

Year	First semester 2026
Course	Mathematics B
Day/Period	Thu.1Period
Credit(s)	2Credits
Instructor	MASAKI HANAMURA,FUMIHIKO NAKANO,TAKUMI YOKOTA
Eligible Participants	Undergraduate 3rd grade./Undergraduate 4th grade
Course code/number	SMA-MAT802E
Main Subjects	
Course of Media Class	
Practical business	
Language Used in Course	English
Course Title	Mathematics B
Purpose/Abstract	<p>Themes are chosen from algebra, geometry, and analysis and are explained in English by experts in each field, allowing students to learn mathematics and how to express it in English.</p> <p>Also the student is assumed to be familiar with the subjects normally taught in classes to math majors by the first half of the 3rd year.</p>
Goal	This course will cover some advanced and basic mathematics. Students will gain perspective and an understanding of the usefulness of mathematics.
Contents and progress schedule of the class	<p>ALGEBRA "Linear representations of finite groups" /Masaki Hanamura</p> <ol style="list-style-type: none"> <li>1. Review of group theory; linear representations of groups; equivalence, irreducibility, unitary representations.</li> <li>2. Complete reducibility; homomorphisms of representations.</li> <li>3. Schur's theorem, Schur orthogonality.</li> <li>4. Characters of representations, decompositions into irreducible representations and multiplicity.</li> <li>5. Regular representations and the second orthogonality of characters.</li> </ol> <p>Analysis "Spectral decomposition theorem for self adjoint operators" / Fumihiko Nakano</p> <ol style="list-style-type: none"> <li>1. Background and motivation : basic principles of quantum mechanics</li> <li>2. Preliminaries : basic facts on Hilbert spaces</li> <li>3. Spectral decomposition on cyclic spaces</li> <li>4. Spectral decomposition on general cases</li> <li>5. Application : spectral projection ; RAGE theorem ; min-max principle</li> </ol> <p>GEOMETRY "Introduction to the Hausdorff measure and dimension" / Takumi Yokota</p> <ol style="list-style-type: none"> <li>1. Definitions</li> <li>2. Examples</li> <li>3. Properties</li> <li>4. Applications</li> <li>5. Related topics</li> </ol>
Grading	Report and attendance
Books required/referenced	No textbook assigned and we will give suitable references at each lecture.
Contents of preparation and review	Study relevant textbooks or references.
Study time for preparation and review	<p>Standard Hours for Preparation/Review per class:</p> <p>*Lectures 4 hour</p> <p>*Seminar 2-4 hour</p> <p>*Experiment, Laboratory Work, and Skill Test 2 hours</p>
How to contact and Google Classroom Code	Materials will be provided via ISTU and/or google classroom (fap4af3). More information will be given at the class.
Remarks	<p>Mail addresses of Hanamura, Yokota, and Nakano are as follows.</p> <p>Masaki Hanamura: masaki.hanamura.a8@tohoku.ac.jp</p> <p>Takumi Yokota : takumiy@tohoku.ac.jp</p>
Last Update	2026-3-2

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One-credit courses require 45 hours of study. In lecture and exercise-based classes, one credit consists of 15-30 hours of class time and 30-15 hours of preparation and review outside of class. In laboratory, practical skill classes, one credit consists of 30-45 hours of class time and 15-0 hours of preparation and review outside of class.