Technical College / Al-Najaf
Department : Building & Construction Technology Engineering

Subject : The Project
Class : Fourth year
Hours : 6 hrs (Practical)

Goals :
The student will be able to design , calculate quantities , plot the architectural , constructional , sanitary , & electrical plans & details for a certain project in civil engineering .

Week	Syllabus
1------30	Different projects supervised by staff members .

Technical College / Al-Najaf
Department : Building & Construction Technology Engineering

Subject : Environmental Engineering
Class : Fourth year
Hours : 3hrs (Theoretical) , 3hr (Practical)

Objectives :
The students will be able to do :

1- **Discuss different environment categories.**
2- **Apply mass and energy balance criteria to environment relationship and process.**
3- **Identify the eco system on plant earth.**
4- **Assess environment risks.**
5- **Analysis and design water distribution networks and wastewater disposal system.**
6- **Explain the different water and wastewater treatment, Air control technique s and Solid waste management's techniques.**
7- **Apply the principle of green energy to future development.**

Week	Theoretical Syllabus
1	Introduction
2	Environmental measurements
3&4	Material & energy balance
5&6	Environmental Chemistry
7&8	Eco system
9&10	Environmental risks
11	Water Quality
12&13&14&15	Water Supply
16	Water Distribution system
17&18	Water Intake structure , pumping station for water and wastewater
19&20&21&22	Water Treatment
23&24	Wastewater treatment
25&26	Wastewater Disposal system design
27&28	Air resources energy
29	Solid waste management
30	Green Engineering

Technical College / Al-Najaf
Department : Building & Construction Technology Engineering

Subject : ISO
Class : Fourth year
Hours : 2hrs (Theoretical)

Objectives :

The student must know the quality , total management of quality , its elements, specifications , standardization , classification & its application in addition to international standard organization (ISO) systems .

Week	Syllabus
1	Quality definition , Standards , Factors affecting quality.
2	Quality determinate , Methods for determining quality.
3	Total quality control , Definition , Historical , Elements.
4	Systems used in total quality control & management.
5&6 &7&8	Application of total quality control , Properties , Stages & Advantages of applications , Examples (total quality control in industry of concrete).
9&10	Quality control of material used in production , Specification , Right decision , Example.
11&12&13	Quality control , Methods , Statistical method , Examples.
14&15	Quality control charts.
16	Quality control cost.
17&18 &19&20	Specification , specification & standardization fundamentals , Properties , Importance , Tolerance, Examples.
21&22	Rings of improving quality.
23	International organization for standardization ISO , Definition , Introduction , Using
24	Advantages of applications of ISO 9000.
25	ISO 9000 & total quality control management.
26&27	ISO 9000 family.
28	Civil engineering & ISO .
29&30	ISO 14000 environmental management system.

Technical College / Al-Najaf
Department : Building & Construction Technology Engineering

Subject: Analysis and Design of Reinforced Concrete Structures (2)
Class: Fourth year
Hours: 2 hrs (Theoretical), 1 hrs (Practical)

Objectives:
Students will build on their knowledge of reinforced concrete design to understand the behavior of reinforced concrete and to design practical reinforced concrete components.

Week	syllabus
1&2&3 &4&5&6 &7&8	**Analysis and design of slabs:** Types of slabs, Design of one way slabs, Temperature and shrinkage reinforcement, Behavior of two-way edge supported slabs, Two-way column supported slabs, Direct design method for column supported slabs, Depth limitation of the ACI code, Equivalent frame method, Shear design in flat plates and flat slabs, Openings in slabs.
9&10&11 &12	**Slender columns:** Concentrically loaded columns, Compression plus bending, ACI criteria for non sway frames versus sway frames, ACI moment magnifier method for non sway frames, ACI moment magnifier method for sway frames, Second-order analysis for slenderness effects.
13&14&15	**Strut and tie models:** Strut and tie methodology, ACI provisions for strut and tie models, Applications.
16&17&18	**Design of reinforcement at joints:** Beam-Column joints, Strut and tie model for joint behavior, Beam to girder joint.
19&20	**Concrete building systems:** Floor and roof systems, Panel, curtain and bearing walls, shear walls, ACI code provisions for shear wall design.
21&22	**Seismic design:** Structural response, Seismic loading criteria, ACI special provisions for seismic design.
23&24	**Prestressed Concrete:** Principles of prestressed concrete, Methods of prestressing, prestressing steel, concrete for prestressed construction.

Technical College / Al-Najaf
Department : Building & Construction Technology Engineering

Subject: Estimation, Specifications and Contracts
Class: Fourth year
Hours: 2 hrs (Theoretical), 2 hrs (Practical)

Objectives:
The student will be able to make approximate and detailed estimates of buildings, specify the proper method of measurement, do the rate analysis for different items of works. He will also be able to write the technical specifications for various civil engineering works. Finally, he will get thorough knowledge on the types of contracts and the general and special conditions related to them.

Week	Syllabus
1&2	Introduction: engineering projects &estimation, definition of estimation, benefits of estimation, factors affecting cost estimation, types of estimation, practical examples on approximate estimation.
3	General rules in quantitative survey: Principles in selecting units of measurement for items, various units and modes of measurement for different items of works, details of quantities measuring.
4	rate analysis, factors affecting the cost of materials and labour, Plants and equipment -hour costs based on total costs and Outputs, Overhead charges, rates for various items of construction of civil engineering works, problems and examples on rate analysis
5&6	Methods of working quantities for various items of works, Measurement and abstract sheets and recording, excavation and fill works for wall footings, estimation of walls and other items of buildings up to D. P. C. level, methods used to calculate the length of various works: method of strips and center lines method, examples and problems.
7&8	Earthworks for various engineering projects: irrigation channels, roadway embankments, methods used for calculating earthwork quantities and volumes, Mass diagrams, calculations of excavation volumes due to cut works (grid leveling method and triangular method), examples and problems.
9	Estimation of masonry works, basic units and materials used, Estimation of walls construction, damp proofing used, brick works, block works, stone works, examples and problems

Technical College / Al-Najaf
Department : Building & Construction Technology Engineering

Subject :Computer Applications (3)
Class : Fourth year
Hours : 1 hrs (Theoretical) , 2hrs (Practical)

Objectives :
The student must learn the structural analysis & design for all structures types using the most recent methods including programs such as (STAAD. pro, CONCAD, SAFE, CSI Bridge, Prokon, Epanet and AutoCAD land development desktop AutoCAD land development desktop).

Week	Syllabus
1	General description of the STAAD. pro structural program , Starting the Programs , Creating a new Structure .
2	Creating the Model (Beam, Column, Slab or plate, wall or surface and solid) using Graphical Interface .
3&4&5&6	Menus bar (file, edit, view, tools, select, geometry)
7&8&9&10	Application examples of structural engineering in STAAD. pro program (analysis and design of concrete beam, column, slab, shear walls and multi-story building subjected to floor load, wind load, earthquake load temperature load and pre-stress load)
11&12&13	Analysis and design of foundation (isolated, strip raft and pile footing using STAAD.pro and STAAD.foundation programs)
14	Analysis and design of steel structure
15	Various applications in civil engineering using structural programs such as : 1.Concad program for analysis and design of concrete beams.
16&17	2. SAFE program for analysis and design of slabs.
18&19&20	4. CSI Bridge for analysis and design of various types of bridges
21	4. Prokon program.
22&23&24	5. Epanet program for water supply network system
25&26 &27&28	6. AutoCAD land development desktop for roads design
29&30	Mini project .

Technical College / Al-Najaf
Department : Building & Construction Technology Engineering

Subject: Design of Steel Structures
Class: Fourth year
Hours: 2 hrs (Theoretical), 1 hrs (Practical)

Objectives:

After successful completion of this course the student will be able to understand the behavior and design of different types of structural steel members and connections. He will gain an educational experience in the design of simple steel structures.

Learning Outcomes

- **Basic understanding of the AISC specifications for design of steel structures.**
- **Knowledge of the design of steel members including connections.**
- **Knowledge of serviceability issues in design.**

Week	Syllabus
1&2	**Introduction: classification of steel structures; Structural steel: scope of use, properties and behavior, merits and demerits, shapes of rolled sections; Loads and load combinations; design approaches and philosophies.**
3&4	**Tension members: Types, sections and shapes, net & effective net area, design of tension members according to AISC ASD ; examples & problems.**
5&6&7	**Compression members: introduction, Euler's formula for buckling, allowable compressive stresses according to AISC ASD; Design of compression members: using ASD equations, using allowable stress & allowable load tables, design of laced columns and other built-up sections, column splices examples & problems.**
8&9&10	**Beam-columns: introduction, stresses in beam-columns, effective length of columns, design of beam-columns according to AISC ASD, method of determination initial trial section, method of equivalent load, examples & problems.**
11&12 &13&14 &15	**Beams: types & sections; review of beam theory, local buckling considerations, lateral torsional buckling considerations; allowable bending stresses & shear stresses according to AISC ASD, local web yielding, deflection limitations according to AISC ASD, design of gantry girders, design of beams using tables & charts; examples & problems.**

Technical College / Al-Najaf
Department : Building & Construction Technology Engineering

Subject : Construction Drawing
Class : 4th year
Hours : 3hrs (practical)

Objectives :

The student will learn to draw all kinds of details related to civil works (structural maps for concrete & steel) as well as to read & execute the projects & plans which were drawn previously.

Week	Syllabus
1	Introduction to define the civil drawing & all application in engineering & industrial fields between the engineer & worker .
2	Concrete drawing & how to take the longitudinal & cross sections in multistory buildings . Show details of roofs , beams , columns , stairs , footing .
3&4&5	Reinforced concrete footings , Wall footing , Isolated , Combined , Strap , Continuous , Raft foundations .
6	Reinforced concrete columns and cross sections.
7&8	Shear walls and staircase, type of staircase, reinforcement details
9&10&11	Reinforced concrete beams : Simple beam , simple beam with cantilever , fixed beam , Continuous beam , Girder, type of reinforcement cut-of and bent-up method.
12&13&14 &15	Reinforced concrete slabs (Types of slabs) : One way slabs , Two way slabs , Flat slabs , Ribbed & hollow – block slabs with all reinforcement details.
16	Building joints , Types of joints , Expansion joints , Construction joints .
17	Introduction to define the steel drawing, steel column base plat connection
18	Beam – column connections (Riveted , Welded , Bolts)
19&20	Pre-stressed concrete, Water tanks and.
21&22	Architectural details : Floors & roofs types , Their materials , Finishing methods , Doors & windows , Types of doors & windows according to their uses .
23	Elevators
24&25&26 &27	Municipal engineering drawing :Water distribution systems : Internal water networks for building (cold & hot) , Water treatment station , Sewage network systems for building .
28&29&30	Irrigation works drawing : Regulators , Pipes , Box culverts , Siphon , Weirs , Bridges .

Technical College / Al-Najaf
Department : Building & Construction Technology Engineering

Subject : Foundation Engineering Technology
Class : Fourth year
Hours : 2 hrs (Theoretical) , 2hrs (Practical)

Objectives :
The student will learn the basic of foundation engineering , soil investigation , calculation of bearing capacity of soil , selection and design of different types of foundation .

Week	Syllabus
1&2&3 &4&5	Soil investigation : Collecting samples , No. of holes , Depth of bore holes , Laboratory tests , Report writing.
6&7&8&9 &10&11	Bearing capacity theories , Factors affecting bearing capacity , Settlement calculations .
12&13 &14&15	Design of shallow foundations .
16&17&18 &19&20	Deep foundations ,Types of piles , Method of execution, Bearing capacity of single pile , Bearing capacity of pile group , Design of piles , Design of piles cap , Settlement of piles .
21	Lateral earth pressure .
22&23	Design of concrete retaining walls .
24&25	Design of sheet piles.
26&27	Slope stability ,Types & factors affecting slope stability, Methods of analysis for clays & sand .
28	Soil improvement , Soil improvement by compaction & additives .
29&30	Introduction to soil reinforcement .

References :

1- Principles of Foundation Engineering , Fifth Edition , By Braja-M. Dass , California University 2006 .
2- Foundation Analysis & Design / Bowles
3- Foundation Engineering / Peck , Hunson & Tharnborm

Technical College / Al-Najaf
Department : Building & Construction Technology Engineering

Subject : Environmental Engineering
Class : Fourth year
Hours : 3hrs (Theoretical) , 3hr (Practical)

Objectives :

The students will be able to do :

1- **Discuss different environment categories.**
2- **Apply mass and energy balance criteria to environment relationship and process.**
3- **Identify the eco system on plant earth.**
4- **Assess environment risks.**
5- **Analysis and design water distribution networks and wastewater disposal system.**
6- **Explain the different water and wastewater treatment, Air control technique s and Solid waste management's techniques.**
7- **Apply the principle of green energy to future development.**

Week	Practical Syllabus
1	Temperature test , Taste and odor test
2	Color test
3&4	Determination of : Total solids (T.S.), Volatile Solid (V. S.) , Non- Volatile solid , Suspended solids (S.S.) , dissolved Solids (D.S.) and settle-able solids
5&6	Electrical Conductivity (E.C.) test and pH Value test
7&8	Hardness test and Sulphate test
9&10	Chloride test and residual Chlorine test
11	Dissolved Oxygen test and Organic Matter test
12&13&14&15	Biochemical oxygen Demand test (BOD), Chemical Oxygen Demand (COD), Oil and grease Test, Phosphate test
16	Phenols test
17&18	Nitrogen Compound determination test : Nitrate (NO_3), Nitrite (NO_2)
19&20&21&22	Heavy Metals Tests (Atomic Absorption Method)