DE LA SALLE UNIVERSITY – MANILA
COLLEGE OF SCIENCE
Mathematics Department

SYLLABUS

COURSE CODE	MTH665M/D
COURSE TITLE	Combinatorics of Finite Geometries
CLASS DAY & TIME	
ROOM	
NAME OF FACULTY	
COURSE CREDIT	3 units
CONTACT NO. (DEPT)	(02) 536-0270, (02) 524-4611 loc. 420/413
TERM/SCHOOL YEAR	

COURSE DESCRIPTION

Combinatorial Geometry is an introduction to the study of Finite Geometry using combinatorial techniques. It lays the basic foundation for 'classical' synthetic geometry with the inclusion of topics such as near linear spaces, linear spaces, projective spaces and affine spaces. An introduction to newer geometries, namely partial geometries, is included and their reinterpretation as strongly regularly graphs is discussed.

COURSE OBJECTIVES

The students will:

1. define and give example of a near-linear space, linear space, projective space, affine space, strongly-regular graph and partial geometry.
2. distinguish isomorphic spaces.
3. construct a projective plane from a given finite field,
4. illustrate Desargues' configuration,
5. construct an affine plane from a given projective plane, and conversely, construct the projective completion of a given affine plane.
6. justify nonexistence of certain spaces using known results on parameters,
7. exhibit capability for dealing with abstract concepts by proving theorems.
8. Exhibit values like:
    - cooperation through group study;
    - honesty by claiming credit only for the work he has done;
    - zeal and seriousness of intent to learn by participating actively in class discussions, doing homework regularly and consulting with his mentor;
    - patience, perseverance and diligence by solving assigned exercises completely;
    - faith in doing what is right and giving his best in performing any assigned task;
    - show concern for the community through sharing of know-how and resources during group discussions; and
    - self-reliance by being able to solve problems independently.

Topic/Subtopic	Learning Strategies/ Activities	Week/Meeting/ Hours
I. NEAR –LINEAR SPACES 1. Definition and examples 2. New near-linear spaces from old 3. Subspace 4. Basis and dimension 5. Some properties of finite near-linear spaces 6. Isomorphism	Lecture-Discussions Problem Solving	Weeks 1-3
II. LINEAR SPACES 1. Definition and examples 2. The exchange property 3. An inequality 4. The case of equality	Lecture-Discussions Problem Solving	Weeks 4-7
MIDTERM EXAMINATION		Week 8
III. PROJECTIVE AND AFFINE SPACES 1. Definition and examples of projective planes 2. Order and dimension of a projective plane 3. Construction of a projective plane from a field 4. Desarguesian plane 5. Definition and examples of affine plane 6. Connection between projective and affine plane 7. Projective and affine spaces	Lecture-Discussions Individual/Group Reporting	Weeks 9-13
IV. GRAPH* 1. Definition and examples 2. Strongly regular graph	Individual/Group Reporting	
V. PARTIAL GEOMETRY* 1. Definition and examples 2. Parameters of a partial geometry 3. Point graph and line graph of a partial geometry 4. Pasch's Axiom and Diagonal Axiom	Individual/Group Reporting	
FINAL EXAMINATION		Week 14

*OPTIONAL

TEACHING STRATEGIES/METHODOLOGY

To achieve the course objectives, a combination of lecture, group discussion and solutions of problem sets will be used. For the research requirements, students are advised to access the databases included in the reading list below.

REQUIREMENTS OF THE COURSE

- **Problem Sets.** A problem set consists of at least two problems given at the end of each class meeting and is due for submission the following meeting. Late submission of a problem set is allowed but with corresponding demerit and only up to 5 days since its due date.

- **Midterm Exam**. The midterm exam is a sit-in, three-hour examination with a total of 100 points.
- **Final Exam**. The final exam is a comprehensive, sit-in, three-hour examination with a total of 100 points.

ASSESSMENT / EVALUATION

The computation of the final grade will be based on the following: problem sets 1/3, midterm exam 1/3, and final exam 1/3. A master student must get a minimum of 60% (or 2.0) to get graduate credit for the course. A doctoral student must get at least 70% (or 2.5) for graduate credit.

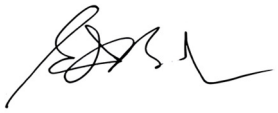
TEXTBOOK

- Batten, Lynn Margaret, *Combinatorics of Finite Geometries,* Second Edition, Cambridge University Press, Cambridge 1997.

REFERENCES & READING LIST

- Gallian, Joseph, *Contemporary Abstract Algebra,* 4th ed**.,** Houghton Mifflin Co., USA 1998.
- Hughes, D.R and Piper, F.C. *Projective Planes,* Springer-Verlag., New York 1973.
- Lam, C.W.H., Kolesova., G. and Thiel, L., *A computer search for finite projective planes of order 9 Discrete Mathematics,* 92 (1991) 187 – 195.
- Lam, C.W. H. Thiel. L., and Swiercz, S., *The non-existence of finite projective planes of order 10*, Canadian Journal of Mathematics 41 (1989) no. 6, 1117 – 1123.
- Lang, Serge, *Algebra,* 3rd ed., Addison – Wesley Publishing Co. USA 1993.
- Room, T.G. and Kirkpatrick, P.B. *Mini Quaternion Geometry: An Introduction to the Study of Projective Planes,* Cambridge University Press, Cambridge 1971.
- Snaith, Victor P. **G***roups, Rings and Galois Theory,* World Scientific Publishing Co. Singapore 1998.

Noted by:



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