| Toyama College | Year | 2022 | Course Title | Comprehensive Mathematics |
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## Course Information

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| Course Code | 0043 | Course Category | General / Elective |
| Class Format | Lecture | Credits | School Credit: 1 |
| Department | Department of Applied Chemistry and Chemical Engineering | Student Grade | 3rd |
| Term | Second Semester | Classes per Week | 2 |
| Textbook and/or Teaching Materials | "大学新入生のためのリメディアル数学 第2版 (Daigaku Shin-nyusei no Tameno Remedial Sugaku, 2nd Ed.)" (森北出版 Morikita Publ.) (written in Japanese), "新線形代数 (Shin Senkei Daisu)" (大日本図書 Dai-nippon Publ.), Lecture/exercise handouts | | |
| Instructor | Kase Junko,Kasatani Masahiro | | |

## Course Objectives

At the completion of this course, students will be able to
1) Solve standard problems picked up from contents of the first grade mathematics.
2) Solve standard problems picked up from contents of the second grade mathematics.
3) Give a presentation of solving problems in front of classmates.
4) Understand a geometric meaning of determinants, and calculate area of parallelogram or volume of parallelepiped.
5) Understand definition of linear transformation, and calculate linear transformation.

## Rubric

| | Ideal Level of Achievement | Standard Level of Achievement | Unacceptable Level of Achievement) |
|---|---|---|---|
| Evaluation 1 | Can solve standard problems picked up from contents of the first grade mathematics quickly and almost perfectly. | Can solve standard problems picked up from contents of the first grade mathematics. | Can't solve standard problems picked up from contents of the first grade mathematics. |
| Evaluation 2 | Can solve standard problems picked up from contents of the second grade mathematics quickly and almost perfectly. | Can solve standard problems picked up from contents of the second grade mathematics. | Can't solve standard problems picked up from contents of the second grade mathematics. |
| Evaluation 3 | Can give a presentation of solving problems in front of classmates very positively. | Can give a presentation of solving problems in front of classmates. | Can't give a presentation of solving problems in front of classmates. |
| Evaluation 4 | Understand a geometric meaning of determinants well, and calculate area of parallelogram and volume of parallelepiped. | Understand a geometric meaning of determinants for the most part, and can calculate area of parallelogram or volume of parallelepiped. | Don't understand a geometric meaning of determinants, and can't calculate area of parallelogram or volume of parallelepiped. |
| Evaluation 5 | Understand definition of linear transformation well, and can calculate various linear transformation. | Understand definition of linear transformation for the most part, and can calculate elementary linear transformation. | Don't understand definition of linear transformation, and can't calculate linear transformation. |

## Assigned Department Objectives

ディプロマポリシー 3

## Teaching Method

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| Outline | Based on the first and second grade mathematics, students will comprehensively review the fundamentals of mathematics necessary for the study of natural sciences and engineering, and will exercise standard problems. |
| Style | Each class will be divided into several subclasses. One teacher will be assigned to each subclass.<br>Evaluations will be made comprehensively by exams (making up about 60% of the grade), by exercises and homework (making up about 40% of your grade).<br>Written exams will be carried out several times. |
| Notice | Requisites: Attendance to lectures, exercise handouts, lesson notes, and textbooks of related subjects, (and if necessary, reference books, problem books, etc).<br>Please be sure to prepare complete solutions for problems before classes. |

## Characteristics of Class / Division in Learning

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|---|---|---|---|
| ☑ Active Learning | ☑ Aided by ICT | ☑ Applicable to Remote Class | ☐ Instructor Professionally Experienced |

## Course Plan

| | | | Theme | Goals |
|---|---|---|---|---|
| 2nd Semester | 3rd Quarter | 1st | Guidance / Exercise / Review | Can solve standard problems and can give a presentation of them |
| | | 2nd | Exercise / Review | Can solve standard problems and can give a presentation of them |
| | | 3rd | Exercise / Review | Can solve standard problems and can give a presentation of them |
| | | 4th | Exercise / Review | Can solve standard problems and can give a presentation of them |
| | | 5th | Exercise / Review | Can solve standard problems and can give a presentation of them |
| | | 6th | Exercise / Review | Can solve standard problems and can give a presentation of them |
| | | 7th | Exercise / Review | Can solve standard problems and can give a presentation of them |

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| | | 8th | Midterm exam | |
| | 4th Quarter | 9th | Review of midterm exam | |
| | | 10th | Condition where homogeneous simultaneous linear equations have non-trivial solutions<br>Condition where vectors are linearly independent | Can find the coefficient matrix where homogeneous simultaneous linear equations have non-trivial solutions.<br>Can determine whether given vectors are linearly independent. |
| | | 11th | Geometric meaning of determinants<br>Cross product | Can calculate area of parallelogram or volume of parallelepiped.<br>Can calculate cross product of given vectors. |
| | | 12th | Definition of linear transformation | Can find matrix representing linear transformation. |
| | | 13th | Basic property of linear transformation | Can calculate image of linear transformation. |
| | | 14th | Composition, and inverse of linear transformation<br>Rotational transformation | Can calculate matrices of composition and inverse of linear transformation.<br>Can calculate rotation matrix. |
| | | 15th | Final exam | |
| | | 16th | Review of final exam | |

Evaluation Method and Weight (%)

| | Examination | Presentation | Mutual Evaluations between students | Behavior | Portfolio | Other | Total |
|---|---|---|---|---|---|---|---|
| Subtotal | 60 | 15 | 0 | 0 | 0 | 25 | 100 |
| Basic Ability | 60 | 15 | 0 | 0 | 0 | 25 | 100 |
| Technical Ability | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Interdisciplinary Ability | 0 | 0 | 0 | 0 | 0 | 0 | 0 |