

Kurdistan Region Government

Ministry of Higher Education and Scientific Research

Erbil Polytechnic University

**Module Catalogue**

**2022-2023**

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| **College/ Institute**  | **Erbil Technology College** |
| **Department** | **Survey and Road construction** |
| **Module Name** | **Concrete Technology** |
| **Module Code** | **COT 403** |
| **Degree** | **Technical Diploma Bachelor High Diploma Master PhD** |
| **Semester** | **4** |
| **Qualification** |  |
| **Scientific Title**  | **Assistant Professor** |
| **ECTS (Credits)** | **7** |
| **Module type** | **Prerequisite Core Assist.** |
| **Weekly hours** |  |  |
| **Weekly hours (Theory)** | **( 2 )hr Class** | **( 24 )Total hrs Workload** |
| **Weekly hours (Practical)** | **( 3 )hr Class** | **( 24 )Total hrs Workload** |
| **Number of Weeks** | **12 (lectures)**  |
| **Lecturer (Theory)** | **Dr. Khaleel Hasan Younis**  |
| **E-Mail & Mobile NO.** | **Khaleel.younis@epu.edu.iq**  |
| **Lecturer (Practical)** | **Galawezh Mohamad Ahmad** |
| **E-Mail & Mobile NO.** | **galawezh.ahmed@epu.edu.iq**  |
| **Websites**  |  |

**Module Catalogue**

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| **Course Description** | **This module involves study the important properties of concrete components with practical tests related, and additive materials to concrete, besides the specification of fresh concrete and hard concrete with their application in construction and roads. Also study types of admixtures and their benefits and uses in special conditions. Transportation of concrete to site and factors affecting on transporting of concrete. Also, the module includes performing practical tests on concrete according to international codes. Studying the concrete mix design using ACI by weight and volume methods is the last part of this module. The module is delivered through lectures, in class activities, group tasks and seminars. The achievement of module outcomes will be assessed through formative and summative assessment (individual and group).**  |
| **Course objectives** | **The focus of the course is to acquire knowledge about concrete and develop skills about its practical use through:****1- Understanding the basic components of concrete and their properties** **2- recognizing the types of concrete****3- Studying cement and their types** **4- Studying aggregate and their properties** **5- Studying the common admixtures used for concrete****6- Studying main properties of fresh concrete** **7- Designing basic of concrete mixtures by ACI-code**  |
| **Student's obligation** | **Student should attend all theoretical and practical classes. The students should be restricted to bring their text books and lecture notes for share in classes.**  |
| **Required Learning Materials**  | **The lectures will be viewed by data show supported by solution of examples on white board. Performing practical test in Lab. by students** **under supervision of the teachers. Depending on teaching system using sub groups of students to solve home works and performing lab tests.** |
| **Evaluation** | ‌ **Task** | **Weight (Marks)** | **Due Week** | **Relevant Learning Outcome** |
| Paper Review  |  NA |  |  |
| Assignments | Homework | √  | Week 4 and Week 11 |  1,2, 3,6 |
| Class Activity |  √  |   | 1, 2,3,4,5,6 |
| Report |  √ |  Week 12 | 1, 2,3,4,5,6 |
| Seminar |  √ |  Week 10 |  3, 4,5 |
| Essay |  NA |  |  |
| Project |  NA |  |  |
| Quiz |  √ | Week 3 and week 7 |  2,3,4 |
| Lab. |  |  |  |
| Midterm Exam |  |  |  |
| Final Exam |  |  |  |
| Total |  |  |  |
| **Specific learning outcome:** |  **The students at end of the course will be able to:****1- Describe concrete constituents: cement, aggregates, water and identify engineering and physical properties of these components.****2- Explain admixtures and their types and effects on concrete.****3- Evaluate methods of cement and concrete manufacturing with high specifications.****4. Determine and assess the properties of hard and fresh concrete; and conduct most common practical tests related to cement, aggregate and concrete.** **5- Design concrete mixtures by ACI code** **6- Analyse results of tests and write practical report through collaboration and team working.**  |
| **Course References‌:** | 1-Neville, A.M., 1995. *Properties of concrete* (Vol. 5, p. 2011). London: Longman.2-Neville, A.M. and Brooks, J.J., 1995. *Concrete technology* (Vol. 438). England: Longman Scientific & Technical.**”** 3- Shetty, M.S. and Jain, A.K., 2019. *Concrete Technology (Theory and Practice), 8e*. S. Chand Publishing. |
| **Course topics (Theory)** | **Week** | **Learning Outcome** |
| **Definition of concrete – Types of concrete****History of cement and Manufacture of cement****Hydration and cement** **Structure and properties of cement paste** **Types of cement** | **Week 1****Week 2** | **1 and 2**  |
| **Aggregate, Classification and types of Aggregate.****Physical properties of Aggregate.****Mechanical properties.****Aggregate Grading** | **Week 3****Week 4** |  **1 and 2** |
| **Water used in concrete mixing and curing.** | **Week 4** | **1 and 2** |
| **Admixtures, types and uses.****Accelerator, air – entraining and retarder materials.****Admixtures and water- reducing admixtures.** | **Week 5****Week 6** |  **1 and 2** |
| **Properties of fresh concrete.** **Workability and consistency.****Consistency tests.****Slump, segregation, bleeding, shrinkage.****Unit weight of fresh concrete.** | **Week 7** |  **3 and 4** |
| **Manufacturing and transportation of concrete.****Measuring of materials, mixing.****ready mixed concrete.** **types of concrete mixers .**  | **Week 8** |  **3 and 4** |
| **Concrete pumping.****types of concrete compressors.** **pipe line.****admixture materials in pumping.** | **Week 9** |  **3 and 4** |
| **Placing, compacting and curing.****Methods of concrete compacting.****Strength of hardened concrete.** | **Week 10** |  **4 , 5 and 6** |
| **Concrete mixing design by ACI -code****Example of Mixing design****Non-destructive tests of concrete** **(ultrasonic and Schmidt hammer** **Examination** | **Week 11 Week 12** |  **5 and 6** |
| **Course topics (Practical)**  | **Week** | **Learning Outcome** |
| **Cement tests: cement consistency****Initial and final setting time of cement paste** | **1** |  |
| **Fineness of Portland cement****Compression and tension of cement mortar** | **2** |  |
| **Specific gravity of fine and coarse Aggregate****Bulk density of compacted and uncompacted aggregate** | **3** |  |
| **Sieve analysis of fine aggregate****Sieve analysis of Coarse aggregate** | **4** |  |
| **Bulking of sand**  | **5** |  |
| **Workability, slump test of fresh concrete****Compaction factor test** | **6** |  |
| **Flow test of fresh concrete****Vebe Test** | **7** |  |
| **Hardened concrete tests: compressive strength of concrete** | **8** |  |
| **Estimation material quantities for casting cubic and cylindrical mould****Effect of W/C upon Compressive strength machine** | **9** |  |
| **Curing time effect on compressive strength of concrete****Compaction effect on compressive strength of concrete** | **10** |  |
| **Mould shape and size effect on compressive strength of concrete****Effect of mixing ratio upon compressive strength** | **11** |  |
| **indirect tensile strength test of hardened concrete**  | **12** |  |
|  **Questions Example Design**E:\دلیل 2018\IMG_3529.JPG **Ministry of higher Education & Scientific research****Erbil Polytechnic University****Erbil Technology College****Department: Road Construction** **Class: 2nd****Subject: Concrete Technology****Code: COT 403****Time: (2 ) Hours****Date: 31 / 5 / 2021** **Academic Year 2020 - 2021****Final Exam. 1st Trial****Q.1\ Answer the following questions**: **(36 Marks)**1-Define soundness of cement and which oxides caused to make cement unsoundness .2- List types of aggregates due to particle’s shape and which of them is more workable.3- What are effects of impurities in mix water upon properties of concrete.4- Define bleeding and segregation of fresh concrete and write differences between them .5- What are effects of Prolonged mixing over a long period time on properties of concrete6-Show grades of consistency of fresh concrete and recommended methods of compaction  **Q.2\ Choose correct answer from the following** **(15Marks)** 1- Air entraining Admixtures added to fresh concrete for increasing **a- ultimate strength b- workability c- density** 2- Curing and vibration of concrete is very necessary to get high **a- compressive strength b- voids percentage c- permeability** 3- The chemical reaction between hydraulic cement and water called **a- permeability b- hydration c- curing** 4- Low heat Portland cement is usually desired in hot climate because of **a**-**high heat hydration b-sulfate resistance c- low heat hydration**  5- Raw materials used in manufacturing of Portland cement are **a-sulfate b-clay and caco3 c- gypsum****Q.3\ What are differences between** **(20 Marks)** 1- Compressive strength and Tensile strength of hardened concrete. 2- High early strength Portland cement and sulfate resistance Portland cement. **Q.4\ Fill the following blanks with suitable words (12 Marks)**1. Types of admixtures added to fresh concrete are -----------, ----------- ,-----------
2. Methods of compaction of fresh concrete are ----------, ----------, ---------.
3. Methods used for measuring workability of fresh concrete are ---------, -------- , -------

 4- Fineness of cement is important it affects -------- , -------- , ------- **Q.5\Calculate unit weight in (kg/m³) and quantities of (17 Marks)** (cement, sand , gravel , water) in (1m3) of fresh concrete if :  Concrete mix proportion is (1:2:4) and water cement ratio is 47%, Specific gravity for cement (3.15) and for sand & gravel (2.65) Air percentage 2% weight of 1 bag of cement = 50 kg  Good Luck Galawezh M. Ahmad Lecturer  |
|  **Extra notes:** |
| **External Evaluator** |