Course Specification

Institution: **University of Dammam**

College/Department: **College of Sciences – Girls Campus - Dammam**

A Course Identification and General Information

1. Course title and code: **Complex Analysis , Math 444**
2. Credit hours : **3**
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) **Bachelor in Mathematics**
4. Name of faculty member responsible for the course **A specific team from the mathematics department**
5. Level/year at which this course is offered: **8th level**
6. Pre-requisites for this course (if any): **real analysis**
7. Co-requisites for this course (if any): **There is no co-requisites**
8. Location if not on main campus: **College of Sciences – Girls Campus – Ryan City**

B Objectives

1. Summary of the main learning outcomes for students enrolled in the course.

At the conclusion of this unit, the student will be able to:

Know types of analytic functions .

Apply the theory of convergence to analyze sequences and infinite series of functions.

Use the Cauchy theory of complex integration to obtain the power series representation of functions and several of its applications (Liouville's theorem, Fundamental Theorem of Algebra,..)

Compute residues and use them to evaluate real integrals.

Determine explicit conformal maps between given regions and the open unit disk.

2. Briefly describe any plans for developing and improving the course that are being implemented. (eg increased use of IT or web based reference material, changes in content as a result of new research in the field)

Continue to follow the latest books related to the course.

Add websites for the students in order to provide question models and self-tests as much as possible.

Convert the standard course to a digital one.

Update the contents of the course by a continual revision and comparison with similar courses in other universities.

C. Course Description (Note: General description in the form to be used for the Bulletin or Handbook should be attached)

1 Topics to be Covered		
List of Topics	No of Weeks	Contact hours
Complex Numbers, Polar Form, Roots of complex numbers	**3**	**9**
Complex differentiability	**1**	**3**
Cauchy-Riemann differential equations	**1**	**3**
Harmonic functions	**1**	**3**
Geometric properties of complex mappings	**3**	**9**
Contour integration	**3**	**9**
Taylor Series	**2**	6
Laurent Series	**1**	**3**
Residue calculus	**1**	**3**
Conformal Mappings	**1**	**3**

2 Course components (total contact hours per semester):

3. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week)

45 hours/semester

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- **A brief summary of the knowledge or skill the course is intended to develop;**
- **A description of the teaching strategies to be used in the course to develop that knowledge or skill;**
- **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.**

a. Knowledge

(i) Description of the knowledge to be acquired

To recall basic methods and theory in Fundamental properties of analytic functions.
To identify parts of modern analysis which are most useful in applications
To recall The Theory of Convergence and Linear transformations
To use conformal mapping theorem in applications

(ii) Teaching strategies to be used to develop that knowledge

Lectures.
Data analysis.
Explanation.
Discussion.
Self education.

(iii) Methods of assessment of knowledge acquired

Primary trait analysis.
Quizzes.
Written and oral exams.
Homework.
Oral presentation and 3-5 page written report.

b. Cognitive Skills

(i) Description of cognitive skills to be developed

To explain fundamental properties of analytic functions. To apply basic theory of Convergence and residues
To give examples of Linear transformations,
To develop the presentation and writing skills of the students
To develop the problem solving skills of the students in analysis

(ii) Teaching strategies to be used to develop these cognitive skills

Lectures.
Data analysis.
Discussion.
Explanation. Self education.

(iii) Methods of assessment of students cognitive skills

Oral and written tests.
Explain and communicate the corrected answers of the exams and quizzes.
Homework.
Research projects.

c. Interpersonal Skills and Responsibility

(i) Description of the interpersonal skills and capacity to carry responsibility to be developed

Students should demonstrate their sense of responsibility for learning by completing both reading and writing assignments in due time.
Students should act responsibly and ethically in carrying out individual as well as group projects.
Students should participate in class discussion.

(ii) Teaching strategies to be used to develop these skills and abilities

Discussion.
Explanation.
Guidance and supervision of the group assignments for research projects.
Websites visits.
Self study.

(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

Observation.
Interview.
Assignments. Self evaluation.

d. Communication, Information Technology and Numerical Skills

(i) Description of the skills to be developed in this domain.

Ability to communicate in written and in oral.
Ability to explain each step in the problem solving process.
Ability to apply course concepts to mathematical problem solving model.
Ability to use information technology in communication and research projects.

(ii) Teaching strategies to be used to develop these skills

Research projects.
Oral presentations.
Apply software for solving mathematical models discussed during the lectures.

(iii) Methods of assessment of students numerical and communication skills

Periodic written and oral tests.
Discussion.
Observation.

e. Psychomotor Skills (if applicable)

(i) Description of the psychomotor skills to be developed and the level of performance required

N/A

(ii) Teaching strategies to be used to develop these skills

N/A

(iii) Methods of assessment of students psychomotor skills

N/A

5. Schedule of Assessment Tasks for Students During the Semester

Assessment	Assessment task (eg. essay, test, group project, examination etc.)	Week due	Proportion of Final Assessment
1	**Major 1**	**4**	**10%**
2	**Major 2**	**8**	**10%**
3	**Major 3**	**12**	**10%**
4	**Final**	**As scheduled by the registrar**	**50%**
5	**Homework**	**Every two weeks**	**15%**
6	**Research project**	**Last week**	**5%**

D. Student Support

1. Arrangements for availability of teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

Office hours : 2 hours/week

E Learning Resources

1. Required Text(s)

Brown and Churchill, Complex Variables and Applications,6th Ed.,McGraw-Hill,1996

2 Essential References

3- Recommended Books and Reference Material (Journals, Reports, etc) (Attach List)

J.E. Marsdeen and M.J. Hoffman., Complex Analysis, W H Freeman (August 20, 1999).

M.J. Ablowitz and A.S. Fokas., Complex Variables, Introduction and Applications, Cambridge Texts in Applied Mathematics ,No.16,1999

4-.Electronic Materials, Web Sites etc

Listed in the black board of the course.

5- Other learning material such as computer-based programs/CD, professional standards/regulations

Tex typesetting program and Mathematica and/or Maple software

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Lecture rooms, laboratories, etc.) **Lecture room with 20 seats.** **Smart class.**
2. Computing resources **Computer room with at least 10 systems** **Computer room with 20 seats**
3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list) **N/A**

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching

Course evaluation form.
Teachers-students periodical meeting.
Student representation on faculty committees. Student group discussion.
One to one student interviews.

2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department

Faculty annual evaluation including teaching by the instructor and by the department.
Bulletin boards, e-mails, online survey.

3 Processes for Improvement of Teaching

Attendance of workshops in teaching methods and strategies. Attendance of workshops in evaluation methods.
Periodical revision of the course outcomes.

3. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution)

A Committee reviews samples of student work in this course to check on the standard of grades and achievements.
An external faculty member evaluates the course material and the students' work to compare the standard of grades and achievements with those at his university.

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

Self- assessment at every two years and the external assessment by the invited faculty member at every four years will be carried out. The feedback received from these assessments will be used to plan for further improvement in the course syllabus, teaching method, and delivery of course materials.