

**King Fahd University of Petroleum and Minerals**  
**Department of Mathematics & Statistics**  
**Math 430 – Syllabus**  
**2011-2012 (111)**  
**Coordinator: Dr. Adel Khalfallah**

<b>Title:</b>	Introduction to Complex Variables
<b>Credit:</b>	3 – 0 – 3
<b>Textbook:</b>	E.B. Saff, A.D. Snider, <i>Fundamentals of Complex Analysis</i> (3rd ed.), Prentice Hall, 2003.
<b>Prerequisites:</b>	Familiarity with the concepts from Math 201 (Calculus III) is very helpful: <i>convergence criteria</i> for sequences and series, <i>polar coordinates</i> in $\mathbb{R}^2$ , <i>directional derivatives</i> of functions in two real variables.  Students are <i>strongly encouraged</i> to review these notions.
<b>Objectives:</b>	Upon completing this course students are expected, <i>at least</i> , to be able to:  (1) Perform basic arithmetic with complex numbers. (2) Use CR equations to test for analyticity and compute a derivative. (3) Work with standard complex functions (mapping properties, derivatives). (4) Compute contour integrals using definition and Cauchy integral theorems. (5) Compute Taylor and Laurent series expansions of functions. (6) Apply the Residue Theorem, especially for evaluating real definite integrals.
<b>Grading policy:</b>	<b>Class-Work : 20% (Quiz = 10% + HW = 10% )</b> <b>Exam 1 : 25%</b> <b>Exam 2 : 25%</b> <b>Final Exam : 30%</b>
<b>Homework:</b>	The only way to <i>learn</i> mathematics is <i>to do</i> mathematics. The homework assignments <i>will be collected</i> once a week (on Saturday) <i>in the class</i> .
<b>Attendance:</b>	A <b>DN grade</b> will be given according to the regulations written in the Undergraduate Bulletin (pp. 38).
<b>Missing an Exam:</b>	There will be <i>no makeup quiz/exam</i> under any circumstance.  If a student misses a quiz/an Exam for a legitimate, his grade for this quiz/exam will be determined on the basis of his average performance in the quizzes.  Moreover, in such cases students <i>must provide an official excuse within 14 days</i> of the missed quiz/exam.

## Timetable

Week	Date	Section	Topics	Exercises
<b>1</b>	10.09 – 14.09	1.1	The algebra of complex numbers	3, 4, 5ac, 16bd, 20ad, 21, 30
		1.2	Representation of complex numbers	1, 5, 7cdfg, 11, 16
		1.3	Vectors and Polar Forms	1b, 3, 5, 7b,d,h, 8, 10b, 19
<b>2</b>	17.09 – 21.09	1.4	The Complex Exponential	4ac, 7, 11, 12b, 20ab, 23a
		1.5	Powers and Roots	3, 4b, 6c, 7b, 10, 11, 16
		1.6	Planar Sets	2-8, 11, 15-17, 19, 20
<b>24.09</b>		<b>National Day-Holiday</b>		
<b>3</b>	25.09 – 28.09	1.7	The Riemann Sphere	1bc, 2, 5a-c, 6, 9
		2.1	Functions of a Complex Variable	4, 5, 7ab, 8ab, 10, 13
		2.2	Limits and Continuity	1, 2, 4, 5, 7, 11, 12
<b>4</b>	01.10 – 05.10	2.3	Analyticity	2, 3, 4c, 6, 7, 9ac, 11
		2.4	The Cauchy-Riemann Equations	2, 5, 6
		2.5	Harmonic Functions	3acef, 6, 9, 12, 14, 17ab
<b>5</b>	08.10 – 12.10	3.1	Polynomial & Rational Functions	3ac, 5ab, 7, 11ac, 13b, 17
		3.2	Exp. & Trig. Functions.	2, 3, 5bdf, 9acd, 11, 17, 18b
<b>Major Exam I (25%)</b>				
<b>6</b>	15.10 – 19.10	3.3	The Logarithmic Function.	3, 4, 6, 7, 11, 14, 19
		3.5	Power and Inverse Trig. Functions	1ae, 3ab, 4, 5, 8, 12, 15ab, 16
<b>7</b>	22.10 – 26.10	4.1	Contours	1bd, 3, 5, 8, 13abd
		4.2	Contour Integrals	3abd, 5, 7, 11, 14ac
<b>8</b>	29.10 – 31.10	4.3	Independence of Path	2, 4, 5, 7, 10
		4.4	Cauchy's Integral Theorem	6, 7a, 9 all, 10c, 13, 17
<b>01.11 – 11.11</b>		<b>Eid El-Adha Break</b>		
<b>9</b>	12.11 – 16.11	4.5	Cauchy Formula & Consequences	4, 5, 8, 11, 13, 16
		4.6	Bounds for Higher Derivatives	2, 3, 4, 7, 8, 10, 16
<b>10</b>	19.11 – 23.11	5.1	Sequences and Series	1cdf, 4, 5, 9, 11b,c,d, 14
		5.4	Convergence	1, 3bef, 5acd, 9, 10
		5.2	Taylor Sequences	1, 3, 4, 5, 11, 13
<b>Major Exam II (25%)</b>				
<b>11</b>	26.11 – 30.11	5.3	Power Sequences	1, 2, 3adfg, 6, 10, 12, 15
		5.5	Laurent Series	1, 2, 5, 9
<b>12</b>	03.12 – 07.12	5.6	Zeros and Singularities	1, 3ab, 4, 7, 12
		5.7	The Point at Infinity	1a,e,h, 3c, 5, 6, 7
		6.1	The Residue Theorem	1, 2, 3ceg
<b>13</b>	10.12 – 14.12	6.3	Improper Integrals over $\mathbb{R}$	1, 2, 7, 9, 10
		6.2	Trig. integrals over $[0, 2\pi]$	1, 4, 7, 11
		6.4	Improper Integrals with Trig. Fcts.	1, 5, 6, 10
<b>14</b>	17.12 – 21.12	6.7	Rouche's Theorem	1c-e, 3, 7, 8, 10, 13, 18
<b>15</b>	24.12 – 28.12		Review of the material	
<b>Final Exam (30%)</b>				