

**SPRING 2006**  
**MTH 474.01 – COMPLEX VARIABLES (3 credit hours)**  
**MWF 12:00-12:50PM BMH C121**

**Instructor:** Dr. Ming Fang, Assistant Professor

**Location:** BMH B-181

**Phone Number:** 823-8867

**E-mail:** [mfang@nsu.edu](mailto:mfang@nsu.edu) (preferred)

**Office Hours:** 9:00-11:00am and 1:00-2:00pm Monday, 11:00-12:00pm Tuesday, 9:00-11:00am, Wednesday and Friday.

**Math Dept.** BMH B168 **Phone:** 823-8820

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**Course Description:**

Treats the fundamentals of analytic function theory. Includes algebra and geometry of the complex numbers, limits, derivatives, Cauchy-Riemann equations, Cauchy's Theorem, Taylor and Laurent series, and contour integration.

**Prerequisite:** Real Analysis (Math 473)

**Course Rationale:**

This course introduces students to complex numbers, their algebra and geometry, the calculus and analysis of complex-valued functions, Cauchy integral theory, the calculus of residues and examples of physical phenomena modeled with complex functions. Additionally, the course will give students practice developing sound logical arguments and communicating in written form, and will help students mature mathematically.

**Goals & Measurable Intended Student Learning Outcomes:**

After completing MATH 474, the student will be able to:

- express complex numbers in both cartesian and polar forms
- identify curves and regions in the complex plane defined by simple formulae
- determine whether and where a function is analytic
- obtain appropriate series expansions of functions

Upon completion of this course, students should be able to perform materials listed in Course Outline at a 70% or better mastery level.

**Course Materials/Requirements/ Required Text:**

Each student must:

1. Attend lectures/demonstrations as I may have you work on problems that are handed in *class*. These problems may be **collected and graded** as the bonus part of homework. If you are absent, you will not have the opportunity to complete the problems. Therefore, attendance is very important to your success in this course. There are other reasons for attending class. For example, my exam questions will (for the most part)

- reflect the examples that I complete in class. **You are responsible for keeping current with *what is covered in class*--not necessarily just what is in the book.**
2. Complete assignments as scheduled by the instructor;
  3. Read textbook.

**Text:** Saff and Snider, *Fundamentals of Complex Analysis with Applications to Engineering and Sciences* 3<sup>rd</sup> edition.

**Primary Method(s) of Instruction / Methods to Engage Students:**

- 1) 3 hour lecture and discussion
- 2) Homework assignments, quizzes, exams

**Course Outline:**

1. Complex Numbers
  - 1.1 The Algebra of Complex Numbers
  - 1.2 Point Representation of Complex Numbers
  - 1.3 Vectors and Polar Forms
  - 1.4 The Complex Exponential
  - 1.5 Powers and Roots
2. Complex Functions
  - 1.1 Functions of a Complex Variable
  - 1.2 Limits and Continuity
  - 1.3 Analyticity
  - 1.4 Cauchy-Riemann Equations
  - 1.5 Harmonic Functions
3. Elementary Functions
  - 3.1 Polynomial and Rational Functions
  - 3.2 The Exponential, Trigonometric, and Hyperbolic Functions
  - 3.3 The Logarithmic Function and Its Branches
  - 3.5 Complex Powers
4. Integrals
  - 4.1 Contours
  - 4.2 Contour Integrals
  - 4.3 Independence of Path
  - 4.4 Cauchy Theorem
  - 4.6 Liouville's Theorem and The Fundamental Theorem of Algebra
5. Series
  - 5.1 Sequences and Series
  - 5.2 Taylor Series
  - 5.3 Power Series

- 5.5 Laurent Series
- 5.6 Zeros and Singularities

*The outline is subject to change at the discretion of the instructor or depending upon the progress of the class.*

**Related University-Wide and Course- Specific Requirements**

- **Writing:** The student will have a number of computer project in which there will be reports completed.
- **Information Technology Literacy:** Students are encouraged to communicate (outside of class) with the professor or classmates through electronic means. Matlab and Maple can be used effectively for projects in this course. You are required to explore various websites to gain a better understanding of those software because they are a secondary technology.
- **Quantitative Reasoning:** Most of the math concepts have applications that require quantitative reasoning.
- **Scientific Reasoning:** Most of the math applications require the use of scientific reasoning.
- **Oral Communication:** The student demonstrates this through classroom discussions and explanations at the board.
- **Critical Thinking:** Most of the math concepts and applications require critical thinking.

**Evaluation:** Course grades are determined as follows:

|          |            |
|----------|------------|
| Homework | 100 points |
| Exams    | 100 points |
| Total    | 200 points |

**Grading Standards:**

The following grades are guaranteed if you earn the corresponding percentage of the total points by the end of the semester:

|         |        |        |        |        |           |
|---------|--------|--------|--------|--------|-----------|
| 90-100% | 87-89% | 84-86% | 80-83% | 77-79% | 74-76%    |
| A       | A-     | B+     | B      | B-     | C+        |
| 70-73%  | 67-69% | 64-66% | 60-63% | 57-59% | Below 56% |
| C       | C-     | D+     | D      | D-     | F         |

*The instructor reserves the right to revise the grading criteria as appropriate and will make*

*reasonable attempts to notify students as time permits.*

Class Policies And Procedures:

1. **Make-up Tests/Quizzes.** Tests can be made up with a valid excuse and **PRIOR** to the return of the Test/Quiz papers (usually before the next class period).
2. **Cheating of any kind will not be tolerated and will result in an automatic grade of “F” for the semester (further disciplinary actions may be taken by the university).**

### **ACADEMIC INTEGRITY POLICIES:**

Students are expected to attend all class sessions. Further information regarding academic or academically related conduct and disciplinary procedures and sanctions regarding misconduct may be obtained by consulting the NSU Student Handbook.

### **Americans With Disabilities Act (ADA) Statement**

In accordance with section 504 of the 1973 Rehabilitation Act and the Americans with Disabilities Act (ADA) of 1990, if you have a disability or think you have a disability please make contact with Supporting Students through Disability Services (SSDS) Office.

**Location:** 2<sup>nd</sup> floor/Lyman B. Brooks Library, Room 240

**Contact Person:** Marin E. Shepherd, Disability Services Coordinator

**Telephone:** 823-2014

### **University Assessment Statement**

As part of NSU's commitment to provide the environment and resources needed for success, student may be required to participate in a number of university-wide assessment activities. The activities may include tests, surveys, focus groups and interviews, and portfolio reviews. The primary purpose of the assessment activities is to determine the extent to which the university's programs and services maintain a high level of quality and meet the needs of the students. Students will not be identified in the analysis of results. Unless indicated otherwise by the instructor, results from University assessment activities will not be computed in the student grades.

