Name of the Teacher: Chirag Oberoy,

Class: M.Sc. Mathematics (1st Semester), MM-405: Differential Equations –I

**Lesson Plan**

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| **S No** | **Period** | **Topics to be Covered** | **Academic Activity to be Organized** |
|  | **17-31 July 2017** | Preliminaries: Initial value problem and equivalent integral equation, ε-approximate solution, equicontinuous set of functions. Basic theorems: Ascoli- Arzela theorem, Cauchy –Peano existence theorem and its corollary. | **Oral Presentations** |
|  | **01-31 Aug 2017** | Lipschitz condition. Differential inequalities and uniqueness, Gronwall’s inequality. Successive approximations. Picard-Lindelöf theorem. Continuation of solution, Maximal interval of existence, Extension theorem. Kneser’s theorem (statement only) | **Oral Presentations** |
|  | **01-30 Sept 2017** | Linear differential systems: Definitions and notations. Linear homogeneous systems; Fundamental matrix, Adjoint systems, reduction to smaller homogeneous systems. Nonhomogeneous linear systems; variation of constants. Linear systems with constant coefficients. Linear systems with periodic coefficients; Floquet theory. | **Group Discussion** |
|  | **01-31 Oct 2017** | Higher order equations: Linear differential equation (LDE) of order n; Linear combinations, Linear dependence and linear independence of solutions. Wronskian theory: Definition, necessary and sufficient condition for linear dependence and linear independence of solutions of homogeneous LDE. Abel’s Identity, Fundamental set, More Wronskian theory. Reduction of order. Non-homogeneous LDE. Variation of parameters. Adjoint equations, Lagrange’s Identity, Green’s formula. Linear equation of order n with constant coefficients. | **Group Discussion** |
|  | **01-13 Nov 2017** | System of differential equations, the n-th order equation. Dependence of solutions on initial conditions and parameters: Preliminaries, continuity and differentiability. (Relevant portions from the book of ‘Theory of Ordinary Differential Equations’ by Coddington and Levinson) Maximal and Minimal solutions. Differential inequalities. A theorem of Wintner. Uniqueness theorems: Kamke’s theorem, Nagumo’s theorem and Osgood theorem. |  |

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

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| **Assignment 1** | Theorem of Section 2 |
| **Assignment 2** | Numericals of Section 3 |
| **Class Test** | Linear differential systems: Definitions and notations. Linear homogeneous systems; Fundamental matrix, Adjoint systems, reduction to smaller homogeneous systems. Nonhomogeneous linear systems; variation of constants. Linear systems with constant coefficients. Linear systems with periodic coefficients; Floquet theory |