement test results. *For each course validated, a cadet will take the next sequential standard course or an appropriate elective course.* A cadet who has appreciable prior knowledge of the subject matter, although not sufficient for validation, or who demonstrates unusual ability, may be enrolled in an advanced course. Advanced courses normally cover the subject matter of the corresponding standard course but include subject matter which is significantly broader or deeper in scope. *From the foregoing it should be apparent that there is a great opportunity for advanced study for those candidates who have, for varying reasons, attended college before enter-*

ing the Academy. It is important for such a candidate not only to complete the term in which he is enrolled, but also to do as well as possible during the terms he attends college so that he may participate in the validation program to the maximum extent. Furthermore, if the candidate is attending college before entering the Academy he should select very carefully a program of studies which approximates that of the Academy and thus be better assured of validating courses at the Academy.

Elective Courses

Elective courses are those courses a cadet selects at designated stages in the curriculum. At present, each cadet taking the Standard Academic Program will select and pursue four elective courses during his final two years at the Academy. Cadets who validate standard courses will, at some time between validation and graduation, take additional elective courses equivalent in terms of credit hours to the validated courses. With approval, cadets of the upper classes may take elective courses in addition to their normal course loads. The elective courses offered are listed in the following pages.

Honors Courses

For a select few cadets Honors Courses are offered in the First Class year.

Listing of Courses

Standard, advanced, and elective courses are shown by departments. Courses for the Fourth Class are numbered in the 100's; courses for the Third Class in the 200's; courses for the Second Class in the 300's; and courses for the First Class in the 400's. Advanced and elective courses are indicated by the second digit, 5 and 8, respectively. For standard and advanced courses the third digit indicates the term in which the course is offered; odd digit for first term, even digit for second term. Elective courses may be offered in either or both terms as indicated in the course description. Credit hours are computed generally on the basis of actual number of hours of classroom instruction per week.

Methods of Instruction

Cadets attend classes in small sections of from 12 to 15 students so that emphasis may be placed on daily student participation. Cadets are normally assigned to sections on the basis of their demonstrated ability in each subject. The resulting homogeneous grouping enables the instructor to pace his teaching to the capability of the student. Thus the cadet is intellectually challenged and the maximum of learning can take place at

not so
for phys ed

all levels. Cadets are resectioned periodically. Weekly posting of grades contributes much to the development of a competitive spirit in academics among cadets. Periodic reports of each cadet's academic progress are provided to parents.

Although the school is a boarding school, the students are not isolated from the world. They are encouraged to participate in all school activities and to take part in the life of the community. The school is a part of the life of the community and the community is a part of the life of the school.

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STANDARD AND ADVANCED STUDY PROGRAMS

COURSES IN THE STANDARD
ACADEMIC PROGRAM

COURSES IN THE ADVANCED
ACADEMIC PROGRAM

4th Class (Freshman)

Engineering Fundamentals	Advanced Engineering Fundamentals
Composition, Reading, and Speech Making	Evolution of American Ideals
Environment	Geography of the USSR
Foreign Languages	Advanced French, German, Russian or Spanish
Mathematics	Advanced Mathematics

3d Class (Sophomore)

Chemistry	Advanced General Chemistry with Analysis
Comparative Literature	Accelerated French, German or Spanish
Foreign Languages	Advanced French, German, Russian or Spanish
History of Europe and America: 1500-1870	Middle Eastern Studies
History of Europe and America Since 1870	History of Russia
	Latin American Studies
	History of U.S. Foreign Relations
Mathematics	Advanced Mathematics
Physics	Advanced Physics
Psychology	Additional Electives

2d Class (Junior)

Atomic and Nuclear Physics	Augmented Atomic and Nuclear Physics
Economic Principles and Problems	Comparative Economic Systems
Electives (2)	Additional Electives
Electrical Science	Augmented Circuits
Law	Augmented Electronics
Fluid Mechanics	Advanced Fluid Mechanics
Engineering Mechanics I	Advanced Engineering Mechanics I
Thermodynamics	Advanced Thermodynamics
U.S. Government	Political Philosophy

**COURSES IN THE STANDARD
ACADEMIC PROGRAM**

**COURSES IN THE ADVANCED
ACADEMIC PROGRAM**

1st Class (Senior)

**Structural Analysis
Structural Design, Soils and
Concrete**

**Honors Course in Civil
Engineering
or
Introduction to Nuclear
Engineering**

**Contemporary Foreign
Governments**

Additional Electives

**Electives (2)
History of Military Art
History of Modern Asia
International Relations**

**National Security Problems
Problems of Developing Nations**

**Literature and Advanced
Exposition**

**Honors Course in Ordnance
Engineering**

**Military Leadership
Ordnance Engineering**

**Structural Analysis
Structural Design, Soils and
Concrete**

**Honors Course in Civil
Engineering**

**Contemporary Foreign
Governments**

**Introduction to Nuclear
Engineering**

**Electives (2)
History of Military Art
History of Modern Asia
International Relations**

Additional Electives

**Literature and Advanced
Exposition**

**Honors Course in Ordnance
Engineering**

**Military Leadership
Ordnance Engineering**

**National Security Problems
Problems of Developing Nations**

W. Point 1965-66

**ELECTIVE COURSES
IN
MATHEMATICS—SCIENCE—ENGINEERING**

- *Abstract Algebra
- Advanced Calculus I
- Advanced Calculus II (Complex Variable)
- Advanced Engineering Mechanics II
- Advanced Structural Analysis
- *Automatic Control Systems
- Automotive Engineering
- *Chemistry Research Project
- *Computer Science Fundamentals
- *Continuum Mechanics
- Design of Concrete Structures
- ↔ Differential Equations (Intermediate)
- Digital Computers
- *Electromagnetic Fields and Advanced Circuits
- Electromechanical Energy Conversion
- Electronic Circuits
- Engineering Materials
- Engineering Mechanics II
- *Experimental Physics
- Gas Dynamics
- Graphical Computations
- *Heat, Mass, and Momentum Transfer
- Individual Engineering Projects
- Individual Ordnance Project
- *Information Transmission
- Introduction to Theoretical Physics I
- Introduction to Theoretical Physics II
- ↔ Linear Algebra and Linear Programming
- Management Engineering
- Nuclear Physics
- Nuclear Reactor Theory
- Numerical Analysis with Digital Computation
- *Operations Research
- *Organic Chemistry I
- *Organic Chemistry II
- Physical Chemistry I
- Physical Chemistry II
- Quantum Mechanics
- Soil Mechanics
- Solid State Electronics
- Space Mechanics

* New for Academic Year 1965-1966.

3403
cont hrs

173 scrh

W. Point

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STANDARD ACADEMIC SCHEDULE 1965-66
FOURTH CLASS (FRESHMAN) YEAR

Subject	Frequency of Attendance	Number of Attendances	Length of Period in Minutes	Contact Hours	Semester Credit Hours
Mathematics	Every day Mon-Sat	208	75	260	15
Engineering Fundamentals	Every other day Mon-Fri	88	120	176	5
Environment	Every other day Mon-Fri	88	60	88	5
English	Every other day Mon-Fri	88	60	88	5
Foreign Languages	Every other day Mon-Fri	88	60	88	5
Physical Education	As scheduled	145	45-90	129	3
Tactics	Twice each week	68	60	68	2.5
				<u>897</u>	<u>40.5</u>

total hours in the year

7.5 cred in one sem
7.5 hrs/week (P59)
(P88) =
= 260 = 17 1/3 weeks

This is for year.
In one semester we have 130 hours 7.5 hrs per week →
130 / 7.5 = 260 / 15 = 17 1/3 wks

THIRD CLASS (SOPHOMORE) YEAR

Mathematics	Every other day Mon-Sat	104	80	139	8
Chemistry	Every other day Mon-Sat	104	80	139	8
Physics	Every other day Mon-Sat	104	80	139	8
Foreign Languages	Every other day Mon-Sat	104	80	139	8
History, Europe and America	Every other day Mon-Fri	88	60	88	5
English	Every other day Mon-Fri	¹ 44	60	44	2.5
Psychology	Every other day Mon-Fri	² 44	60	44	2.5
Physical Education	As scheduled	73	55-90	83	1.5
Tactics	Twice each week	49	60	49	1.5
				<u>864</u>	<u>45</u>

Stand Prog is 23 cr.
Since 15 cr is 260
Cont hrs →
23 cr. corresponds to

SECOND CLASS (JUNIOR) YEAR

Fluid Mechanics and Thermodynamics	Every other day Mon-Sat	104	80	139	8
Electrical Science	Every other day Mon-Sat	104	80	139	8
Atomic and Nuclear Physics	Every other day Mon-Sat	52	80	69	4
Engineering Mechanics	Every other day Mon-Sat	52	80	69	4
Economics; U.S. Government	Every other day Mon-Fri	88	60	88	5
Law	Every other day Mon-Fri	88	60	88	5
Electives (2)	Every other day Mon-Fri	88	60	88	5
Tactics	Twice each week	61	60	61	2.5
Physical Education	As scheduled	48	55-90	58	1.5
				<u>799</u>	<u>43 scrh</u>

260, 23 = 398.67
75 = 399
2.5 cr → 130 / 3 = 43.33

Total contact hrs with

¹ First Term.
² Second Term.

ACADEMIC PROGRAMS 65

Phys ed contact hrs

129
83
58
64
334

Phys ed credit hrs
= 3 * 1.5 + 1.5 + 1
= 7 sem. cr. hrs.

43 scrh is 260 + 139 = 399 for all Progs, advanced or not

17
 81 137
 5
 57
 56

1 credit =
 17 total hrs

W. Point
 1965-66

FIRST CLASS (SENIOR) YEAR

Subject	Frequency of Attendance	Number of Attendance ¹	Length of Period in Minutes	Contact Hours	Semester Credit Hours
Civil Engineering...	Every other day Mon-Sat...	103	80	137	8
History of Military Art.	Every other day Mon-Sat...	103	80	137	8
Contemporary Foreign Governments; Modern Asia; International Relations.	Every other day Mon-Sat...	103	80	137	8
Ordnance Engineering.	Every other day Mon-Sat...	103	80	137	8
Electives (2).....	Every other day Mon-Fri...	88	60	88	5
English.....	Every other day Mon-Fri...	² 44	60	44	2.5
Leadership.....	Every other day Mon-Fri...	¹ 44	60	44	2.5
Tactics.....	Twice each week.....	55	60	55	1.5
Physical Education..	As scheduled.....	54	55-90	64	1

44.5 scrh

843

Phys Ed, all 4 yrs
 hrs credits
 129 + 83 + 58 + 64
 = 334

Ratio = 47.7 hrs/credit

¹ First Term.
² Second Term.

tive powers and limitations; individual rights under the Constitution; the defense establishment and constitutional powers with respect to International Law.

Military Law. A study of punishments, the component parts of crimes and offenses, criminal responsibility, selected articles of the UCMJ, jurisdictions, pretrial matters, nonjudicial punishment and courts-martial procedures. Basic theories and practical procedures are joined to enhance the cadet's ability to discharge his future responsibilities in military law.
2.5 Credit Hours.

Elective Course

LW 481. INTERNATIONAL LAW (*Either Term*)

An introduction to International Law to include a discussion of the nature and sources of International Law; problems of nationality; recognition of states; jurisdiction of states; international agreements and diplomatic intercourse; and the law of war.
2.5 Credit Hours.

DEPARTMENT OF MATHEMATICS

Professors: Col. C. P. Nicholas (Head of Department), Col. J. S. B. Dick.

Associate Professors: Col. G. W. Bixby, Col. W. H. Karstedt.

Assistant Professors: Lt. Cols. R. H. Allen, A. J. Armstrong, T. C. Bielicki, P. J. Donohoe, A. Gerardo, A. L. Whitley; Maj. J. V. Foley, G. E. Lear, W. H. Lowrey, J. R. Mackert, J. F. Martin, R. L. Schneider, H. W. Tousley; Capt. R. W. Giuliano, D. F. Nidever, J. H. Sewell, Jr., J. F. Vincent.

Instructors: Lt. Cols. M. C. Carrigan, T. H. M. Crampton, G. W. Medsger; Maj. J. S. Crosby, R. M. McPherson, D. M. Rhea, C. D. Richards; Capt. R. H. Allison, R. A. Beltz, R. N. Bierly, J. C. Burke, D. R. Carrier, R. E. Clark, A. A. Cockrell, Jr., M. J. Conrad, B. M. Cowan, E. E. DeMaris, C. R. Domeck, W. Echevarria, P. G. P. Eliot, J. G. Felber, Jr., J. E. Fiscus, R. H. Gates, V. J. Gongola, W. R. Johansen, J. B. Kaiser, J. R. Matteson, G. J. McRee, G. C. Mitchell, G. L. Richardson, B. W. Rose, Jr., H. J. Skidmore, Jr., B. F. Stout, E. M. Valence, F. A. Waskowicz, R. S. Yelverton.

Mathematics at West Point is organized into programs at ascending levels, known as standard, advanced, and elective. During the first two years every cadet is enrolled in either the standard program or in one of three advanced programs, depending on his mathematical preparation and aptitude. The elective program is available to all cadets during the third and fourth years, and overlaps with the advanced programs during the first two years.

Successful completion of the standard program by the end of the second year satisfies the requirement in mathematics for graduation from the Military Academy. The three advanced programs are designed

for cadets who, by virtue of exceptional aptitude or above-standard preparation before entering West Point, are able to complete the standard program at an accelerated pace, thus gaining time for extra courses chosen from the elective program. Such cadets may complete from one to four of these elective courses (2½ to 10 credit hours) during their first two years, depending on how much time they gain by validation and acceleration.

During the first year cadets attend mathematics 6 days a week, during the second 3 days a week. All cadets perform five independent exercises on the digital computer during these two years, regardless of whether their program be standard or advanced. The courses constituting the standard and advanced programs are shown below. Parentheses indicate courses for which credit is given by validation.

Standard Program: First year, MA 101-102; second year, MA 201-202-204. Validation credit, none; residence credit, 23 hours.

Advanced Program I: First year, MA 101-(108)-156; second year, MA 483-202-204. Validation credit, 2½ hours; residence credit, 23 hours.

Advanced Program II: First year, MA (107)-157-(108)-481-158; second year MA (483)-202-204. Validation credit, 5 hours; residence credit, 23 hours.

Advanced Program III: First year, MA (109)-159-481-202-204; second year, MA (483)-484-485. Validation credit, 10 hours; residence credit, 23 hours.

(Note. During his first year in Program III the cadet completes most of the mathematics required for graduation, and by special arrangement may complete all of it. His electives during the second year need not be in mathematics, but if he chooses mathematics the appropriate courses are the three shown above.)

The subject-matter content of the separate courses is described in the outlines to follow.

Adv Prog I
 101 7.5
 108 (2.5)
 156 7.5
 483 3
 202 2
 204 3
 23

linear alg
 +
 lin prog

102 +
 201 -
 val
 complex
 vgr

Prob + stat

DE

these are credits as listed with the course descript.

102 + 201

Prob + stat

not in standard prog
 Adv calc.

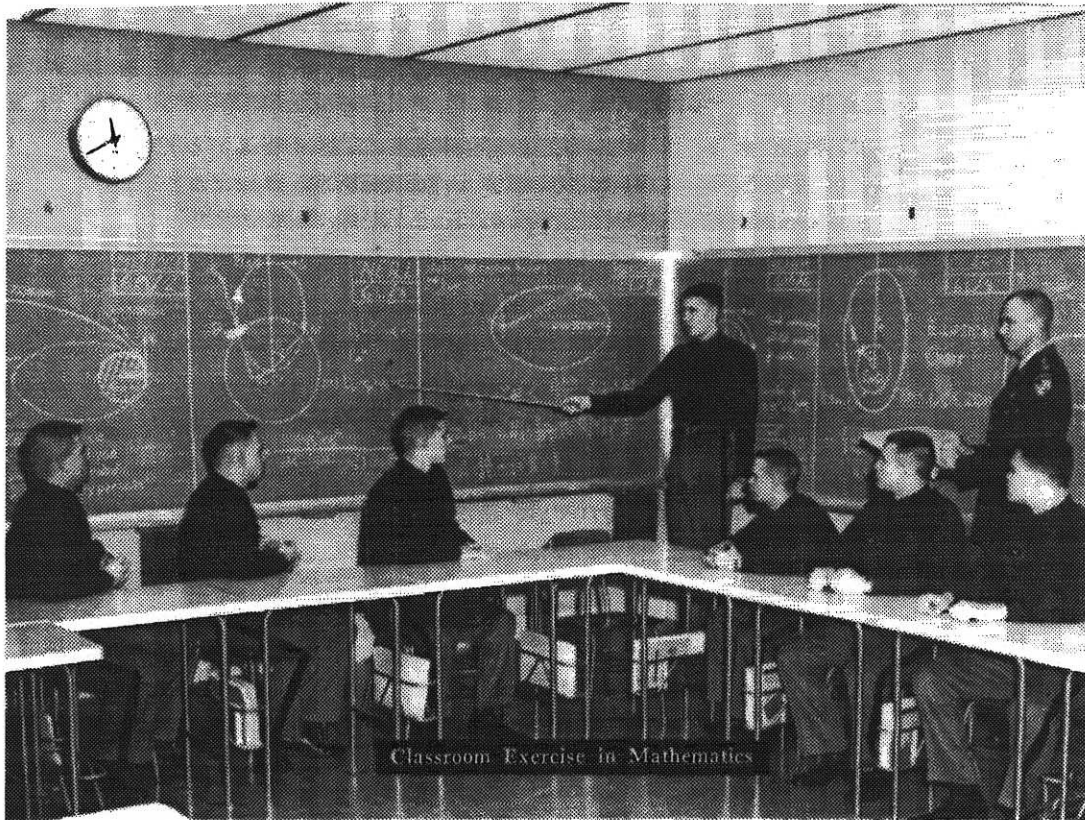
101 + 102

Adv calc

lin alg + lin prog

adv calc

Diff Eq. (winter)



Standard Courses

MA 101. CALCULUS AND ANALYSIS

This is the fall semester course in the standard program cadet's first year. Calculus is introduced early in the semester by work in foundations of the number system to include partitioning, nested intervals, the concept of ϵ , variables, limits and infinite position numerals, followed by work in controlled numerical approximations, functions of a single real variable, the δ - ϵ criterion, and continuity. Prerequisite topics of plane analytic geometry not sufficiently covered in the student's mathematical preparation prior to entering the Military Academy are introduced at the proper time. The study of derivatives and differentials of algebraic and transcendental functions, with fundamental applications, is completed. Numerical methods suitable to electronic digital computation are emphasized.

7.5 Credit Hours.

MA 102. CALCULUS, ANALYSIS AND LINEAR ALGEBRA

This is the first-year spring semester course for the standard program,

following Mathematics 101. It continues with further applications of the derivative and differentials, including derivatives of functions defined parametrically; introduction to differential equations to include the central force problem and applications to long range trajectories and orbits; analytic geometry of three dimensions; linear algebra to include vector spaces, the algebra of matrices, linear transformations, and the theory of eigenvalues and eigenvectors. The course closes with a return to calculus, to include partial differentiation and applications, vector differentiation, the gradient, the divergence, the curl, and fundamental concepts of integral calculus. The latter includes formal integration and introduction to elementary numerical approximations of definite integrals. Problems in digital computation, applying principles of calculus, are assigned concurrently. In addition there are a few lessons in spherical trigonometry essential for military applications.

7.5 Credit Hours.

MA 201. CALCULUS

This course is given during the first term of the standard program cadet's second year of mathematics. It further develops the integral calculus started in MA 102, to include applications to geometrical and physical problems, infinite series, expansion of functions, and multiple integrals. Problems requiring digital computation are assigned concurrently.

3 Credit Hours.

MA 202. DIFFERENTIAL EQUATIONS

This is a brief course in differential equations, following the completion of calculus. Continuing from the introduction to differential equations given in first year calculus, it treats solutions of standard types of first and second order equations using differential operators, method of undetermined coefficients, integrating factors, certain higher order equations, introduction to Laplace transforms, introduction to partial differential equations, and applications to physics and engineering. Methods requiring digital computation are included.

2 Credit Hours.

MA 204. PROBABILITY THEORY AND STATISTICAL INFERENCE

This is the final course in the mathematics sequence required for graduation from USMA, and it emphasizes calculus as a prerequisite. Included are fundamentals of probability theory and mathematical models to include random variables, probability distributions and measurements of these distributions, probability and density functions; binomial and

3 cr.

$$7.5 = \frac{3}{x}$$

$$x = \frac{130.3}{7.5}$$

$$= \frac{130.3}{2.5} = \frac{260}{5}$$

$$= 52 \text{ hr}$$

$$2 \text{ cr} = 52 \times \frac{2}{3}$$

$$= 34.66$$

$$= 35 \text{ hr}$$

normal distributions; use of de Moivre's theorem, the Central Limit theorem, and the Student-t, Chi-Square and Poisson distributions; basic statistical inference including sampling distributions, theory of estimation, hypothesis testing; correlation; and applications of these techniques to practical problems.

3 Credit Hours.

Validation and Advanced Placement Courses

MA 107. INTRODUCTION TO ANALYTIC GEOMETRY AND CALCULUS

This course consists of basic plan analytic geometry and an introduction to operating techniques of differential calculus. Cadets who completed substantially equivalent work before admission to USMA may qualify for validation credit by demonstrating their proficiency to the satisfaction of the Department of Mathematics. Those who do so are enabled to take an advanced placement course during their first semester at West Point. (See MA 157.) Cadets who have not completed the equivalent of MA 107 before entering USMA take residence work in the same subject matter as an integral part of MA 101 and MA 102.

2.5 Validation Credit Hours.

MA 108. INTRODUCTION TO SOLID ANALYTIC GEOMETRY AND INTEGRAL CALCULUS

This course consists of basic solid analytic geometry, plus an introduction to operating techniques of integral calculus and basic linear algebra. Cadets who completed substantially equivalent work before entering USMA, or those able to master the content by residence work at a considerably faster pace than is customary, may qualify for validation credit by demonstrating their proficiency to the satisfaction of the Department of Mathematics. Those who do so are enabled to take an advanced placement course during the second semester of their first year at West Point. (See MA 156 and MA 158.) Cadets not qualifying for validation of MA 108 take residence work in the same subject matter as an integral part of MA 102 and MA 201.

2.5 Validation Credit Hours.

MA 109. BASIC ANALYSIS AND LINEAR ALGEBRA

This course consists of plane and solid analytic geometry, basic linear algebra, and the principal operating techniques of differential and integral calculus at the college level. Cadets who completed substantially equivalent work before entering USMA may qualify for validation credit by demonstrating their proficiency to the satisfaction of the De-

partment of Mathematics. Those who do so are enabled to take an advanced placement course at the highest level during their first year at the Military Academy. (See MA 159.) Cadets receiving no validation credit take residence work in the subject matter of MA 109 as an integral part of MA 101, MA 102 and MA 201.

10 Validation Credit Hours.

MA 156. ADVANCED PLACEMENT CALCULUS, ANALYSIS AND LINEAR ALGEBRA

This course is given in the second semester of the first year to selected cadets who completed MA 101 with high standing and also qualify for validation credit for MA 108. The content of MA 156 is equivalent to MA 102 plus 201, less: (1) vector differentiation; (2) multiple integrals; and (3) the validated subject matter of MA 108. The linear algebra in this course is at a somewhat higher level than that in MA 102.
7.5 Credit Hours.

MA 157. ADVANCED PLACEMENT CALCULUS AND ANALYSIS

This course is given in the first semester of the first year to cadets who qualify for validation credit for MA 107. The course concentrates on foundations of the number system, introductory theory of functions, and a rigorous treatment of differential calculus for functions of a single real variable. The content is equivalent to MA 101 plus MA 102 through introductory differential equations and most of solid analytic geometry, less the validated subject matter of MA 107.

7.5 Credit Hours.

MA 158. ADVANCED PLACEMENT CALCULUS, ANALYSIS AND LINEAR ALGEBRA

This course is given in the second semester of the first year to cadets who satisfactorily completed MA 157 and also qualify for validation credit for MA 108. MA 158 provides an accelerated treatment of the linear algebra portion of MA 102, and continues with a rigorous treatment of integral calculus for functions of a single real variable, expansion of functions, and infinite series, plus an introduction to calculus of functions of two or more variables. The content is equivalent to the portions of MA 102 beginning with linear algebra, plus MA 201, less: (1) vector differentiation; (2) multiple integrals; and (3) the validated subject matter of MA 108.

5 Credit Hours.

MA 159. ADVANCED PLACEMENT CALCULUS, ANALYSIS, AND LINEAR ALGEBRA

This course is given in the first semester of the first year to cadets

Theory of Funct
+ Calc

who qualify for validation of MA 109. The course concentrates on foundations of the number system, introductory theory of functions, rigorous treatment of differential and integral calculus for functions of a single real variable, an introduction to partial derivatives, and an introduction to linear algebra. The content is equivalent to MA 101, MA 102 and MA 201, less: (1) vector differentiation; (2) multiple integrals; and (3) the validated subject matter of MA 109.

7.5 Credit Hours.

Elective (Advanced) Courses

These courses in advanced mathematics are offered to all cadets as electives during their third or fourth year at West Point. In addition, qualified cadets may complete one or more of these courses during their first and second years at West Point, as participants in one of the advanced programs.

MA 481. LINEAR ALGEBRA AND LINEAR PROGRAMING (*Either Term*)

Prerequisite: MA 102.

This course starts with a study of linear transformations on a vector space. It includes vector operations, vector spaces, matrices, determinants, properties of linear transformations, systems of linear equations, characteristic values and vectors, and quadratic forms. Later the course proceeds into linear programing, where it is concerned with the "best" solution to a system of linear equations. This portion includes an introduction to convex sets and n-dimensional geometry, a development of the properties of a solution to the linear programing problem, the generating of extreme point solutions, and the simplex computational procedure. The usefulness of the concepts developed is presented through practical problems emphasizing military applications. Solutions using the digital computer are included.

2.5 Credit Hours.

MA 482. ABSTRACT ALGEBRA (*Second Term*)

Prerequisite: MA 201.

This course is a survey of some of the abstract structures of algebra. Sets and their properties comprise the vehicle of presentation. The subject is introduced by a study of mappings and operations defined on sets, and relations existing on sets. The course continues with the development of the theory relating to groups, rings, integral domains, and fields. A study of the ring of polynomials and the fields of real and complex numbers is included.

2.5 Credit Hours.

MA 483. ADVANCED CALCULUS I (*First Term*)

Prerequisite: MA 201.

This course treats differential and integral calculus of scalar and vector functions of more than one variable to include: Jacobians, gradient, curl, divergence, multiple integrals, line and surface integrals, Green's Theorem, the Divergence Theorem and Stokes' Theorem. Applications to problems in physics and engineering are emphasized.

2.5 Credit Hours (Afternoon Elective)

3 Credit Hours (Morning Elective)

MA. 484. DIFFERENTIAL EQUATIONS (INTERMEDIATE) (*Either Term*)

Prerequisite: MA 202.

This course includes ordinary differential equations; power series solutions and the more important special functions of engineering; Fourier Series and orthogonal functions; partial differential equations and boundary value problems; numerical methods; and applications to science and engineering.

2.5 Credit Hours.

MA 485. ADVANCED CALCULUS II (COMPLEX VARIABLE) (*Either Term*)

Prerequisite: MA 483.

This course is primarily an introduction to functions of a complex variable, including algebra of a complex variable, elementary functions, limits, derivatives, Cauchy's Integral Theorem and Formula, series representation to include Taylor's and Laurent's series, theory of residues, conformal mapping and linear transformations, Poisson's Integral Formula, and special topics in complex potential.

2.5 Credit Hours.

MA 486. NUMERICAL ANALYSIS WITH DIGITAL COMPUTATION (*Second Term*)

Prerequisite: MA 202 (May be taken concurrently).

This course emphasizes the methods of numerical analysis with the digital computer in a strong supporting role. It includes methods grouping together the cadet's entire mathematical background in linear algebra, calculus and differential equations, in a context of modern numerical methods requiring programing and execution of solutions on the digital computer.

2.5 Credit Hours.

W Pt. 1965-66

Standard math 399 hours.

For adv. stu up to 10 credits (173 hrs) of elect. can be squeezed into 1st 2 yrs. The last 2 yrs contain 4 elective opportunities, but note that there are only 6 electives, ~~so max~~ of 2.5 credits each so max^{max} credits beyond standard prog is 15 cr. = 260 hrs.

Min math 399 hrs

Max $399 + 260 = 659$ hrs

All subj.

1st yr

897 hrs.

2

864

3 yr

799

843

3403 hrs.

Phy Ed 334 hrs