CIVIL ENGINEERING DEPT.

2023-2022

High Diploma STRUCTURES

H. Diploma STUDY-STRUCTURAL ENGINEERING
First Semester/ general

Code	Subject	Hours		Units
		P	T	
Eng.Civil 500	Mathematics & Statistics	1	2	2.5
Eng.Civil 501	Surveying and Projects Management	1	2	2.5
Eng.Civil 502	Structural Engineering	--	2	2
Eng.Civil 503	Geotechnical Engineering	--	2	2
Eng.Civil 504	Environmental Engineering	--	2	2
TOTAL		**2**	**10**	**11**

SECOND SEMESTER/specific

Code	Subject	Hours		Units
		P	T	
Eng.Civil 505	Software Applications	2	1	2
Eng.Civil 506	Design of Bridges	--	2	2
Eng.Civil 507	Concrete Technology	--	2	2
Eng.Civil 508	Design of Special Structures	--	3	3
Eng.Civil 509	Retrofitting of Buildings	--	1	1
TOTAL		**2**	**9**	**10**

Third semester
A thesis in the specialty for three months (4 unit)

Total units (25 unit)

First Semester / STRUCTURAL ENGINEERING/ general

MATHEMATICS AND STATISTICS (500)

1. Mathematics
   - Matrices and determents
     - Basic concepts
     - Systems of linear equations
     - Rank of matrix
     - Eigen values, Eigen vectors
     - Properties of Eigen vectors
     - System of differential equations
   - Series solutions of differential equations
     - Power series method
     - Legenders equation
     - Bessel's equation
2. Statistics
   - Introduction and definitions
   - Normal Z,T distributions
   - Chi-Square test, ANOVA
   - Simple regression
   - Multiple regression
   - Non-linear regression

SURVEYING AND PROJECT MANAGEMENTS (501)

- **Surveying**
  - Introduction and definitions, errors and precision, tape measurements and corrections, leveling, 3-wire leveling, DEM, TIN, DSM, Viewshed, Watershed, Theodolites, Trigonometric leveling.
  - Advanced Instruments, Total station, EDM, Laser, Digital level
  - GPS-Surveying, GPS Segments, Types of errors, PDOP, coordinates, UTM.
  - GIS- Concepts, raster and vector, spatial and attribute data, topology, buffer, network analysis.

- Photogrammetry, types, stereovision, products.

- **project managements:**

    - project planning and control
    - project planning approaches
    - Operation research
    - Work breakdown structure
    - Value engineering
    - Decision making.

STRUCTURAL ENGINEERING (502)

- Structural Concrete
    - Limit State analysis and design
    - Introduction
    - Inelastic behaviour of reinforced concrete
    - Moment curvature relation
    - Concept of plastic hinge and collapse mechanisms
    - Allowable rotation for collapse load design

- Structural Steel
    - Composite construction (Design of Beams)
    - Composite construction (Design of Columns)
    - Plastic design

GEOTECHNICAL ENGINEERING (503)
Soil investigation and classification

1. Soil condition in the field
2. Stresses in soils
3. Flow through porous media
4. Shallow foundations
5. Engineering properties of rocks

ENVIRONMENTAL ENGINEERING (504)

1. Introduction: What's the environmental engineering.
2. Application of mass transfer concept in environmental engineering.
3. Water quality in rivers
4. Water quality in lakes
5. Water treatment
6. Wastewater treatment
7. Air pollution
8. Solid Waste management
9. Noise pollution

SECOND SEMESTER/ STRUCTURAL ENGINEERING/ specific

SOFTWARE APPLICATION (505)

- Introduction to structural software.
- STAAD PRO package.
- Applications of STAADPRO.
- ETAB package.
- Applications of ETAB.

DESIGN OF BRIDGES (506)

- Introduction
- Types of Bridges
- Design of Solid slab bridges
- Design of Girder bridges
- Design of Box Girder bridges

- Continuous bridges
- Principles of Arch bridges Analysis
- Substructure of bridges
- Types of Foundations.
- Design of Abutments.

CONCRETE TECHNOLOGY (507)

1. Grading of aggregates (New concepts)
2. Shrinkage and creep- Methods and factors affecting
3. Durability of concrete- Aggressive waters and sulphate contents – degrees of exposure
4. Strength of concrete – maturity of concrete, compressive, tensile, & how they are related. Lab work experiments
5. Admixtures – types - classification
6. Mix design – lab work application
7. Special concretes – (SCC) self compacting preplaced aggregate concrete – high strength concrete (According to ACI 211 – 1998)

DESIGN OF SPECIAL REINFORCED CONCRETE STRUCTURES (508)

- Introduction
- Design of water tanks
- Design of shear walls
- Design of portal frames
- Design of domes and shells
- Design of silos

RETROFITTING OF STRUCTURES (509)

- **Introduction**
- **Retrofitting materials, types and specification**
- **Types of damages in the structures, evaluation concrete in concrete structures, cracking, spalling, distortions, delamination**
- **causes of distress and deteriorations of concrete**
- **Retrofitting of bearing walls structures, repair techniques, sealing with epoxy, stitching, external stress, blanketing overlays, grouting**

- **Retrofitting of portal frame structures, jacketing and its types**
- **Retrofitting of other types of structures, replacement of concrete, strengthening of concrete structures by fibres(carbon and glass)**