Title of Course: Abstract Algebra
Class Hours: 3

MAT 320 - ____________
Laboratory Hours per Week: ____________

Semester ___________________________

Instructor Information (Phone#, Office#, email):

Credits: 3

Course Description: The course covers the standard material comprising sets, mappings, relations, operations, groups, subgroups, factor groups, homomorphisms, Sylow theorems, rings, fields, ideals, factor rings and rings of polynomials.

Basic Skills: Students will be introduced to the nature of mathematical abstraction and formal proofs. The syllabus presents the standard content of similar courses and designed to be transferable to four-year institutions.

Prerequisites: Linear Algebra (MAT315) or the equivalent with departmental approval. The course is open to all students of the A.S. program in Mathematics who satisfy course prerequisites or by Departmental approval.

Corequisites: Linear Algebra (MAT315) or the equivalent with departmental approval.

<table>
<thead>
<tr>
<th>Course Student Learning Outcomes (Students will be able to…)</th>
<th>Measurements (means of assessment for student learning outcomes listed in first column)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identify major algebraic structures including groups, rings and fields.</td>
<td>1. Homework assignments and/or take home projects: Quizzes and/or Midterm Exams: Final Exam.</td>
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<tr>
<td>2. Operate in modular arithmetic and apply Little Fermat’s theorem.</td>
<td>2. Homework assignments and/or take home projects: Quizzes and/or Midterm Exams: Final Exam.</td>
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<tr>
<td>3. Prove and use the homomorphism theorem.</td>
<td>3. Homework assignments and/or take home projects: Quizzes and/or Midterm Exams: Final Exam.</td>
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<td>4. Prove and use Lagrange’s theorem and Sylow theorems on finite groups.</td>
<td>4. Homework assignments and/or take home projects: Quizzes and/or Midterm Exams: Final Exam.</td>
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<tr>
<td>5. Perform calculations involving the two binary operations in a ring of polynomial.</td>
<td>5. Homework assignments and/or take home projects: Quizzes and/or Midterm Exams: Final Exam.</td>
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</table>
Below are the college’s general education learning outcomes, the outcomes that are checked in the left-hand column indicate goals that will be covered and assessed in this course. (Check at least one.)

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<tr>
<th>General Education Learning Outcomes</th>
<th>Measurements (means of assessment for general education goals listed in first column)</th>
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<td>Communication Skills- Students will be able to write, read, listen and speak critically and effectively.</td>
<td>Assignments and/or the home projects; exams and/or midterm exams; Final exam</td>
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<tr>
<td>Quantitative Reasoning- Students will be able to use quantitative skills and the concepts and methods of mathematics to solve problems.</td>
<td>Assignments and/or the home projects; exams and/or midterm exams; Final exam</td>
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<tr>
<td>Information &amp; Technology Literacy- Students will be able to collect, evaluate and interpret information and effectively use information technologies.</td>
<td>Assignments and/or the home projects; exams and/or midterm exams; Final exam</td>
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</table>


 Other Resources: 

 Use of Technology (If Applicable): 

 Evaluation and Requirements of Students: At the beginning of the semester, the instructor will advise the student of the determination of the final grade, which will be based on class work, tests, and the final examination. Students are required to attend all scheduled classes.
Outline of Topics:

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<td><strong>Chapter 1: Groups and Subgroups</strong></td>
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<td>1. Introduction and Examples</td>
<td>11 - 18</td>
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<td>2. Binary Operations</td>
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<td>3. Isomorphic Binary Structures</td>
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<td>4. Groups</td>
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<td>5. Subgroups</td>
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<td>6. Cyclic Groups</td>
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<td>7. Generators and Cayley Digraphs</td>
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<td><strong>Chapter 2: Permutations, Cosets, and Direct Products</strong></td>
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<td>8. Groups of Permutations</td>
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<td>9. Orbits, Cycles, and the Alternating Groups</td>
<td>87 - 93</td>
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<td>10. Cosets and the Theorem of Lagrange</td>
<td>96 - 101</td>
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<td>11. Direct Products and Finitely Generated Abelian Groups</td>
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<td>12. Plane Isometries (optional)</td>
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<td><strong>Chapter 3: Homomorphisms and factor groups</strong></td>
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<td>13. Homomorphisms</td>
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<td>14. Factor Groups</td>
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<td>15. Factor-Group Computations and Simple Groups</td>
<td>144 - 151</td>
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<td>16. Group Action on a Set</td>
<td>154 - 159</td>
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<td>17. Applications of G-Sets to Counting (optional)</td>
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<td>18. Rings and Fields</td>
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<td>20. Fermat's and Euler's Theorems</td>
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<td>21. The Field of Quotients of an Integral Domain</td>
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<td>23. Factorization of Polynomials over a Field</td>
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<td><strong>Chapter 5: Ideals and Factor Rings</strong></td>
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<td>25. Ordered Rings and Fields</td>
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<td>26. Homomorphisms and Factor Rings</td>
<td>237 - 243</td>
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<td>27. Prime and Maximal Ideas</td>
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Chapter 6: Extension Fields

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30. Vector Spaces 274 - 280
31. Algebraic Extensions 283 - 291
32. Geometric Constructions (optional) 293 - 318

Chapter 7: Advance group theory

36. Sylow Theorems 321 - 326

College Attendance Policy
At BMCC, the maximum number of absences is limited to one more hour than the number of hours a class meets in one week. For example, you may be enrolled in a three-hour class. In that class, you would be allowed 4 hours of absence (not 4 days). In the case of excessive absences, the instructor has the option to lower the grade or assign an F or WU grade.

Academic Adjustments for Students with Disabilities
Students with disabilities who require reasonable accommodations or academic adjustments for this course must contact the Office of Services for Students with Disabilities. BMCC is committed to providing equal access to all programs and curricula to all students.

BMCC Policy on Plagiarism and Academic Integrity Statement
Plagiarism is the presentation of someone else’s ideas, words or artistic, scientific, or technical work as one’s own creation. Using the idea or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism. Students who are unsure how and when to provide documentation are advised to consult with their instructors. The library has guides designed to help students to appropriately identify a cited work. The full policy can be found on BMCC’s website, www.bmcc.cuny.edu. For further information on integrity and behavior, please consult the college bulletin (also available online).