Engineering Materials
EG 2105 CE

Year: II **Total: 5 Hrs. /week**
Semester: I **Lecture: 4 Hrs./week**
Tutorial: Hrs./week
Practical: 1Hrs./week
Lab:2/2 Hrs./week

Course Description:
This course is designed to help students on using various construction materials in construction works.

Course objectives:
After the completion of this course, students will be able to:

1. Recognize various construction materials that are essential in construction;
2. Select the quality materials for the use in construction;
3. Test materials for quality, strength and durability and
4. Use materials in their proper field and state.

Course Contents:

Theory

Unit 1: Stones: **[7 Hrs.]**

1.1 Introduction to stones as building units
1.2 Stones as various forms of engineering materials
1.3 Formation of rocks and its classification
1.4 Geological classification of stones
1.5 Availability of stones in Nepal
1.6 Physical and Chemical properties of stones
1.7 Quarrying of stones – Excavation, wedging and blasting,
1.8 Blasting of stones – Precautions
1.9 Preparing building units from stones- Dressing and seasoning.
1.10 Testing of stones for-
  1.10.1 Weathering
  1.10.2 Durability,
  1.10.3 Water absorption and porosity,
  1.10.4 Specific gravity,
  1.10.5 Compressive strength
1.11 Characteristics of good building stones.

Unit2: Bricks **[8 Hrs.]**

2.1 Introduction
2.2 Classification
2.3 Brick earth: Composition of brick earth, functions of various constituent of brick earth, harmful constituents.
2.4 Preparation of brick earth for making bricks: digging, weathering, blending and tempering.
2.5 Moulding of bricks and various methods of moulding
2.6 Drying of moulded bricks
2.7 Burning of bricks: Intermittent and continuous kilns
2.8 Traditional method of brick burning

2.9 Tests of bricks: Compressive strength, Water absorption and Efflorescence.

Unit 3: Tiles **[6 Hrs.]**

3.1Types of tiles: Roofing tiles, wall tiles, clay pipes and uses in construction
3.2Manufacturing of tiles
3.3Properties of tiles

Unit 4: Lime: **[6 Hrs.]**

4.1Introduction
4.2Classification of limes: Fat Lime (white lime), Lean lime, and Hydraulic lime.
4.3Setting action of lime
4.4Manufacturing of lime
4.5Raw materials, burning, slaking
4.6Intermittent and continuous methods of manufacture
4.7Testing of Limes: Visual examination test, acid test, ball test, impurity test and working test

Unit 5: Cement: **[8 Hrs.]**

5.1 Introduction
5.2 Uses of Cement in Construction
5.3 Raw materials (Ingredients) of Cement
5.4 Wet process of manufacturing
5.5 Flow diagram of wet process of manufacturing
5.6 Various types of cement and their properties
5.7 Storage and transportation
5.8 Various admixtures and bogue compounds
5.9 Standards test on Cement

Unit 6: Timber and Timber products: **[10 Hrs.]**

6.1 Introduction
6.2 Definition and sources of timber
6.3 Classification of trees
6.4 Structure of tree, hard wood and soft wood and their characteristics,
6.5 Defects in timber
6.6 Seasoning of Timber, Objectives of Seasoning, Various methods of seasoning, Prevention of drying of logs, Preservation of Timbers,
6.7 Plywood, Lamina Boards, Block boards, Hard boards, Fiber boards

Unit 7: Metals and Alloys: **[8 Hrs.]**

7.1 Ferrous and Non-ferrous metals
7.2 Uses of different metals in construction
7.3 Occurrence of Iron: Pig iron
7.4 Properties and uses of:
- Cast iron
- Wrought iron

7.5 Comparison of wrought iron with cast iron in similar headings
7.6 Steel: Composition, properties and uses, different types of steels
7.7 Corrosion in ferrous metals
7.8 Protection of ferrous metals
7.9 Alloys: Aluminium alloys, copper alloys and bronzes: composition, properties and uses.

Unit 8: Paints and Varnishes: **[4 Hrs.]**

8.1 Introduction – Paints and Varnishes
8.2 Uses of Paints and Varnishes
8.3 Composition of various types of Paints: Oil paint, Water Paint, Cement paints and Acrylic paints
8.4 Methods of application of various paints

Unit 9: Miscellaneous Materials: **[3 Hrs.]**

9.1 Glass (Constituents, types, properties, applications and limitation in use)
9.2 Plaster of Paris
9.3 Insulation Boards
9.4 Prefabricated materials (gypsum board, sandwich panel)

Practical (Laboratory) **[15 Hrs.]**

1. Perform fineness test of cement
2. Perform consistency test of cement
3. Determine initial and Final setting time of cement
4. Perform compressive test of cement
5. Perform tensile test of cement

References:

1. Bhavikatti, S.S., (2015). Building materials and construction
2. Singh Surendra., (latest edition). Engineering materials, Vikas publishing house pvt.ltd.
3. Chong, C.V.Y., (1977). Properties of materials, MacDonald and evans ltd. estover, plymouth, UK
4. Gupta, R. B., (1974). Material science and processes, Satya prakashan, inc. tech India publication, New Delhi.
5. Sthapit, Chinikaji, (2011/12) Engineering materials, Laxmi pustak Bhandar

Evaluation Scheme

Unit	Chapter	Time (Hrs.)	Marks
1	Stones	7	12
2	Bricks	8	12
3	Tiles	6	8
4	Lime	6	12
5	Cement	8	16
6	Timber and timber products	10	16
7	Metals	8	12
8	Paints and varnishes	4	8
9	Miscellaneous materials	3	4
	Total	75	100