Information of the graduate level course on **Advanced Analysis (MAD002P6E)** at IIT Jammu, India

Course contents:

- Review of topology of metric spaces, limits and continuity of functions defined on metric spaces, differentiability for functions of several real variables. Inverse and Implicit function theorems, the rank theorem and applications. Single and Multiple Riemann integrals, parametric surfaces, tangent plane, surface measure, surface integrals, Green's and Gauss divergence theorems.
- σ-algebra, measures and measurable sets, Borel measure. Measurable functions, simple functions, Integration of non-negative function, Mode's of convergence, Product measure, Egoroff's theorem.
- Lebesgue integral and its properties, monotone convergence theorem, Fatou's Lemma, Dominated convergence theorem, various modes of convergence and their relations. Signed and complex measures, The Lebesgue-Radon-Nikodym Theorem, The Lebesgue-differentiation theorem, Functions of bounded variation and absolutely continuous function.
- Elements of functional analysis: Normed linear spaces, linear functionals, Bair-category theorem and its consequences, Hilbert spaces, L^p spaces: The Minkowski's and Holder's inequalities, completeness of L^p, denseness results in L^p spaces.

Class timing for the course:

- Monday, 4:30 PM to 6:00 PM
- Wednesday, 4:30 PM to 6:00 PM
- Friday, 4:30 PM to 6:00 PM (Tutorial class)

Credit system for the course:

- 20 marks for quizes, Quizzes will be on 24/09/2021, 15/10/2021, 12/11/2021, 03/12/2021 and 24/12/2021.
- 30 marks for Mid-Sem exam. Mid-sem exam will be on November 3, 2021.

- 50 marks for End-Sem exam. End-Sem exam will be January 3, 2022.

References for the course:

1. M. Spivak, Calculus on Manifolds, CRC Press A Chapman & Hall Book, 1965.
2. W. Rudin, Principles of Mathematical Analysis, McGraw-Hill, 1976.
3. G.B. Folland, Advanced calculus, Pearson Education, 2012.
4. G.B. Folland, Real Analysis, Modern Techniques and Their Applications, 2nd edition, A Wiley Interscience Publication, 2007.
5. T. M. Apostol, Mathematical Analysis, Addison-Wesley, 1981.