Name of the Teacher: Madhu Garg

Class: M.Sc.2nd Year (3rd Semester), Functional Analysis (Paper –MM 501)

**Lesson Plan**

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| **S No** | **Period** | **Topics to be Covered** | **Academic Activity to be Organized** |
|  | **17-31 July 2017** | **Normed linear spaces, Banach spaces and examples, subspace of a Banach space,**  **completion of a normed space** | **Group Discussion** |
|  | **01-31 Aug 2017** | **quotient space of a normed linear space and itscompleteness, product of normed spaces, finite dimensional normed spaces andsubspaces, equivalent norms, compactness and finite dimension, F.Riesz’s lemma.** | **Oral Presentations** |
|  | **01-30 Sept 2017** | **Inner product spaces, Hilbert spaces and their examples, pythagorean theorem,**  **Apolloniu’s identity, Schwarz inequality, continuity of innerproduct, completion of aninner product space, subspace of a Hilbert space, orthogonal complements and directsums, projection theorem, characterization of sets in Hilbert spaces whose space is dense. Orthonormal sets and sequences, Bessel’s inequality, series related to orthonormalsequences and sets, total(complete) orthonormal sets and sequences, Parseval’s identity,** | **Oral Presentations** |
|  | **01-31 Oct 2017** | **separable Hilbert spaces.Representation of functionals on Hilbert spaces, Riesz**  **representation theorem for bounded linear functionals on a Hilbert space, sesquilinearform, Riesz representation theorem for bounded sesquilinear forms on a Hilbert space.Hilbert adjoint operator, its existence and uniqueness, properties of Hilbert adjointoperators, self adjoint, unitary, normal, positive and projection operators Hahn-Banach theorem for real linear spaces, complex linear spaces and normed linearspaces, application to bounded linear functionals on C[a,b], Riesz-representation theoremfor bounded linear functionals on C[a,b], adjoint operator, norm of the adjoint operator.**  **Reflexive spaces, uniform boundedness theorem and some of its applications to the spaceof polynomials and fourier series** | **Group Discussion** |
|  | **01-13 Nov 2017** | **Bounded and continuous linear operators, differentiation operator, integral operator,bounded linear extension, linear functionals, bounded linear functionals, continuity andboundedness, definite integral, canonical mapping, linear operators and functionals on**  **finite dimensional spaces, normed spaces of operators, dual spaces with examples** | **Test** |

**Topics of Assignments/ Class Tests to be given to the Students:**

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| **Assignment 1** | **series related to orthonormal sequences and sets,** |
| **Assignment 2** | **Apolloniu’s identity, Schwarz inequality, continuity of innerproduct, completion of aninner product space** |
| **Class Test** | **Orthonormal sets and sequences, Bessel’s inequality, series related to orthonormalsequences and sets, total(complete) orthonormal sets and sequences, Parseval’s identity,**  **separable Hilbert spaces.Representation of functionals on Hilbert spaces, Rieszrepresentation theorem for bounded linear functionals on a Hilbert space, sesquilinear form,** |