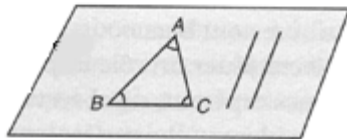


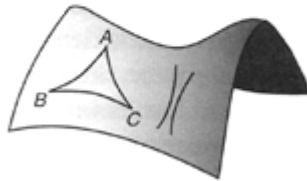
Department of Mathematics



Spherical Geometry



Euclidean Geometry



Hyperbolic Geometry

Student Handbook for Math Majors



**WILLIAM
PATERSON**
UNIVERSITY

Fall 2005

Mission of the Department of Mathematics

The Department of Mathematics of William Paterson University aspires to achieve an active, collaborative learning community where each member contributes to the learning of others. To develop such a community for learning, the Department has an academically diversified faculty with specializations from many fields of Mathematics.

The main goal of the Department is to prepare students for graduate school, teaching and professional careers in Mathematics through its major and minor programs. Students will be encouraged to

- Understand the logic of mathematical thinking,
- Develop an understanding of Mathematics by studying underlying structures, relationships and operations,
- Develop a repertoire of problem-solving techniques,
- Develop mathematical skills and applications,
- Understand the difference between conjecture and rigorous mathematical proof,
- Use the language of mathematics to present precise descriptions and logical relationships

The Department strives to develop competent, confident, enthusiastic majors who have a broad foundation in the study of Mathematics and who can apply their developed skills and knowledge to a wide variety of theoretical and applied programs.

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Welcome Letter

Dear Mathematics Major:

Welcome to the Mathematics Department at William Paterson University and to the extended family of mathematicians all over the world. We congratulate your commitment to the field that over the generations has been dubbed as the “key to all sciences.” We look forward to our joint participation in the effort to make your educational experience a rewarding and exciting one.

This booklet is designed to guide and help you through the mathematics program at William Paterson University. Please read it thoroughly and keep it handy for future reference.

The Department has an active **Math Club** and **Women's Math Group**, and you are encouraged to join and get involved. You should take advantage of all academic support services and facilities we have to offer and attend Department seminars and events.

Finally, it is critical that you meet **your Academic Advisor** assigned to you as soon as possible. Your advisor will not only assist you each semester in course selection and charting your way through as a math major but also will answer your questions and concerns about the department and the university. If need be, do not hesitate to contact me or my colleagues regarding any matter that is on your mind.

I wish you the best. Take advantage of all that we have to offer in becoming a successful mathematician.

Sincerely,

Melkamu Zeleke

Melkamu Zeleke
Chairperson
Department of Mathematics
973 720 2574
zelekem@wpunj.edu

Curriculum

Degree Programs

The Department of Mathematics offers a Bachelor of Arts (B.A.) degree program with two tracks: **Mathematics** and **Applied Mathematics**, and two minors: **Mathematics** and **Statistics**. In addition to these programs, the university offers a program of study leading to the certification as a mathematics teacher.

A graduate of the Department of Mathematics will be prepared to take the Graduate Record Examination (GRE), the Actuarial Examination I and II, and/or the mathematics section of the Praxis National Teachers' Exam for teaching certification.

To graduate, a student must complete 128 credit hours comprising of general education (GE) courses, Non-Western Civilization, Race and gender and 40-41 credits hours of mathematics courses as described below.

Mathematics Track

40-41 CREDITS

Required Courses

27 Credits

MATH 160	Calculus I (to be taken as a GE requirement)	-
MATH 161	Calculus II	4
MATH 200	Logic and Methods of Higher Mathematics	3
MATH 201	Calculus III	4
MATH 202	Linear Algebra	3
MATH 301	Modern Algebra	3
MATH 302	Advanced Calculus	3
MATH 423	Real Analysis	3
MATH 425	Introduction to Topology	3
MATH 490	Math Seminar	1

Additional Required Courses

4 Credits

CS 230	Computer Science I	4
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Electives

9-10 Credits

*Choose three from the following; at least one must be a 400 level course, distinct from 499. Courses with * are required for K-12 teaching certification*

MATH 322	Differential Equations	3
MATH 323*	Foundations of Geometry*	3
MATH 324*	Probability and Statistics*	4
MATH 325	Topics from Applied Mathematics	3
MATH 332	Statistical Computing	3
MATH 380	Mathematical Models and Applications	3
MATH 399	Selected Topics	1-3
MATH 401	Applied Algebra	3
MATH 411	Advanced Discrete Mathematics	3
MATH 421	Mathematical Statistics	3
MATH 422	Complex Analysis	3
MATH 424	Introduction to Numerical Analysis	3
MATH 499	Independent Study	1-3

Special Electives

Required for K-12 teaching certification

MATH 211*	The History of Mathematics*	3
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Applied Mathematics Track**40-41 CREDITS****Required Courses****28 Credits**

MATH 160	Calculus I (to be taken as a GE requirement)	-
MATH 161	Calculus II	4
MATH 200	Logic and Methods of Higher Mathematics	3
MATH 201	Calculus III	4
MATH 202	Linear Algebra	3
MATH 322	Differential Equations	3
MATH 324	Probability and Statistics	4
MATH 325	Topics from Applied Mathematics	3
MATH 411	Advanced Discrete Mathematics	3
MATH 490	Math Seminar	1

Electives**9 Credits**

*Choose three from the following; at least one must be a 400 level course, distinct from 499. Courses with * are required for K-12 teaching certification*

MATH 301	Modern Algebra	3
MATH 302	Advanced Calculus	3
MATH 323	Foundations of Geometry*	3
MATH 332	Statistical Computing	3
MATH 380	Mathematical Models and Applications	3
MATH 399	Selected Topics	1-3
MATH 401	Applied Algebra	3
MATH 421	Mathematical Statistics	3
MATH 422	Complex Analysis	3
MATH 423	Real Analysis	3
MATH 424	Introduction to Numerical Analysis	3
MATH 499	Independent Study	1-3

Special Electives

Required for K-12 teaching certification

MATH 211*	The History of Mathematics*	3
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Minors**Mathematics Minor****18-21 CREDITS****Required Courses****11 Credits**

MATH 160	Calculus I	4
MATH 161	Calculus II	4
MATH 202	Linear Algebra	3

Electives**9-10 Credits**

Three additional mathematics courses from those listed under the Mathematics Major Track. At least two of these courses must be at the 300-level or higher.

Statistics Minor

20 CREDITS

For a Non-mathematics Major

MATH 140	Quantitative Mathematics I	3
MATH 145	Quantitative Mathematics II	3
MATH 230	Statistics	4
MATH 324	Probability and Statistics	4
MATH 332	Statistical Computing	3
MATH 421	Mathematical Statistics	3

For a Mathematics Major

MATH 230	Statistics	4
MATH 324	Probability and Statistics	4
MATH 325	Topics in Applied Mathematics	3
MATH 332	Statistical Computing	3
MATH 421	Mathematical Statistics	3
MGT 470	Introduction to Operations Research	3

Mathematics Certification K-12

To be eligible for certification in elementary education (K-8) or in mathematics (K-12), students must complete a prescribed teacher education program. This professional program sequence is an intensive one in the theoretical and practical aspects of teaching that culminates in a full semester senior teaching internship in a school system.

As mandated by the NCTM standards (<http://mathforum.org/mathed/nctm.new.pedagogy.html>), the following additional math courses are required

- MATH 211 - The History of Mathematics
- MATH 323 - Foundation of Geometry
- MATH 324 - Probability and Statistics

Students interested in seeking certification in the areas offered by the College of Education are urged to seek advisement regarding acceptance criteria from the Department of Elementary and Early Childhood, and the Department of Secondary and Middle School Education before enrolling in any courses in the professional program sequence. The College of Education is located at 1600 Valley Road, telephone 973 720-2331.

Rotation of Course Offerings

All 100- and 200-level courses are offered every semester. However, 300- and 400-level courses are offered by rotation as follows. Some courses also follow the Day/Evening rotation.

Fall		Spring	
MATH 301	Modern Algebra	MATH 302	Advanced Calculus
MATH 322	Differential Equations	MATH 322	Differential Equations
MATH 323	Foundations of Geometry	MATH 324	Probability and Statistics
MATH 324	Probability and Statistics	MATH 325	Topics from Applied Mathematics
MATH 422	Complex Variable	MATH 401	Applied Algebra

MATH 423	Real Analysis	MATH 411	Advanced Discrete Mathematics
MATH 424	Numerical Analysis	MATH 421	Mathematical Statistics
MATH 490	Mathematics Seminar	MATH 422	Complex Analysis
		MATH 425	Introduction to Topology
		MATH 490	Mathematics Seminar

This cycle may change. Please contact the department for the most recent 2-year cycle.

Suggested Sequence of Courses

Mathematics Track

1-4 = Year in School, F = Fall, S = Spring

1F		1S	
MATH 116 or MATH 135	4	MATH 160 Calculus I*	4
GE: Writing Effective Prose*	3	GE: Social Sciences*	3
GE: Arts and Communication*	3	GE: Humanities*	3
GE: Social Science	3	GE: Racism & Sexism*	3
2F		2S	
MATH 161 Calculus II	3	MATH 201 Calculus III	4
ENG 300 or 330	3		
CS 230	3	GE: Humanities*	3
GE: Humanities*	3	GE: Science*	4
GE: Science*	4	Free Elective	3
MATH 200 Logic	3	MATH 202 Linear Algebra	3
3F		3S	
MATH 301 Modern Algebra	3	MATH 302 Advanced Calculus	3
MATH Elective	3	MATH 323 Foundations of Geometry	3
GE: Humanities*	3	GE: Health and Movement Science*	3
GE: Social Science*	3	Non-Western Requirement	3
GE: Elective	3		
4F		4S	
MATH 423 Real Analysis	3	MATH 425 Topology	3
MATH Elective/Complex Variable	3	MATH Elective	3
GE: Humanities*	3	GE: Humanities*	3
GE: Arts and Communication*	3	Upper Level Elective	3
Upper Level Elective	3	Free Elective	3
Upper Level Elective	3		

* General Education Requirements.

Applied Mathematics Track

1-4 = Year in School, F = Fall, S = Spring

1F		1S	
MATH 116 or MATH 135	3/4	MATH 160 Calculus I*	4
GE: Arts and Communication*	3	GE: Arts and Communication*	3
GE: Humanities*	3	GE: Humanities*	3
GE: Writing Effective Prose*	3	GE: Social Science*	3
2F		2S	
MATH 161 Calculus II	4	MATH 200 Logic	3
CS 230	4	MATH 201 Calculus III	4
GE: Arts and Communication*	3	GE: Humanities*	3
GE: Humanities*	3	GE: Science*	4
GE: Humanities*	3	GE: Social Sciences*	3
3F		3S	
MATH 202 Linear Algebra	3	MATH 322 Differential Equations	3
MATH 324 Probability	3	MATH 325 Topics in Applied Math	3
ENG 300 or 330	3	GE: Health and Movement Science*	3
GE: Humanities*	3	GE: Social Sciences*	3
GE: Sciences*	4	GE: Elective	3
4F		4S	
MATH Elective/MATH 424	3	MATH 411 Advanced Discrete Math	3
MATH Elective	3	MATH Elective	3
GE: Elective	3	Non-western Requirement	3
GE: Arts and Communication*	3	Upper Level Elective	3
Upper Level Elective	3	Upper Level Elective	3
Free Elective	3		3

* General Education Requirements.

Student Participation in the Department

Student's Bill of Rights

Each student has the right to:

- A. Receive high quality education; expect punctuality in class, administration of tests and return of tests in a timely manner;
- B. Have an academic advisor to receive proper advice in course work;
- C. See the instructor/advisor during their office hours and/or by appointment to seek help or discuss other concerns;
- D. Expect that all topics in the department course syllabus will be covered in a timely manner;
- E. Have the date and time of all final exams during the first week of the semester. (This information is in the Master Schedule.);
- F. Complain if you feel “shortchanged” in the following order:

- a. Step I: Talk to your instructor. If not resolved,
- b. Step II: talk to the chairperson. If not resolved,
- c. Step III: talk to the Dean of the College of Science and Health.

For complete details refer to University catalog under “Procedure for Investigating Complaints.”

Student Activities

The Math Club

The Math Club, sponsored by the Student Government Association (SGA), is a chapter of the Mathematical Association of America. The club organizes academic and extracurricular activities including social, cultural, educational, career-oriented events and field trips. The club also publishes a newsletter, with articles written by students and faculty. Membership is open to all interested students. For more information, please visit the club web site at <http://euphrates.wpunj.edu/clubs/mathclub/>.

The Women's Math Group and Mentoring Program

The Women's Math Group was formed to encourage and support female students as they prepare for college and careers in the mathematical sciences. The group provides a forum for discussion of issues relating to the difficulties women encounter, and provides a greater understanding of the contributions of women in the mathematical sciences. The group organizes such activities as mathematical and career workshops, lectures with invited speakers, and special events including *Sonia Kovalevsky Day*.

As part of the mentoring program students also participate in a mentoring network and participation in Association for Women in Mathematics (AWM) events.

Membership is open to all interested students and faculty. For further information contact Prof. Donna Cedio-Fengya at 973-720-2316 or by email at fengyad@wpunj.edu, or visit the Group's web site at <http://euphrates.wpunj.edu/clubs/mathwomen/>.

Math Awareness Month

Mathematics Awareness Month is a nationwide celebration to help focus national attention on the need for a solid grounding in mathematics that emphasizes problem-solving skills.

Each year this event concentrates on a particular theme. At William Paterson University, the Department of Mathematics and the Math Club organize the month long program. The program consists of a series of talks given by students, faculty and guest speakers, to highlight the contributions that mathematicians have made to our society, and to mark the significance of Mathematics in our daily life. The program also includes a problem solving contest, social events, computer demonstrations, career information, informal interaction among students, faculty, alumni and mathematicians in science, business, industry, etc.

Students Awards

The Department of Mathematics has two student awards that are presented at the end of the Spring semester. Each consists of a cash award and a certificate.

- a. An award for academic excellence is given to the student(s) with the highest overall GPA and excellence in research or inquiry-based studies.
- b. An award for service to the department and extra-curricular activities given to the student(s) who has contributed significantly to the department.

Faculty members of the Math Department nominate students for the awards and the Department Council makes the final decision.

Seminar Program

The Math Department sponsors a seminar program in various topics of Mathematics. Students are encouraged to attend these presentations.

Membership in Professional Organizations

The Mathematics Department supports memberships in the *American Mathematical Society* (AMS), the *Mathematical Association of America* (MAA), the *Association for Women in Mathematics* (AWM), *American Statistical Association* (ASA) and the *Society for Industrial and Applied Mathematics* (SIAM). Each year three students are sponsored for membership in AWM. Memberships to MAA, ASA or AMS are possible at the students' request. The Provost's office provides limited funds for students to attend MAA and/or any other applicable conferences.

Pi Mu Epsilon

William Paterson University is a member of Pi Mu Epsilon, a National Mathematics Honor Society. Pi Mu Epsilon, Inc., or PME, is an honorary national mathematics society, was founded on May 25, 1914 at Syracuse University. It is a non-secret organization, whose purpose is the promotion of scholarly activity in mathematics among the students in academic institutions and among the staffs of qualified non-academic institutions.

A person meeting any one of the following five sets of qualifications may be elected to membership by a chapter. This election shall be irrespective of sex, religion, race, or national origin:

1. Undergraduate students who have had at least two years of college mathematics including calculus, who have completed their mathematical work with honor (at least B average), and who are in the top one-third of their class in their general college work.
2. Sophomores who are majoring or intending to major in mathematics, who have completed at least three semesters of college mathematics including one semester of calculus, who have achieved a straight A record in all mathematics courses taken, and, who are in the top quarter of their class in their general work.
3. Graduate students whose mathematical work is at least equivalent to that required of qualified undergraduates, and who have maintained at least a B average in mathematics during their last school year prior to their election.
4. Members of the faculty in mathematics or related subjects.
5. Any persons who have achieved distinction in a mathematical science.

For more information, please contact the faculty advisor Professor Madeleine Rosar at 973 720 3379 or by email at rosarm@wpunj.edu.

Gamma-Lambda Fund

The Gamma-Lambda Fund is a fund in the Department of Mathematics created to support scholarship, book loans, tuition reimbursement and student awards for deserving undergraduate students enrolled in the Mathematics Program.

Computer Lab

The Department has a well-furnished computer laboratory with the latest equipment and software packages. The Lab has several mathematical software packages to enhance learning and allow access to the campus network and to the Internet. The software packages, upgraded on a regular basis, include Mathematica, SAS, SPSS, Matlab, The Geometer's Sketchpad, DPGraph and others, offering the most current trends in Mathematics.

Work Opportunities

The Department of Mathematics encourages work/study students who are math majors to be assigned to the Department in a variety of tasks, ranging from clerical work to tutoring.

Tutors for the Mathematics Learning Center

Prospective tutors must have successfully completed MATH 160 and 161 (or equivalent) with a grade of B⁺ or better. Tutors are to provide help and instruction for students in the following courses:

- MATH 115 - College Algebra
- MATH 116 - Precalculus
- MATH 135 - Algebra, Trig, and Functions
- MATH 140 – Quantitative Math I
- MATH 145 – Quantitative Math II
- MATH 160 - Calculus I
- MATH 161 - Calculus II

For more information, please contact Prof. M. Rosar at 973-720-3379 or by e-mail at rosarm@wpunj.edu.

Computer Lab Assistants

Prospective computer lab assistants must have a reasonable knowledge of Mathematica® and be familiar with basic computer tasks. Assistants are to provide help to students working in the department's computer lab (S117).

For more information, please contact Prof. W. Lim at 973-720-3412 or by e-mail at limw@wpunj.edu.

Office Assistants

Prospective office assistants must be eligible for work/study positions. For more information, please contact the chairperson, Prof. M. Zeleke at 973-720-2158 or by e-mail at zelekm@wpunj.edu.

Academic Regulations and Policies

Every student is expected to know and comply with all policies and regulations stated in the University catalog, in the Student Handbook and in each semester's Master Schedule of Courses. Students are also expected to be aware of and responsible for their scholastic standing at all times, including their cumulative and major grade point average, number of credits completed and their progress toward meeting the specific graduation requirements for their chosen degree.

- **Attendance Policy**
Students are expected to attend punctually and regularly all classes and are responsible for all work required in courses. The instructor will determine the effect of absences on grades and may permit or deny the privilege of making up the work, including exams, during the semester.
Certain courses such as MATH 115, MATH 116, MATH 135, MATH 160 and MATH 161 have specific attendance requirements. Contact the Department for further details.
- **Advanced Placement Credit Policy**
Students who take the Advanced Placement courses in Calculus and who have received a score of 4 or 5 will be granted 3 credits for the course equivalent of MATH 160 - Calculus I and will be exempt from taking that course.
- **Common Exams for Multiple Sections**
Common exams are administered in the multi-section courses MATH 115, MATH 116, MATH 135, MATH 160, MATH 161.
- **Important Dates**
Dates such as pass/fail option, withdrawal from a course, filing for graduation, field experience, practicum, etc. must be adhered to strictly. No exceptions are made. For more information see <http://ww2.wpunj.edu/admnsrv/pub-info/academiccal.htm>.

Please read *Academic and Related Regulations* at http://ww2.wpunj.edu/catalog/undergrad_2001_03/CatalogFront/AcademicRegulations.pdf for details on the following topics:

- **Academic Integrity Policy**
- **Pass/Fail Policy**
- **Procedure for Retaking Courses**
- **Appeal of Grade Procedure**
- **The College Level Examination Program (CLEP)**
- **Course Substitution Policy**
- **Incomplete Grades**
- **Independent Study**
- **Off-Campus Courses,**

Advisement

William Paterson University has adopted an academic advising system that will assist you in attaining educational excellence and in developing abilities for lifelong independent learning. This system helps you to achieve your personal, academic, career and professional goals.

All students who have declared a major in the Department of Mathematics will be assigned a faculty advisor within the Department.

Students must meet at least twice a semester with their advisors to discuss their progress, develop curriculum plans, and receive other help with any aspect of university life. There is a direct link between academic advisement and student success in choosing the best courses and, eventually, the best career.

To learn more about the University advisement model, please read about the following topics:

- What is An Advisor?
- Who is my Advisor?
- Students Roles and Responsibilities
- Faculty Roles and Responsibilities,

which are part of the **Student Guide to Advisement**, found at the *Advisement Services* website: <http://www.wpunj.edu/academics/advisement/>

Faculty and Research Interests

Faculty	Office	Phone	Research Interest
Eliana Antoniou Assistant Professor Ph.D., New Jersey Institute of Technology	S 350	3715	Modeling in Biological Systems
Donna Cedio-Fengya Assistant Professor Ph.D., Rutgers University	S 336D	2316	Numerical Partial Differential Equations
Zhiqiang (Peter) Chen Professor Ph.D., University of Connecticut, Storrs	S 363	3382	Statistics Probability
Eleanor Goldstein Professor Ph.D., City University of New York	S 365	2262	Differential Geometry
Mahendra Jani Professor Ph.D., City University of New York	S 361	2159	Algebraic Topology Enumerative Combinatorics
Diane Kalish Associate Professor Ph.D., City University of New York	S 359	2376	Differential Geometry
Wooi K. Lim Assistant Professor Ph.D., The University of Southwestern Louisiana	S 342	3412	Statistics
Marcelo Llarull Professor Ph.D., State University of New York, Stony Brook	S 348	2291	Differential Geometry
Sandeep Maheshwari Professor D.Sc., Washington University, St. Louis	S 353	2327	Discrete Mathematics Optimization Theory
Carl Mancuso Assistant Professor M.A., Montclair State College	S 345	2674	Public Education System Math Education
David Miller Professor Ph.D., New York University (Courant Institute)	S 355	3386	Geometric Topology
David Nacin Assistant Professor Ph.D., Rutgers University	S 346	3380	Noncommutative Algebras

Faculty	Office	Phone	Research Interest
Eswar Phadia Professor Ph.D., Ohio State University	S 351B	3385	Mathematical Statistics
Madeleine Rosar Assistant Professor Ph.D., New York University (Courant Institute)	S 357	3379	Numerical Partial Differential Equations
Omar Saldarriaga Assistant Professor Ph.D., State University of New York, Binghamton	S 340	3381	Lie Algebras & Associative Algebras
Melkamu Zeleke Associate Professor Ph.D., Temple University	S 336C	2574	Enumerative Combinatorics Number Theory

College of Science and Health Reference

Sandra DeYoung, Dean
Steven Vail, Interim Associate Dean
Science 317, Tel: 2194

Department	Chairperson	Department	Chairperson
Biology Science 434A Tel: x-3441	E. Gardner	Environmental Science & Geography Science 434A Tel: x-2589	R. Pardi
Chemistry and Physics Science 434D Tel: x-2470/3463	G. Gerardi	Exercise & Movement Science Gym 132 Tel: x-2790	G. Schimdt
Communication Disorders Hunziker Wing 6C Tel: x-2208/2209	C. Gelfer	Mathematics Science 104C Tel: x-2158	M. Zeleke
Community Health Hunziker Wing 132 Tel: x-3478	J. Hayden	Nursing Hunziker Wing 106 Tel: x-3494	J. Bliss
Computer Science T 115 Tel: x-2960	J. Najarian		