**Reinforced Concrete Buildings**

**Code: MFMVB31SM3-EN**

**ECTS Credit Points: 3**

**Evaluation: mid-semester grade**

Year, Semester: 4th year/1st semester

Number of teaching hours/week:

Lecture: **2**

Practice: **1**

**Prerequisites:** Reinforced Concrete Structures III.: MFVBS33SS3-EN

**Topics**:

Reinforced concrete buildings. Monolithic and prefabricated systems: structural elements of RC frames and RC halls. Bracing systems of tall buildings. Reinforced concrete constructions: forming of dilatations, forming of structural joints, structural elements for thermal, voice and water isolations as well as vibrations, connection of prefabricated RC members. Special design problems of construction of prefabricated elements: connections of monolithic and prefabricated elements, details of joints. Design considerations for the main formwork types. Effects of fire on RC structures, structural fire design.

**Literature:**

fib Bulletin 51 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 1., Federation International du Béton – International Federation for Structural Concrete, (2009) ISSN: 1562-3610, ISBN:978-2-88394.091-8

fib Bulletin 52 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 2., Federation International du Béton – International Federation for Structural Concrete, (2010) ISSN: 1562-3610, ISBN:978-2-88394.091-8

fib Bulletin 53 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 3., Federation International du Béton – International Federation for Structural Concrete, (2009) ISSN: 1562-3610, ISBN:978-2-88394-093-2

fib Bulletin 54 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 4., Federation International du Béton – International Federation for Structural Concrete (2010), ISSN: 1562-3610, ISBN:978-2-88394-094-9

fib Bulletin 62 Structural Concrete – Textbook on behavior, design and performance – Second Edition – Volume 5., Federation International du Béton – International Federation for Structural Concrete, (2012) ISSN: 1562-3610, ISBN:978-2-88394-102-1

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

EN 1991-1-1:2002 Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings.

MSZ EN 1992-1-1: 2010 Design of concrete structures Part 1-1.: General rules and rules for buildings

MSZ EN 1992-1-2: 2010 Design of concrete structures Part 1-2: General rules. Structural fire design

MSZ 4798-1:2004 Concrete Part 1: Specification, performance production, conformity, and rules of application of MSZ EN 206-1 in Hungary

Robert Park & Thomas Paulay: Reinforced Concrete Structures, Wiley-India Edition (2010), ISBN: 978-81-265-2362-5

Prab Bhatt, Thomas J. MacGinley & Ban Seng Choo: Reinforced Concrete Design Theory and Examples, Taylor & Francis Group (2010), ISBN: 0-415-30796-1

Prab Bhatt, Thomas J. MacGinley & Ban Seng Choo: Reinforced Concrete Design to Euroceodes – Design Theory and Examples, Taylor & Francis Group (2014), ISBN-13: 978-1-4665-5252-4

A. M. Neville: Properties of concrete Fourth and Final Edition Standarts updated to 2002, Pearson Prentice Hall (2004), ISBN: 0-582-23070-

Jack C. McCormac: Design of Reinforced Concrete Fifth Edition, John Wiley &Sons Inc. (2001), ISBN: 0-471-39576-5

**Schedule**

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| **1st week:****Lecture:** Classification of reinforced concrete high buildings. Special loads of high rise reinforced concrete buildings. Bracing systems of high rise buildings. **2nd week:** **Lecture:** Determination of loads and stresses of the bracing systems of high rise reinforced concrete buildings. Examples.**3rd week:****Practice:** Examples for static analysis of different bracing systems of high rise buildings.***Outgiving and discussion of the******1st Design Task****.***4th week:****Lecture:** Special aspects of precast concrete and precast reinforced concrete. Safety factors, concrete strength, effects of the industrial area. Examples.**5th week:****Lecture:** Prestressing technologies. Prestressing force loss of prestressing, effective prestressing forces.**6th week:****Lecture:** Design of pressed members. Magnel lines. Ultimate moment capacity according to Mörsch. Effects of prestressing on shear. ***Outgiving and discussion of the******2nd******Design Task****.***7th week:****Lecture:** Postensioning technologies. Special problems of the postensioned structures. Design aspects and problems of the statically determined and undetermined structures.  | **8th week:*****1st Test******Handing in of the 1st Design Task******Handing in of the 2nd Design Task*****9th week:****Lecture:** Reinforced concrete footings I. Design of footings. Examples.***Outgiving and discussion of the******3rd Design Task****.***10th week:****Lecture**: Reinforced concrete footings II. Design of footings. Examples.***Outgiving and discussion of the******4th Design Task****.***11th week:****Lecture**: Reinforced concrete footings III. Design of footings. Examples.***Outgiving and discussion of the******5th Design Task****.***12th week:****Lecture**: Types, properties, applications and design aspects of different kind of fibre reinforced concrete.**13th week:****Lecture:** Fire resistance of reinforced concrete structures, design for fire.**14th week:****Lecture:** Industrial visit.**15th week:*****2nd Test******Handing in of the 3rd Design Task******Handing in of the 4th Design Task******Handing in of the 5th Design Task*** |

**Requirements**

Attendance at **lectures** is **strongly recommended**, but not compulsory. Participation at **practice classes** is **compulsory**. Students must attend practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can’t make up a practice with another group. Attendance at lectures and practice classes will be recorded by the staff of the department. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, being discussed with the tutor. Students are required to bring a calculator and the printed materials of the lectures to each lecture and practice class. Active participation is evaluated by the teacher in every class. Active student’s participation should be required during lectures as well as practice classes.

Students have to **submit all the two tests and the five design tasks** 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 – and there are five design tasks. In order to get the **signature**, minimum point of tests and design tasks has to be taken (min. 50 points of 80 points). In order to take an exam grade – minimum (2) pass grade – minimum point of the tests and the design tasks as well as exam points have to be taken (Summa minimum 61 points from 100 points). The minimum and the maximum points related to the tests and design tasks can be obtained are the following:

**Two tests:**

Test I: Maximum: **15 points** Minimum: **8 points**

Test II: Maximum: **15 points** Minimum: **8 points**

 Summa: **30 points 16 points**

**Five design tasks:**

Design Task 1: Maximum: **8 points** Minimum**: 5 points**

Design Task 2: Maximum: **15 points** Minimum**: 11 points**

Design Task 3: Maximum: **9 points** Minimum**: 6 points**

Design Task 4: Maximum: **9 points** Minimum**: 6 points**

Design Task 5: Maximum: **9 points** Minimum**: 6 points**

 Summa: **50 points 34 points**

**Points required for a signature:**

Maximum: **80 points** Minimum**: 50 points**

(In case of having min. 50 points from the Tests and from the Design Tasks, a signature can be obtained)

**Exam:**

 Maximum: **20 points** Minimum: **11 points**

**Summa points:**

Maximum: **100 points** Minimum: **61 points**

The course ends in an **exam grade (AW5)**. Based on the summa points of the tests, the summa point of the design tasks and the summa point of the exam, the exam grade is defined according to the following calculation:

 **Score Grade**

 0 – 60 points: fail (no signature)

61 – 70 points: pass (2)

71 – 80 points: satisfactory (3)

81 – 90 points: good (4)

91 – 100 points: excellent (5)