MAT423/523 Special Topics: Cement Chemistry and Technology 2020-21 syllabus

Classes start on the 9th of Oct and ends 20th of Jan 2021.

MAT 423/523 Fridays 09:40 pm-12:30 pm on zoom

A Joint Project between AkçanSA, Ozyegin University and Sabancı University

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| Week.class hr | topic | Lectures on | Instructors | comments |
|  |  |  |  | Date of lectures |
| 1.1 | Introduction | Requirements and Organization of course | Dr. Mehmet Ali Gülgün  & Dr. Zeynep Başaran | 09/10/2020 |
| 1.2 | Introduction | History Of Cement and types of cements | Dr. Mehmet Ali Gülgün  & Dr. Zeynep Başaran |
| 1.3 | Introduction | Portland Cement its phases  And their function and structure | Dr. Mehmet Ali Gülgün  & Dr. Zeynep Başaran |
| 1.4 | Hydration | Hydration of OPC phases  Properties of CSH  hydrated microstructure | Dr. Mehmet Ali Gülgün  & Dr. Zeynep Başaran |
| 4.1 | SCMs | Supplementary cementitious materials | Mali/Pozhhan | 16/10/2020 |
| 4.2 | Alternative Cementitious materials | Alternative raw materials and Composite cements | Mali/Pozhhan |
| 4.3 | additives | Organic additives, Superplasticizers, retarders, water reducers etc. | Mali/Ozge |
| 4.1 | SCMs | Supplementary cementitious materials | Mali/Pozhhan |
| 2.1 | Cement Manufacture Raw Materials | Raw materials and Extraction Preparation of kiln mix, | Çağlar Geven | 23/10/2020 |
| 2.2 | Cement Manufacture Raw Materials | raw material calculations \* Homework #1 Raw material calculations Rotary Kilns | Çağlar Geven |
| 2.3 | Cement Manufacture clinker production | Comminution Raw Meal Homogenization | Çağlar Geven |
| 2.4 | Cement Manufacture Raw Materials | Cement Grinding Plants – Ball Mills - Classifiers | Çağlar Geven |
| 3.1 | Cement Manufacture clinker production | Clinker Reactions and high temperatuire Chemistry | İrfan Akikol | 30/10/2020 |
| 3.2 | Pyroprocess | Firing Systems - Fuels Preheaters, Calciner & Bypass Systems, Clinker Coolers | İrfan Akikol |
| 3.3 | Pyroprocess | Kiln Heat and Mass Balance  \* Homework #2 Thermodynamics and chemistry of kiln | İrfan Akikol |
| 3.4 | Cement Manufacture Grinding homogenization | Clinker Microstructure | Mali |
| 5.1 | Other Cement Types and uses | White Portland Cement, its uses, properties and reactions | Mali | 06/11/2020 |
| 5.2 |  | Calcium Aluminate Cement and its hydration | Mali |
| 5.3 | properties | - Calcium Sulfoaluminate Cement Oil-well cements and Their properties | Mali |
| 6 | EXAM | I MIDTERM | Mali | 13/11/2019 |
| 7.1 | Production of Concrete | Concrete to cement | İsmail Gökalp | 20/11/2020 |
| 7.2 | Production of Concrete | Concrete to cement | İsmail Gökalp |
| 7.3 | Production of Concrete | Concrete Design | İsmail Gökalp |
| 8.1 | Production of concrete | Concrete Ingredients & Properties of Concrete -Properties of fresh concrete -Early age properties -Strength and deformation of concrete | Zeynep Basaran Bundur | 04/12/2020 |
| 8.2 | Properties of concrete for different environment | Concrete Rheology and pumping | Zeynep Basaran Bundur Ismail Gokalp |
| 8.3 | New Concrete Design and uses | Transport and Placement Concrete | Ismail Gokalp |
| 9.1 | Novel concrete materials | SCC, HPC UHPC, DUCTAL,ECC, | Dr.Zeynep Başaran | 11/12/2020 |
| 9.2 |  | Magnetorheology, self-healing | Dr.Zeynep Başaran |
| 9.3 |  | 3-D manufacturing | Dr.Zeynep Başaran |
| 10.1 | Fiber Reinforced cement-based composites | High Strength precast | Dr. Bekir Pekmezci | 18/12/2020 |
| 10.2 | Fiber Reinforced cement-based composites | RMC Precast Applicaitons  Dry-Mix Applications (Mortars, Renders&Plasters, Tile Adhesives, Floor Screed) | Dr. Bekir Pekmezci |
| 10.3 | Fiber Reinforced cement-based composites | Dry-Mix Applications (Grout, Self Levelling Underlayments, External Insulation & Repair Systems) | Dr. Bekir Pekmezci |
| 11 | EXAM | II MIDTERM | Mali | 25/12/2020 |
| 12.1 | Precast and dry mix | New alternative for Construction | Dr. Bekir Pekmezci Dr.Zeynep Başaran | 08/1/2021 |
| 12.2 | Dry-Mix | New alternative for Construction | Dr.Zeynep Başaran |
|  |  | Self Healing Concrete | Dr.Zeynep Başaran |  |
| 13.1 | Fresh and Hardened Performance of concrete | Durability of Cementitious Materials & Environment | Dr.Zeynep Başaran | 15/1/2021 |
| 13.2 | Durability | Main Cement Problems Related to Durability(Sulfata Attack, Efflorescence, ASR, Freeze-Thaw.. Etc.) | Dr.Zeynep Başaran |
| 13.3 | Durability | Main Cement Problems Related to Durability(Sulfate Attack, Efflorescence, ASR, Freeze-Thaw.. Etc.) | Dr.Zeynep Başaran |
| 14.1 | Factory Visit | Career opportunities | Akçansa & Çimsa HR Representatives | 22/1/2021  Plant Visit  Career Fair. |
| 14.2 | Factory Visit Quality Control | Fuel Analysis, XRD and Microscopy Standards, Quality Control Certifications’ (CE) |  |
| 14.3 | Factory Visit Quality Control | Sampling, Elemental Analysis, Mechanical and Physical Analysis ( Mechanical Behavior of Paste) |  |

As course Materials we will use

**Cement Chemistry by HFW Taylor, 1997, Thomas Telford Pub.**

**Lea's Chemistry of Cement and Concrete, by Peter Hewlett, 4th edition.**

**Calcium Aluminate Cements by R. J. Mangabhai, E & FN Spon**

**And instructors’ own slide presentations.**