



**University of Tehran**  
**School of Electrical and Computer Engineering**

<b>Course:</b>	<b>8101۲۰۳ – Advanced Engineering Mathematics</b>									
<b>Course type:</b>	EE*						CE*			Credit: 3
	Com	E	P	B	Con	D	SW	HW	IT	
	Required	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Elective	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>Level:</b>	Undergraduate <input type="checkbox"/> Graduate <input checked="" type="checkbox"/>									
<b>Co-requisite(s):</b>	None									
<b>Prerequisite(s):</b>	Engineering Mathematics (8101206)									
<b>Prerequisite by topic:</b>	Partial Differential Equations, Fourier Analysis, Functions of a Complex Variable									
<b>Textbook(s):</b>	[1] D.G. Dudley, Mathematical Foundations for Electromagnetic theory, IEEE Press, 1994. [2] H.W. Wyld, Mathematical Methods for Physics, Benjamin Inc., 1976, 1979. [3] G. Arfken, Mathematical Methods for Physics, 3rd Ed., Academic Press, 1985. [4] J. Mathews and R.L. Walker, Mathematical Methods of Physics, Benjamin Inc., 1969. [5] R. Courant and D. Hilbert, Methods of Mathematical Physics, Vol. I and II, John Wiley, 1953.									
<b>Coordinator:</b>	Jalil Rashed-Mohassel, Professor, School of ECE									
<b>Goals:</b>	This is a graduate level course covering multiple parts, Sturm-Liouville problems, boundary value problems, generalized functions (distributions), Dirac delta function, the Green's function and spectral representation methods, Poisson's equation, electromagnetic sources in various coordinates, integral equations, asymptotic expansion of integrals, calculus of variations, conformal mapping, Wiener-Hopf technique.									
<b>Outcome:</b>	Upon successful completion of the course, students will be able <ol style="list-style-type: none"> <li>1. to derive Green's functions for different operators,</li> <li>2. to solve different integral equations,</li> <li>3. to use conformal mappings for a number of practical problems,</li> <li>4. to understand calculus of variations.</li> </ol>									
<b>Topics:</b>	1) Sturm-Liouville problems 2) The Green's function									

	3) Spectral representation methods 4) Electromagnetic sources and boundary value problems 5) Integral equations 6) Calculus of variations 7) Conformal mapping
<b>Computer usage:</b>	MATLAB or another programming language of student choice
<b>Assignments:</b>	8 HW assignments
<b>Projects:</b>	One term project Understanding (new) method(s) presented in a journal paper relevant to the course topics and (partial) validation (derivation and simulation) of paper results is regarded as a decent term project.
<b>Grading:</b>	Assignments: 15% Project: 10% Midterm exams: 35% Final exam: 40%
<b>Further readings:</b>	[1] C.T. Tai, Generalized Vector & Dyadic Analysis, IEEE Press, 1992. [2] C.T. Tai, Dyadic Green's Functions in EM Theory, IEEE Press, 1994. [3] P.M. Morse & H. Feshback, Methods of Theoretical Physics, Vol. I&II, McGraw Hill, 1953. [4] C.A. Balanis, Advanced Engineering Electromanetics, John Wiley & Sons, 1989. [5] Arnold Sommerfeld, Partial Differential Equations in Physics, Vol.IV from Lectures on theoretical physics, Academic press, 1949, (Translated by E. Straus) [6] F. B. Hildebrand, <i>Methods of Applied Mathematics</i> , 2 <sup>nd</sup> ed., Prentice-Hall Inc., 1965. [7] C. Bender and S. Orszag, <i>Advanced mathematical methods for scientists and engineers</i> , McGraw-Hill, 1978. [8] R. E. Collin, <i>Field Theory of Guided Waves</i> , McGraw-Hill, 1960. [9] R. Plonsy and R. E. Collin, <i>Principles and Applications of Electromagnetic Fields</i> , McGraw-Hill, 1961. [10] R. Haberman, <i>Applied Partial Differential Equations</i> , 4 <sup>th</sup> ed., Pearson Education, Inc., 2004. [11] Class Notes, Various Journal and Research Papers.
<b>Prepared by:</b>	Mojtaba Dehmollaian
<b>Date:</b>	August 26, 2017

*EE: Electrical Engineering		CE: Computer Engineering	
Com	Communications	SW	Software
E	Electronics	HW	Hardware
P	Power	IT	Information Technology
B	Bioelectronics		
Con	Control		
D	Digital System		

