TEACHING PLAN	
Course Title: Applied Operator Theory	**Duration of Examination: 3 hours**
Course Code: MAMT- 402	**Maximum Marks: 100**
Course Instructor: Dr. Sanjay Kumar	
Unit I	
LECTURE I	Spectral Theory in Finite Dimensional Normed Spaces
LECTURE 2	Eigenvalues, eigenvecotrs, eigenspaces, spectrum, resolvent set of a matrix
TUTORIAL 1	Exercises related to Lecture I and Lecture 2
LECTURE 3	Eigenvalues of an operator, Existence Theorem for eigenvalues
LECTURE 4	Spectral theory for infinite dimensional normed linear spaces, resolvent of an operator
TUTORIAL 2	Examples and exercises related to Lecture 3 and Lecture 4
LECTURE 5	Spectrum of a bounded linear operator on a complex Banach space, Representation Theorem
LECTURE 6	Resolvent equation, commutative properties of resolvent, Spectral Mapping Theorem for polynomials
TUTORIAL 3	Examples and Exercises related to Lecture 5 and Lecture 6
LECTURE 7	Local holomorphy, holomorphy of resolvent operators
LECTURE 8	Spectral radius of bounded linear operators
TUTORIAL 4	Exercises related to Lecture 7 and Lecture 8
Unit II	
LECTURE 9	Definition of normed algebra and Banach algebra with examples
LECTURE 10	Further properties of Banach algebra
TUTORIAL 5	Exercises related to Lecture 9 and Lecture 10
LECTURE 11	Invertible elements, Theorems related to invertible elements
LECTURE 12	Banach-Alaoglu Theorem
TUTORIAL 6	Exercises and examples related to Lecture 11 and Lecture 12
LECTURE 13	Multiplicative linear functional and related theorems
LECTURE 14	Spectrum, resolvent set, spectral radius, division algebra
TUTORIAL 7	Exercise related to Lecture 13 and Lecture 14
LECTURE 15	Gelfand-Mazur Theorem
LECTURE 16	Sepctral Mapping Theorem
TUTORIAL 8	Exercises related to Lecture 15 and Lecture 16
Unit III	
LECTURE 17	Compact linear operator on normed spaces and examples
LECTURE 18	Compactness criterion
TUTORIAL 9	Examples and exercises related to Lecture 17 and Lecture 18

LECTURE 19	Uniform limit of a sequence of compact operators
LECTURE 20	Examples related to lecture 19
TUTORIAL 10	Exercises related to Lecture 19 and Lecture 20
LECTURE 21	Spectral properties of compact linear operators on normed spaces
LECTURE 22	Compactness of product
TUTORIAL 11	Examples and exercises related to Lecture 21 and Lecture 22
LECTURE 23	Finite rank operators
LECTURE 24	Eigenvalues and eigenspaces for compact operators
TUTORIAL 12	Examples and exercises related to Lecture 23 and Lecture 24
Unit IV	
LECTURE 25	Unbounded linear operators and examples
LECTURE 26	Hellinger-Toeplitz Theorem
TUTORIAL 13	Examples and exercises related to Lecture 25 and Lecture 26
LECTURE 27	Densely defined operators
LECTURE 28	Hilbert-Adjoint operators
TUTORIAL 14	Examples and exercises related to Lecture 27 and Lecture 28
LECTURE 29	Inverse of the Hilbert-adjoint operators
LECTURE 30	Symmetrics linear operators
TUTORIAL 15	Examples and exercises related to Lecture 29 and Lecture 30
LECTURE 31	Closed linear operators, closable operator and closure
LECTURE 32	Spectrum of self-adjoint linear operators
TUTORIAL 16	Examples and exercises related to Lecture 31 and Lecture 32
Unit V	
LECTURE 33	Multiplication operators and related theorems
LECTURE 34	Differentiation operators and related theorems
TUTORIAL 17	Examples and exercises related to Lecture 33 and Lecture 34
LECTURE 35	Self-adjoint multiplication operator
LECTURE 36	Theorems related to Lecture 35
TUTORIAL 18	Examples and exercises related to Lecture 35 and Lecture 36
LECTURE 37	Spectrum of multiplication operators
LECTURE 38	States, Observables
TUTORIAL 19	Examples and exercises related to Lecture 37 and Lecture 38
LECTURE 39	Position and moment operators
LECTURE 40	Heisen-berg Uncertainty Principle
TUTORIAL 20	Examples and exercises related to Lecture 39 and Lecture 40
Total Lectures: 40 Total Tutorials: 20 Total = 60	

Text book:

• Erwin Kreyszig, Introductory Functional Analysis with Applications, John Wiley & Sons, USA, 1989.

Reference books:

- Ronald G. Douglas, Banach Algebra Techniques in Operator Theory, Springer-Verlag, New York, 1998.
- John B. Conway, A course in Operator Theory, AMS, 2000.
- Arch. W. Naylor and George R. Sell, Linear Operator Theory in Engineering and Sciences, Springer-Verlag, New York, 2000.