

MATH 7230: Partitions, Hypergeometric  $q$ -series and Modular Forms  
Spring 2017

Lectures: Lockett 111, TTh 10:30 – 11:50

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| <b>Professor:</b> Karl Mahlburg  | <b>Office:</b> Lockett 320           |
| <b>Office Hour:</b> T 12:00  | <b>E-mail:</b> mahlburg@math.lsu.edu |
| <b>Webpage:</b> <a href="http://www.math.lsu.edu/~mahlburg">www.math.lsu.edu/~mahlburg</a> |                                      |

**Website** All important course information, including lecture information, homework assignments, and other announcements will be found on the course website. Most announcements will also be sent by e-mail. Please check frequently!

**Textbook** George Andrews, *The Theory of Partitions, 2nd edition*, Cambridge University Press, 1998.

We will cover material from Chapters 1 – 10 of Andrews' book. You will also be provided with a significant amount of supplemental reading sources.

**Content** This course gives an introduction to integer partitions and their many applications, as well as the deep connections to basic hypergeometric  $q$ -series and modular forms. Topics will include simple combinatorial properties, including generating functions; Jacobi's Triple Product, the Rogers-Ramanujan identities, and other results from basic hypergeometric  $q$ -series; Ramanujan's congruences and other arithmetic properties; The Hardy-Ramanujan asymptotic expansion and other analytic properties; the role of theta functions and modular forms; applications in group theory and representation theory.

**Prerequisites** You must have completed MATH 7210: Algebra I in order to enroll in this course. Complex analysis at the undergraduate level (MATH 4036) is also helpful.

**Schedule** Due to University holidays, class will **not** be held on Tuesday, Feb. 28; Tuesday, Apr. 11; or Thursday, Apr. 13. If you are unable to attend the regularly held office hours, you may also schedule an appointment.

**Homework** Your grade will be based on weekly homework assignments. Regular attendance and participation during lectures is also expected.

Homework assignments will be due on most Thursdays throughout the semester. There will be approximately 8 – 10 assignments, containing a total of at least **40** problems. Your course grade will be determined on a scale of **20** problems, with your total grade determined as follows:

| Grade | Homework Problems completed |
|-------|-----------------------------|
| A     | 18 – 20                     |
| B     | 16 – 18                     |
| C     | 14 – 16                     |
| D     | 12 – 14                     |
| F     | Less than 12                |

You therefore have the choice to work on the problems that interest you the most. However, you must complete **at least one** problem from each assignment in order to receive credit. If you skip an assignment, your grade may be lowered by one step on the plus/minus scale.

**Group Work** You are allowed, and even encouraged to work in small groups on homework assignments, subject to the following conditions:

1. You must list the names of all of the other students with whom you discussed the problems at the top of your assignment;
2. You must write up your own solutions using your own words and arguments.

**Conduct** LSU students are expected to maintain high standards of academic integrity. Any incidences of suspected cheating on exams and quizzes will be reported directly to the Judicial Affairs Division in the Dean of Students Office; offenses can result in loss of course credit or expulsion from the university. Instances of direct copying on homework assignments will result in loss of credit for **both** students involved.

Scientific calculators and touchscreen or stylus computers are allowed *solely* for note-taking. Cell phones, MP3 players, and all other electronic devices are not allowed in the classroom at any time.