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| Akashi College                                                                                                                                                                                                                                                                                            |             | Year                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2022                        |                                                                                                                                                                                                       | Course Title                                                                                                                                                                       | Structural Analysis ⅢB                                                                                                                                                                                             |  |
| Course Information                                                                                                                                                                                                                                                                                        |             |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |                                                                                                                                                                                                       |                                                                                                                                                                                    |                                                                                                                                                                                                                    |  |
| Course Code                                                                                                                                                                                                                                                                                               |             | 4416                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             | Course Category                                                                                                                                                                                       |                                                                                                                                                                                    | Specialized / Compulsory                                                                                                                                                                                           |  |
| Class Format                                                                                                                                                                                                                                                                                              |             | Lecture                                                                                                                                                                                                                                                                                                                                                                                                                                   |                             | Credits                                                                                                                                                                                               |                                                                                                                                                                                    | School Credit: 1                                                                                                                                                                                                   |  |
| Department                                                                                                                                                                                                                                                                                                |             | Architecture                                                                                                                                                                                                                                                                                                                                                                                                                              |                             | Student Grade                                                                                                                                                                                         |                                                                                                                                                                                    | 4th                                                                                                                                                                                                                |  |
| Term                                                                                                                                                                                                                                                                                                      |             | Second Semester                                                                                                                                                                                                                                                                                                                                                                                                                           |                             | Classes per Week                                                                                                                                                                                      |                                                                                                                                                                                    | 2                                                                                                                                                                                                                  |  |
| Textbook and/or Teaching Materials                                                                                                                                                                                                                                                                        |             | 中川肇「基礎から学ぶ」建築構造力学 理論と演習からのアフ ローチ」((株)井上書院)を使用する。(参考図書)鈴木基行著:構造力学徹底演習、森北出版                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                                                                                                                                                                       |                                                                                                                                                                                    |                                                                                                                                                                                                                    |  |
| Instructor                                                                                                                                                                                                                                                                                                |             | NAKAGAWA Hajime                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |                                                                                                                                                                                                       |                                                                                                                                                                                    |                                                                                                                                                                                                                    |  |
| Course Objectives                                                                                                                                                                                                                                                                                         |             |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |                                                                                                                                                                                                       |                                                                                                                                                                                    |                                                                                                                                                                                                                    |  |
| (1) To calculate the deformation and stress of a statically indeterminate structures using the principle of virtual work.<br>(2) To calculate the stress of a statically indeterminate beam using the fixed moment method. To be able to draw the graph of the stress of a statically indeterminate beam. |             |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |                                                                                                                                                                                                       |                                                                                                                                                                                    |                                                                                                                                                                                                                    |  |
| Rubric                                                                                                                                                                                                                                                                                                    |             |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |                                                                                                                                                                                                       |                                                                                                                                                                                    |                                                                                                                                                                                                                    |  |
|                                                                                                                                                                                                                                                                                                           |             | Ideal Level                                                                                                                                                                                                                                                                                                                                                                                                                               |                             | Standard Level                                                                                                                                                                                        |                                                                                                                                                                                    | Unacceptable Level                                                                                                                                                                                                 |  |
| Achievement 1                                                                                                                                                                                                                                                                                             |             | Can well calculate the fulcrum reaction force and draw the stress graph of statically indeterminate structures using the displacement method (deflection angle method) and the fixed moment method.                                                                                                                                                                                                                                       |                             | Can calculate the fulcrum reaction force and draw the stress graph of statically indeterminate structures using the displacement method (deflection angle method) and the fixed moment method.        |                                                                                                                                                                                    | Can not calculate the fulcrum reaction force and draw the stress graph of statically indeterminate structures using the displacement method (deflection angle method) and the fixed moment method.                 |  |
| Achievement 2                                                                                                                                                                                                                                                                                             |             | Can well use the principles of virtual work and energy to calculate the fulcrum reaction force, stress (graph), deformation (deflection, deflection angle) of a structure (beam, rigid frame, truss, etc.)                                                                                                                                                                                                                                |                             | Can use the principles of virtual work and energy to calculate the fulcrum reaction force, stress (graph), deformation (deflection, deflection angle) of a structure (beam, rigid frame, truss, etc.) |                                                                                                                                                                                    | Can not use the principles of virtual work and energy and can not calculate the fulcrum reaction force, stress (graph), deformation (deflection, deflection angle) of a structure (beam, rigid frame, truss, etc.) |  |
| Achievement 3                                                                                                                                                                                                                                                                                             |             | Can well calculate the fulcrum reaction force of a statically indeterminate structure using principles for statically indeterminate structure, such as the virtual work method.                                                                                                                                                                                                                                                           |                             | Can calculate the fulcrum reaction force of a statically indeterminate structure using principles for statically indeterminate structure, such as the virtual work method.                            |                                                                                                                                                                                    | Can not calculate the fulcrum reaction force of a statically indeterminate structure using principles for statically indeterminate structure, such as the virtual work method.                                     |  |
| Assigned Department Objectives                                                                                                                                                                                                                                                                            |             |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |                                                                                                                                                                                                       |                                                                                                                                                                                    |                                                                                                                                                                                                                    |  |
| Teaching Method                                                                                                                                                                                                                                                                                           |             |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |                                                                                                                                                                                                       |                                                                                                                                                                                    |                                                                                                                                                                                                                    |  |
| Outline                                                                                                                                                                                                                                                                                                   |             | Structural analysis is the basis for building structure and structural design. The applied course follows Structural Analysis I (2nd year) and Structural Analysis III (3rd year). The students will acquire the main solving methods for statically indeterminate structures, displacement method (deflection angle method) and the fixed moment method. As part of the school global education, the tests and exercises are in English. |                             |                                                                                                                                                                                                       |                                                                                                                                                                                    |                                                                                                                                                                                                                    |  |
| Style                                                                                                                                                                                                                                                                                                     |             | Lecture and problem-solving practice using textbook chapters 12 to15.                                                                                                                                                                                                                                                                                                                                                                     |                             |                                                                                                                                                                                                       |                                                                                                                                                                                    |                                                                                                                                                                                                                    |  |
| Notice                                                                                                                                                                                                                                                                                                    |             | To listen to the lectures and take notes. To solve exercise problems and understand them correctly. The students are supposed to ask questions and make sure they know the content before proceeding in the course. The students should review the topics learned in structural analysis courses I (2nd year) and II (3rd year). 5 absences will be excused.                                                                              |                             |                                                                                                                                                                                                       |                                                                                                                                                                                    |                                                                                                                                                                                                                    |  |
| Characteristics of Class / Division in Learning                                                                                                                                                                                                                                                           |             |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |                                                                                                                                                                                                       |                                                                                                                                                                                    |                                                                                                                                                                                                                    |  |
| <input type="checkbox"/> Active Learning                                                                                                                                                                                                                                                                  |             | <input type="checkbox"/> Aided by ICT                                                                                                                                                                                                                                                                                                                                                                                                     |                             | <input checked="" type="checkbox"/> Applicable to Remote Class                                                                                                                                        |                                                                                                                                                                                    | <input type="checkbox"/> Instructor Professionally Experienced                                                                                                                                                     |  |
| Course Plan                                                                                                                                                                                                                                                                                               |             |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |                                                                                                                                                                                                       |                                                                                                                                                                                    |                                                                                                                                                                                                                    |  |
|                                                                                                                                                                                                                                                                                                           |             |                                                                                                                                                                                                                                                                                                                                                                                                                                           | Theme                       |                                                                                                                                                                                                       | Goals                                                                                                                                                                              |                                                                                                                                                                                                                    |  |
| 2nd Semester                                                                                                                                                                                                                                                                                              | 3rd Quarter | 1st                                                                                                                                                                                                                                                                                                                                                                                                                                       | Slope deflection method (1) |                                                                                                                                                                                                       | To understand the fundamental equation of the slope deflection method of a non-statically rigid frame structure.                                                                   |                                                                                                                                                                                                                    |  |
|                                                                                                                                                                                                                                                                                                           |             | 2nd                                                                                                                                                                                                                                                                                                                                                                                                                                       | Slope deflection method (2) |                                                                                                                                                                                                       | To calculate the stress of a non-statically determinate beam.                                                                                                                      |                                                                                                                                                                                                                    |  |
|                                                                                                                                                                                                                                                                                                           |             | 3rd                                                                                                                                                                                                                                                                                                                                                                                                                                       | Slope deflection method (3) |                                                                                                                                                                                                       | To understand the joint equilibrium moment equation, through a calculation example of non-statically continuous beams and rigid frame structure using the slope deflection method. |                                                                                                                                                                                                                    |  |
|                                                                                                                                                                                                                                                                                                           |             | 4th                                                                                                                                                                                                                                                                                                                                                                                                                                       | Slope deflection method (4) |                                                                                                                                                                                                       | To practice with exercises of non-statically determinate beams using the deflection method.                                                                                        |                                                                                                                                                                                                                    |  |
|                                                                                                                                                                                                                                                                                                           |             | 5th                                                                                                                                                                                                                                                                                                                                                                                                                                       | Slope deflection method (5) |                                                                                                                                                                                                       | To understand the equivalent stiffness ratio, distribution and carry over factors of the structural member.                                                                        |                                                                                                                                                                                                                    |  |
|                                                                                                                                                                                                                                                                                                           |             | 6th                                                                                                                                                                                                                                                                                                                                                                                                                                       | Slope deflection method (6) |                                                                                                                                                                                                       | To understand the equivalent stiffness ratio, distribution and carry over factors of the beam and column.                                                                          |                                                                                                                                                                                                                    |  |
|                                                                                                                                                                                                                                                                                                           |             | 7th                                                                                                                                                                                                                                                                                                                                                                                                                                       | Slope deflection method (7) |                                                                                                                                                                                                       | To review the content learned                                                                                                                                                      |                                                                                                                                                                                                                    |  |
|                                                                                                                                                                                                                                                                                                           |             | 8th                                                                                                                                                                                                                                                                                                                                                                                                                                       | Assignment (5)              |                                                                                                                                                                                                       |                                                                                                                                                                                    |                                                                                                                                                                                                                    |  |
|                                                                                                                                                                                                                                                                                                           | 4th Quarter | 9th                                                                                                                                                                                                                                                                                                                                                                                                                                       | Mid-term Exam               |                                                                                                                                                                                                       |                                                                                                                                                                                    |                                                                                                                                                                                                                    |  |
|                                                                                                                                                                                                                                                                                                           |             |                                                                                                                                                                                                                                                                                                                                                                                                                                           | Slope deflection method (8) |                                                                                                                                                                                                       | To calculate a statically indeterminate rigid frame with supports that move.                                                                                                       |                                                                                                                                                                                                                    |  |

|  |      |                                                                 |                                                                                                                                                 |
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|  | 10th | Slope deflection method (9)                                     | To calculate a statically indeterminate rigid frame with supports that move.                                                                    |
|  | 11th | Fixed end moment method (1)                                     | To understand the principles and the graphs of fixed end method (FEM). To solve an example model of a non-statically continuous beam using FEM. |
|  | 12th | Fixed end moment method (2)                                     | To understand how to solve an example model of a non-statically rigid frame structure using Fixed end moment method (FEM).                      |
|  | 13th | Fixed end moment method (3)                                     | To solve the problems at the end of the textbook chapter. To elucidate doubts about the content learned.                                        |
|  | 14th | Fixed end moment method (4)                                     | To solve problems related to the content learned.                                                                                               |
|  | 15th | Practice using past universities entrance examination problems. | To review the content learned                                                                                                                   |
|  | 16th | End-term Exam                                                   |                                                                                                                                                 |

#### Evaluation Method and Weight (%)

|                         | Examination | Assignments | Total |
|-------------------------|-------------|-------------|-------|
| Subtotal                | 80          | 20          | 100   |
| Basic Proficiency       | 0           | 0           | 0     |
| Specialized Proficiency | 80          | 20          | 100   |
| Cross Area Proficiency  | 0           | 0           | 0     |