**Civil Engineering Orientation**

**Code:** MK3MEC1S8SX17EN

**ECTS Credit Points:** 8

**Evaluation:** mid-semester grade

**Year, Semester:** 1st year, 1st semester

**Its prerequisite(s):** -

**Further courses are built on it:** Yes

**Number of teaching hours/week**

Lecture: 4

Practice: 2

**Topics**:

The lectures are focused on the basic of statics and fluid mechanics, hydraulics. Basic mechanical concepts: Vectors, Force, moment of force, Varignon's theorem, Equilibrium equations. Balancing the plane system with 2 or 3 forces. Balancing supports. Basic concepts and properties of fluids: fluids at rest and in motion; Dimension and Unit; Fluid as Continuum; Pressure; Density; Viscosity; Thermal Conductivity; Coefficient of compressibility/Bulk modulus; Surface Tension; State Relations for Gases and Liquids; Classifications of Fluid Flows; Fluid statics- Pressure distribution in atmospheres and oceans; Design of manometer pressure instruments; Forces on submerged flat and curved surfaces; Buoyancy on a submerged body; Behaviour of floating bodies. Fluids in the environment. Scope of environmental fluid mechanics. Exchange between fluid parcels of different densities and at different heights. Turbulence. Environmental fluid mechanics problems for the 21st Century. Some connections between fluid mechanics and the solving of industrial and environmental fluid-flow problems.

**Literature:**

*Compulsory:*

EN 1990:2002/A1:2005 Eurocode - Basis of structural design.

Munson, Bruce R., Young, Donald F., Okiishi, Theodore H., Huebsch, Wade W. Fundamentals of Fluid Mechanics, Sixth Edition. John Wiley & Sons, Inc. (2009). ISBN 978-0470-26284-9

Marriott, M.: Nalluri & Featherstone's Civil Engineering Hydraulics: Essential Theory with Worked Examples, 6th Edition, Wiley Blackwell (2016), ISBN: 978-1-118-91563-9

*Recommended:*

fib Bulletin 51 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 1., Federation International du Béton – International Federation for Structural

Jack B. Evett Cheng Liu: 2500 Solved problems in Fluid Mechanics & Hydraulics, First Edition, McGraw Hill (1989), ISBN 0-07-0199783-0

**Schedule**

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| --- | --- |
| **1st week Registration week** | |
| **2nd week:**  **Lecture and Practice:** Some Characteristics of Fluids. Dimensions, Dimensional Homogeneity, and Units. Fluid as Continuum; Pressure; Density; Viscosity; Thermal Conductivity; Coefficient of compressibility/Bulk modulus; Surface Tension.  Calculation ofSpecific Weight, Specific Gravity, Density problems. | **3rd week:**  **Lecture and Practice**: State Relations for Gases and Liquids; Classifications of Fluid Flows; Fluid statics- Pressure distribution in atmospheres and oceans; Design of manometer pressure instruments.  Fluid statics problems, U-Tube manometer problems. |
| **4th week:**  **Lecture and Practice:** Forces on submerged flat and curved surfaces; Hydrostatic force on a plane surface; Pressure distribution and resultant force in an open tank: (a) bottom portion of the tank; (b) side of the tank. Area and moment of inertia of few common shapes.  Hydrostatic Force on a submerged surface. Hydrostatic force on the side of a dam. Lateral force of water on the walls of a tank. | **5th week:**  **Lecture and Practice:** Buoyancy on a submerged body; Behaviour of floating bodies.Archimedes' principle.  Calculation different buoyancy problems. |
| **6th week:**  **Lecture and Practice:** Fluids in the environment. Scope of environmental fluid mechanics. Exchange between fluid parcels of different densities and at different heights. Turbulence. Environmental fluid mechanics problems for the 21st Century. Some connections between fluid mechanics and the solving of industrial and environmental fluid-flow problems.  Calculation of industrial and environmental fluid-flow problems. | **7th week:**  Study trip |
| **8th week: 1st drawing week / 1st test** |  |
| **9th week:**  **Lecture and Practice:** Newton's Laws, Scalars, and Vectors. Vector Language, Intro to Vector Addition. The Triangle Rule and Adding Vectors to find a Resultant. | **10th week:**  **Lecture and Practice:** Using Scalar Equations to Solve for 2 Unknowns, Equations and Unknowns, 3D Vectors. Instruction to moments. |
| **11th week:**  **Lecture and Practice:** Moment about a pint and Specified Axis. Equivalent Systems, System Simplification. | **12th week:**  **Lecture and Practice:** Equilibrium of Rigid Bodies, 2D Support. Simple 2D Reaction Forces on a Truss Problem |
| **13th week:**  **Lecture and Practice:** Grouping of construction materials. Rheology of materials. Idealisation diagrams. | **14th week:**  Study trip |
| **15th week: 2nd drawing week / 2nd test** | |

**Requirements**

Participation at **lectures** is **compulsory**. Students must attend on lectures and may not miss more than three lectures during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Attendance at lectures will be recorded by the staff of the department. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Students are required to bring the calculator and the printed materials of the lectures with them to each lecture and practice class. Active participation is evaluated by the teacher in every class. Active student’s participation should be required.

Students have to **submit all the two tests** as scheduled minimum at a sufficient level. During the semester there are two tests: the 1st test in the 8th week and the 2nd test in the 15th week. In order to take a **mid-semester grade** – minimum (2) pass grade, – minimum point of test has to be taken (Summa minimum 61 points from 100 points). The minimum and the maximum points related to the tests can be obtained are the follows:

**Tests:**

1. Test: Maximum: **50 points** Minimum: **30 points**

2. Test: Maximum: **50 points** Minimum: **30 points**

**Summa points:** Maximum: **100 points**  **61 points**

The course ends with a **mid-semester grade**. Based on the summa points of the tests, the mid-semester grade is defined according to the following calculation:

**Score Grade**

0 – 60 points: fail (no sign)

61 – 70 points: pass (2)

71 – 80 points: satisfactory (3)

81 – 90 points: good (4)

91 – 100 points: excellent (5)