

Course Category	TBA	Credits	2
Subject Code	TBA	Taking Year	1 <sup>st</sup> Grade, 2 <sup>nd</sup> Grade
Course Title (Japanese)	代数位相幾何学	Course Period	2 <sup>nd</sup> Semester
Course Title	Algebraic Topology	Day of the week / Hour	Friday / The second period
Registration Code	TBA	Compulsory / Elective	Elective
Instructor(s)	Eiichi Matsuhashi Tadayuki Watanabe	Course Qualification	Students of Postgraduate Mathematics Course

Course Style	Lecture
Course Aim	The aim of this class is to understand basic homology theory. Also, we apply it to prove various classical results such as the the Brouwer fixed point theorem, Hopf theorem, the Lefschetz fixed point theorem.
Goals and Objectives (Level of Achievement)	Understand basics of homology theory and how it is used to prove classical results.
Course Plan	<ol style="list-style-type: none"> <li>1. Introduction</li> <li>2. Simplex, simplicial complex</li> <li>3. Simplicial maps, barycentric subdivision of a simplicial complex</li> <li>4. The simplicial approximation theorem</li> <li>5. The chain groups of a simplicial complex, boundary homomorphisms</li> <li>6. The homology groups of a simplicial complex</li> <li>7. Simplicial maps and induced homomorphisms, connectedness and <math>H_0(K)</math></li> <li>8. Exact sequences, chain complexes</li> <li>9. Mayer-Vietoris Sequence</li> <li>10. The homology of barycentric subdivisions</li> <li>11. Continuous maps and induced homomorphisms, homotopy equivalence</li> <li>12. The homology of projective space</li> <li>13. Maps of spheres, degree of a map</li> <li>14. Hopf theorem</li> <li>15. Lefschetz fixed point theorem</li> <li>16. The Eilenberg-Steenrod axiom</li> </ol>
Teaching Methods	Students will be expected to do homework every week. If you don't, it will negatively affect your grade.
Key Words	Homology groups, Mayer-Vietoris exact sequence, Homotopy equivalence, Lefschetz fixed point theorem, Hopf theorem.
Texts	None
Reference Books	James R. Munkres: Elements of Algebraic Topology, 2002.
Other Teaching Materials	Further references and materials will be given in class.
Performance Evaluation	Grading is based on reports and class attendance.
Notes on the Course	The formal requirements are some basic algebra and point-set topology.
Office Hour	To be announced
Other Notes	None