

Advanced Structural Materials (ASM)

Code	Credit Hours	Category
CE-816	3	Core

Course Description:

This course covers the detailed description of various advanced structural material including concrete hydration process, hydration kinetics and dormant period. Chemical and mineral admixtures will be discussed. Flow, strength, durability and microstructure of modern concrete is essential part of the course. Stability of concrete and dimensional stability of concrete will also be discussed. Requirements to achieve high performance concrete will be deliberated upon. Steel material along with it's constitute behavior, advantages over concrete and its application as hot rolled, built-up and cold formed steel will be studied. Latest use of composite and smart materials will also be part of deliberate lectures to emphasis their importance in construction industry. Masonry, being the most widely used construction material in Pakistan will also be discussed in both categories, i.e. brick and CMU's.

Text Book:

No specific text book covers this course, however numerous components of course content can be further studied from following books.

- Advance Concrete Technology by John Newman
- Steel Structures- Design and Behavior by Salmon and Johnson.
- Masonry Structures – Behavior and design by R. Drysdale

Reference Books:

- American Standard for Testing Materials (ASTM)
- American Concrete Institute Bulletins (ACI)

Prerequisites:

- BE (Civil, Architecture, Construction Engineering & Management)

Assessment System

Component	Percentage Range
Quizzes	10-15%
Assignments	10-15%
Mid Terms	20-30%
ESE	40-50%

Project (optional)

10-15%

Teaching Plan:

Week No	Topic
1	Introduction to concrete.
2	Micro-structure of concrete. Recent advances in concrete.
3	Strength of concrete.
4	Cement pastes and hydration
5	Ingredients including Course and fine Aggregates, Water
6	Admixtures (Chemical and Mineral)
7	Curing, Hot and Cold Weather Concreting
8	High performance concrete
9	Mid Term Exam/ OHT, (As per NUST Exam Policy)
10	Dimensional stability and Early Volume change of concrete.
11	
12-13	Steel Constitutive behavior – Cold Formed / Built up Sec
14	Composites – CFRP-GFRP
15	Smart Materials-Shape Memory Alloys
16	Masonry Material (Brick and CMU)
17	
18	ESE