INTRODUCTION TO ALGEBRAIC TOPOLOGY (PART-II)

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TYPE OF COURSE   : New | Elective | UG I PG
COURSE DURATION : 12 Weeks (26-Jul' 21 - 15-Oct' 21)
EXAM DATE   : 23 Oct 2021

PRE-REQUISITES : Point Set Topology is pre-requisite. Exposure to Basics of Linear algebra and Group theory is preferred. Preferably attended Algebraic Topology Part-I course offered by the same instructor

INTENDED AUDIENCE : Anybody who would like to get trained in Algebraic Topology such as Computer scientists, Electrical , Aerospace engineers and mathematicians, and physicists.

INDUSTRIES APPLICABLE TO : All IIT's, IISERs , TIFR and Universities in India.

COURSE OUTLINE :
As stated above, this is PG level course in Mathematics, which requires basic knowledge of Linear algebra, Point set topology, and group theory. This course is central to many areas in modern mathematics. The subject itself saw tremendous growth during 1950 and currently has attained a matured status. The syllabus I have chosen is common to MA5102 at IIT Bombay and AFS-III program of National Centre for Mathematics. It has enough material common to the syllabus followed by several Universities and IIT's in the country and goes beyond. Nevertheless it has different flavour liked by variety of students. I have published a book in which one-third of the content is roughly the present course. This book is followed by several universities abroad also for their course.

ABOUT INSTRUCTOR :
I am a retired Emeritus Fellow of Department of Mathematics I.I.T. Bombay. After serving in School of Mathematics T.I.F.R. for 16 years I joined I.I.T. Bombay as a full professor in 1988.Apart from several research papers, in Algebraic and Differential Topology, Algebraic Geometry, Relativity theory, Group theory, etc.,I have published three books. Since 2004, I have been constantly involved in the activities of ATM schools. The chief activity of these schools is to impart advanced training in Mathematics to Ph. D. students in various universities and research institutions in the country. These activities were initially funded by NBHM and currently adapted by National Centre for Mathematics, I.I.T. Bombay.

COURSE PLAN :

 Week 1**:** What is Algebraic Topology: Notion of Homotopy.

 Week 2**:** Categories and Functors

 Week 3**:** Basic Homological Algebra

 Week 4**:** Singular Homology

 Week 5**:** Computations with simple objects

 Week 6**:** Review of Simplicial complexes and Simplicial homoloy

 Week 7**:** Euler Characteristic, Lefschetz Number

 Week 8**:** Relation between fundamental groups and 1st homology

 Week 9**:** Applications homology: Brouwer's invariance of domain

 Week 10**:** Applications continued. Lefschetz Fixed point theorem

 Week 11**:** CW complexes and CW homology

 Week 12**:** Discussion for future topics.