

Subject : Concrete Technology (1)

Class : Second year

Hours : 2hrs (Theoretical), 2hrs (Practical)

Objectives :

The student must learn the physical , mechanical , & chemical characteristics of the main components used in concrete , as well as accomplishing all the related laboratories tests . The student will learn also the characteristics of the fresh concrete & the admixtures of concrete .

Week	Theoretical Syllabus
1	Composition of concrete; Functions of the paste and aggregate ; General properties of ordinary concretes .
2	Concrete – making materials – Portland Cement ; basic constitutes of cement ; Chemical formulas and processes .
3&4	Manufacture of Portland cement ; Chemical analysis of Portland cement ; major compounds in Portland Cement; Influence of composition upon characteristics of Portland cement .
5&6&7	Properties of Portland cement : Fineness of cement ; Consistency of cement paste ; Hydration reactions in cement paste ; Hydration of cement ; heat of Hydration ; setting and hardening of cement : time of setting , soundness of cement , strength of cement paste , loss of ignition .
8&9&10&11	Types of Portland cement : Ordinary ; Modified ; Rapid hardening ; low heat ; Sulphate resisting . Other types : High–early strength ;Pozzolana–cement and pozzolanas;Slag cement ; Blast – Furnas - slag ; Masonry cement ; Expansive cement ; Aluminous cement ; White Portland ; Fly – ash ; Anti – bacterial ; Hydrophobic cement ; Waterproof cement ; Natural cement .
12&13 &14&15&16 &17&18&19	CONCRETE AGGREGATES : Preliminary remarks ; general characteristics ; data needed for proportioning mixtures ; sampling aggregate; particle shape and texture ; bond of aggregates ; specific gravity ;unit weight and voids ; porosity and absorption, moisture content ; Gradation ; sieve analysis ; maximum size of aggregates ; fineness modulus , practical grading ; gap – graded aggregates; oversize and undersize ; all – in aggregates ; bulking of sand ; soundness of aggregates ; handling and storing aggregates ; Deleterious substances : organic impurities ; alkali – aggregates reaction ; alkali – carbonate reaction ; thermal properties of aggregates .

20	WATER : Mixing water ; Curing water .
21&22 & 23&24	ADMIXTURES : Accelerators : Retarders ; Water – Reducing Admixture; super plasticizers ;Workability admixtures ; Air –entraining Admixtures ; Expansion –producing Admixtures; Pozzolan materials ;Bonding admixtures; Curing aids ; Water Proofers ; Colouring agents ; Surface hardeners .
25&26 & 27&28 & 29&30	FRESH CONCRETE : Introduction ; Properties of fresh concrete :(Workability; Consistency ; Segregation ; Bleeding ; Unit weight) . Measurement of workability and Consistency . Factors affecting workability . Air – Entrainment ; Measurement of Entrained – Air : (Volumetric ; Gravimetric and Pressure methods) Unit weight ; yield ; Cement factor . Manufacture of concrete: Batching; Mixing ; Conveying ; Placing ; Compacting ; and Curing of concrete .

References:

1. "Properties of Concrete ", A.M.NEVILLE, 3 rd. Ed. , A pitman International Text. (1981) .
2. "Composition and properties of Concrete ", TROXELL , AVIS , and KELLY , Mc Graw - Hill book Company (1968) .
3. D.F. ORCHARD, "Concrete Technology", Vol. 1,2&3, (1978) .
4. ASTM , BRITISH , and IRAQI specifications for concrete works .
5. د.احمد علي العريان و د. عبد الكريم محمد عطا " تكنولوجيا الخرسانة : مواد الخرسانة المسلحة وصناعتها" ، الجزء الاول ، الطبعة الثانية ، عالم الكتب (1975).
6. د.كنانة محمد ثابت و د.رياض حامد الدباغ ويوسف عمرو " مبادئ الجيولوجيا الهندسية " ، جامعة الموصل (1979) .