



NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF SCIENCES
MATHEMATICS PROGRAM

CM414 – FUNCTIONAL ANALYSIS II

I. GENERAL INFORMATION

CODE	: CM414 – Functional Analysis II
SEMESTER	: 8
CREDITS	: 5
HOURS PER WEEK	: 6 (Theory – Practice)
PREREQUISITES	: CM413 Functional Analysis I
CONDITION	: Mandatory

II. COURSE DESCRIPTION

To know and apply the concepts of spectral theory in differential equations, physics, chemistry and engineering.

III. LEARNING UNITS

1. Special Operators

Bounded linear applications / Linear operators / Bilinear forms / Adjoint operators. Projection Operators / Fourier-Plancherel Operator.

2. General Theory of Linear Applicators

Adjoint operators (general case) / Differentiation of operators in L_2 spaces / Multiplication of operators in L_2 spaces / Closed linear operators / Linear operators of an invariant sub space / Eigenvalues of a linear operator / Spectrum of a linear operator and self-adjoint.

3. Spectral Analysis of Compact Linear Operators

Bounded Linear Operators / Weak Sequence Convergence / Spectrum of a Compact Linear Operator / Spectral Decomposition of a Compact self-adjoint Operator / Fredholm's Integral Equation.

4. Spectral Analysis of Bounded Linear Operators

Order relation for self-adjoint bounded operators / Polynomials of bounded linear operators / Continuous functions of bounded self-adjoint operators / Other functions of bounded self-adjoint operators / Spectral decomposition of a bounded self-adjoint

operator / Functions of a unitary operator / Spectral decomposition of a unitary operator / Spectral decomposition of a bounded normal operator.

5. Spectral Analysis of Unbounded Self-Adjoint Operators

Cayley transform / Spectral decomposition of an unbounded self-adjoint operator / Applications.

IV. BIBLIOGRAPHY

- Gilbert Helms, Introduction to Spectral Theory in Hilbert Space.
- Arch Naylor, Linear Operator Theory.
- V.A. Tregogoiun, Problemas y Ejercicios de Análisis Funcional
- Kreyzig, E., Introductory Functional Analysis. With Applications, John-Wiley & Sons.