Mehran University of Engineering and Technology, Jamshoro
Department of Civil Engineering

Title of Subject	**:**	**Highway and Traffic Engineering (Th + Pr)**
Code	**:**	CE401
Discipline	**:**	Civil Engineering (7th Semester)
Effective	**:**	17-Batch and onwards
Pre-requisite	**:**	---- **Co-requisite: ---**
Assessment	**:**	Theory**:** 20% Sessional, 80% Written Semester Examination (20% Mid, 60% Final) Practical: 30% Sessional, 60% Final Examination
Credit Hours	**:**	03 + 01 **Marks :** 100 + 50
Minimum Contact Hours:		45 + 45

Course Learning Outcomes (CLOs):
Upon successful completion of the course, the student will be able to:

CLO	Description	Taxonomy Level	PLO
1	APPLY concepts of highway engineering for geometric design and effective traffic management.	C3	2
2	DESIGN flexible and rigid pavements.	C6	3
3	PRACTICE to investigate quality of asphalt mix and analyze traffic operations.	P3	4

Course outline:

- **Transportation Engineering**
  Introduction, Evolution of Transportation, Highway planning.

- **Geometric Design**
  Introduction/Functional classification of roads, Design controls, Design vehicle, Design speed, Design Driver, Design Volume, Sight Distances, Types of Cross section, Cross section elements, Cross slopes.

- **Horizontal Alignments**
  Introduction, Horizontal curves, Transition, curves, Super-elevation, Attainment of super elevation.

- **Vertical Alignments**
  Introduction, Grades, Vertical curves.

- **Pavement Design**
  Introduction, Types of Pavements, Wheel loads, Equivalent Single Axle load, Repetition & impact factors, Design of flexible &rigid pavements, Constructions / Maintenance of pavement.

- **Traffic Engineering**
  Introduction, Highway safety, Traffic control devices, Traffic sign, Traffic signals, Capacity Analysis, Traffic Management.

- **Introduction to Relevant Computer Software**

Practical Work to be carried out:

1. Introduction to Laboratory and HSE Measures.
2. To determine the Los Angeles abrasion value (% wear) of aggregate sample.
3. To determine the flakiness and elongation index of aggregate.
4. To determine the stripping value of the given aggregate sample by static immersion method.
5. To determine the aggregate impact value of the given aggregate sample.
6. To determine the soundness of the aggregate using different chemicals.
7. To determine specific gravity, flash & fire point and ductility of bitumen.
8. To determine penetration grade and softening point of bitumen.
9. Determination of aggregate gradation for job mix formula.
10. Determination of volumetric of asphalt mix.
11. To analyse the spot speed on selected road using different methods.
12. To carry out intersection traffic count including turning movement on an intersection using manual and camera technique.
13. To calculate Peak hour factor, ADT, AADT of any selected road section.
14. To carry out parking study in any parking lot.
15. To perform an open-ended lab.

Recommended Books:

- The Design and a performance of Road Pavement, David Croney, HMSO London, Latest Edition
- Highway Engineering, Justo and Khanna, Publication Company, Delhi, Latest Edition
- Traffic engineering and Design, R. J Salter, McGraw Hill Book Company, Latest Edition
- ASHTO Standards, Vall& Valli, Latest Edition
- Traffic & Highway Engineering, Nicholas J Garber lester H. Hoel, Latest Edition
- Highway Engineering, Paul H. wright / Karen K Dixon, Latest Edition
- Transportation Engineering Introduction to Planning, Design and Operations, Jason C. Yu. Elsevier Science Ltd, Latest Edition

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Approval:

Board of Studies:	**Resolution No. 32.3**	**Dated: 03-10-2020**
Board of Faculty:	**Resolution No. 20.11**	**Dated: 07-10-2020**
Academic Council:	**Resolution No. 98.7(ii)**	**Dated: 22-10-2020**

Mehran University of Engineering and Technology, Jamshoro
Department of Civil Engineering

Title of Subject : **Structural Design and Drawing (Th + Pr)**
Code : CE406
Discipline : Civil Engineering (7th Semester)
Effective : 17-Batch and onwards
Pre-requisite : Reinforced and Prestressed Concrete **Co-requisite: ---**
Assessment : Theory**:** 20% Sessional, 80% Written Semester Examination (20% Mid,60% Final)
Practical: 40% Sessional, 60% Written Semester Examination
Credit Hours : 03 + 01 **Marks :** 100 + 50
Minimum Contact Hours: 45 + 45

Course Learning Outcomes (CLOs):
Upon successful completion of the course, the student will be able to:

CLO	Description	Taxonomy Level	PLO
1	DESIGN various reinforced concrete structural members	C6	3
2	DESIGN preliminarily the RCC bridges and Tall buildings.	C6	3
3	PRACTICE on various structural software for design and analysis of different structures and structural components.	P3	5

Course outline:

Slender columns, analysis and design of slender columns, Shear walls, analysis and design of shear walls, Two way slab systems, methods for the design of two way slabs, Flat plate, flat slab, and waffle slabs, Design of flat plate, flat slab and waffle slabs for flexure and shear under gravity loading, Retaining walls, analysis and design of retaining walls, Water tanks, design of water tanks, Bridges, types of bridges, preliminary design of reinforced concrete bridges, High rise buildings, design considerations for high-rise buildings, Introduction to seismic design of reinforced concrete structures.

Practical work to be carried out:

1. To get acquainted with the structural drawing of RCC beams.
2. To get acquainted with the structural drawing of RCC columns.
3. To get acquainted with the structural drawing of RCC slabs.
4. To get acquainted with the structural drawing of RCC footings.
5. To get acquainted with the structural drawing of RCC staircases.
6. To draw the L-section and cross section of a simply supported rectangular RCC beam.
7. To draw a sectional plan and elevation of a square, rectangular and circular column with a footing.
8. To draw a sectional plan and elevation of a simply supported one-way and two-way RCC slabs.
9. To draw a cross section of end connection of a column with a beam.
10. To draw cross section showing connection of two beams (1st floor and roof level) with intermediate and end columns.
11. Introduction to ETABS software and setting out grid lines and story data in ETABS.
12. To define and assign the various sections and loads in ETABS.
13. To analyze a multi-story building using ETABS software.
14. To design a multi-story building using ETABS software.
15. To perform an open-ended lab.

Recommended Books:

- Reinforced Concrete Design, Park &Palily, Willy Interscieer Publication, John Willy &Sons
- Reinforced Concrete Design, C.K Wang and C.G Salamon, Harlperand Row Publisher New York, Latest Edition
- Reinforced & Pre-stressed Concrete, F.K Kong and R.H Evans, Ven National Reinhold U.K, Latest Edition
- Structural Concrete: Theory and Design, M.N. Hassoun and A.A. Manaseer, Publisher: John Wiley & Sons. Inc., Latest Edition

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Mehran University of Engineering and Technology, Jamshoro
Department of Civil Engineering

Title of Subject : **Geotechnical Engineering (Th + Pr)**
Code : CE411
Discipline : Civil Engineering (7th Semester)
Effective : 17-Batch and onwards
Pre-requisite : Soil Mechanics **Co-requisite: ---**
Assessment : Theory**:** 20% Sessional, 80% Written Semester Examination (20% Mid,60% Final)
Practical: 40% Sessional, 60% Written Semester Examination
Credit Hours : 03 + 01 **Marks :** 100 + 50
Minimum Contact Hours: 45 + 45

Course Learning Outcomes (CLOs):
Upon successful completion of the course, the student will be able to:

CLO	Description	Taxonomy Level	PLO
1	EXPLAIN various soil improvement techniques, their applications and equipment.	C2	5
2	ANALYZE the range of soil related problems especially those involving external stresses, shear strengths, earth retaining structures and slope stability.	C4	4
3	PRACTICE laboratory testing to determine compaction characteristics and shear strength parameters of soil.	P3	4

Course outline:

- **Compaction**
  Definition, compaction fundamentals, Moisture-Density relationship, Laboratory compaction methods: standard and modified Proctor tests, Factors affecting compaction, Compaction in the field, field compaction equipment and machinery, field control and measurements of in-situ density.

- **Soil Improvement**
  Introduction to soil improvement techniques: removal and replacement of soil, mechanical and chemical stabilization of soil, in-situ densifications, grouting, preloading, and vertical drains, and soil reinforcement, Basic principles and objectives of various methods of soil improvement, Application of various soil improvement techniques.

- **Shear Strength**
  Shear strength parameters of soils, shear strength of cohesive and cohesion less soils, Mohr-Coulomb failure criterion, Laboratory measurement of shear strength parameters: shear box test, unconfined compression test, vane shear test and tri-axial shear test.

- **Earth Pressures**
  Earth pressure at rest, active and passive earth pressures, Coulombs and Rankine theories for active and passive earth pressures, Earth pressure diagrams for different loading conditions.

- **Stress in a Soil Mass**
  Boussinesq's equations for computing vertical stresses in soil mass under various loadings: point load, line load, uniform load on a strip area, uniform load on circular area, uniform load on

rectangular area and stresses at a point outside the loaded area, Pressure distribution diagrams: Stress isobar, pressure distribution diagrams on horizontal and vertical planes, Equivalent point load method, Newmark influence chart for vertical pressure, 2:1 Method.

- **Stability of Slopes**
  Types of slopes, Factors affecting stability, Types of failure and remedial measures, Factor of safety, Stability of infinite slopes, stability numbers, Stability analysis of finite slopes: Taylor's chart, friction circle, method of slices.

- **Introduction to Relevant Software**

Practical work to be carried out:

1. To determine the moisture-density relationship by Standard Proctor Test.
2. To determine the moisture-density relationship by Modified Proctor Test.
3. To determine the CBR value for un-soaked soil sample.
4. To determine the CBR value for soaked soil sample.
5. To determine the field density by Core Cutter Method.
6. To determine the field density by Water Replacement/Oil Replacement Method.
7. To determine the field density by Sand Replacement (Sand Cone) Method.
8. To determine the relative density of soil sample by Vibrating Table.
9. To determine the shear strength parameters of sandy soil by Direct Shear Box Test.
10. To determine the shear strength parameters of clayey soil by Direct Shear Box Test.
11. To determine the shear strength of clayey soil by Un-Confined Compression Test and Pocket Penetrometer Test.
12. To determine the shear strength of a clayey soil by Laboratory Vane Shear Test.
13. To determine shear strength of fine grained soil by Tri-Axial Test (Demonstration only).
14. To determine sand equivalent value of sand.
15. To perform an open-ended lab.

Recommended Books:

- Modern Geotechnical Engineering, Alam Singh, CBS Publication, Latest Edition
- Principles of Geotechnical Engineering, Das, B.M, Brook/Cole, Latest Edition
- Soil Mechanics and Foundations, Garg, S. K, Khanna Publishers, Delhi, Latest Edition

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Mehran University of Engineering and Technology, Jamshoro
Department of Civil Engineering

Title of Subject : **Irrigation Engineering (Th + Pr)**
Code : CE417
Discipline : Civil Engineering (7th Semester)
Effective : 17-Batch and onwards
Pre-requisite : Hydrology **Co-requisite: ---**
Assessment : Theory**:** 20% Sessional, 80% Written Semester Examination (20% Mid,60% Final)
Practical: 40% Sessional, 60% Written Semester Examination
Credit Hours : 03 + 01 **Marks :** 100 + 50
Minimum Contact Hours: 45 + 45

Course Learning Outcomes (CLOs):

Upon successful completion of the course, the student will be able to:

CLO	Description	Taxonomy Level	PLO
1	DESCRIBE soil-water-crop relationships	C2	2
2	DESIGN irrigation canals and related hydraulic structures.	C6	3
3	PRACTICE the field and software experimentation to verify crop water requirements for designing of irrigation scheduling	P3	5

Course outline:

- **Introduction**
  Definition, Necessity, Scope, Benefits and ill effects of irrigation engineering.

- **Soil-Water-Crop Relationship**
  Soil and its physical and chemical properties, Root zone soil water, Crops of Pakistan and crop rotation.

- **Methods of Irrigation**
  Irrigation methods, Factors affecting choice of irrigation methods, Pressurized and non-pressurized methods, Uniformity coefficient.

- **Water Requirement of Crops**
  Functions of irrigation water, Standards for irrigation water, Definition of some common terms, Relationship between duty and delta, Factors affecting duty, Improving duty, Classes of soil water, Equilibrium points- soil moisture tension, Depth of effective root zone, When to apply irrigation water? Depth of watering to increase the soil moisture, Evapotranspiration, Estimation of evapotranspiration, Irrigation efficiencies, Gross irrigation requirements, Use of computer models.

- **Canal Irrigation System**
  Alluvial and non-alluvial canals, Alignment of canals, Distribution system for canal irrigation, Determination of canal capacity, Canal losses and channel section for minimum seepage loss.

- **Design of Earthen/Alluvial Channels**
  Kennedy's theory, Lacey's theory, Rational approach, Channel design software, Canal falls.

- **Lined Channels**
  Canal Lining and its types, Financial justification and economics of canal lining, Permissible velocities in lined channels, Design of lined irrigation channels.

- **Diversion Head Works**
  Weir and barrage, Types and components of diversion weir, Head regulator and cross regulator, Canal regulation and silt control at the head works, Silt excluders and silt ejectors, Monitoring of flow-telemetry system.

- **Canal Outlets:**
  Definition, Types, Essential requirements and characteristics of outlets, Tail cluster and tail escape.

- **Theory of Seepage**
  Causes of failure by piping and direct uplift, Safety against piping and uplift, Bligh's theory, Khosla's theory and concept of flow net, Critical gradient, Khosla's method of independent variables, Khosla's simple standard profiles, Exit gradient.

- **River Training Works**
  Methods to control bank erosion.

- **Reservoir Planning and Dams in General**
  Types of dams and reservoirs, Storage zones of reservoirs, Storage capacity and yield of reservoir, Estimation of demands and optimal reservoir operation, Reservoir sedimentation, density currents, Trap efficiency, Silt control in reservoir, Economic height of dam, Various types of problems in dam construction, Factors governing the selection of particular type and site of dam, Environmental impacts assessment of dams.

- **Introduction to related Software**

Practical work to be carried out

1. To investigate the effect of nozzle size on the radial distribution of water from a Rotary Sprinkler.
2. To investigate the effect of pressure on the radial distribution of water from a Rotary Sprinkler.
3. To investigate the effect of height of riser on the radial distribution of water from a Rotary Sprinkler.
4. To determine the Coefficient of uniformity for a drip irrigation system.
5. To visualize the flow lines.
6. To investigate the flow net construction.
7. To investigate the seepage flow rate underneath a sheet pile wall.
8. To determine uplift pressure on foundation of hydraulic structure.
9. To change uplift pressure on foundation of hydraulic structure by changing length of flow lines.
10. To reduce or eliminate uplift pressure by providing drainage.
11. To measure discharge by Float method.
12. To measure discharge using Current meter.
13. Introduction to the CROPWAT Software.
14. Determination of CWR (Crop Water Requirement) of crop using CROPWAT.
15. To perform an open-ended lab.

Recommended Books

- Irrigation and Hydraulic Structures: Theory, Design and Practice, Dr. Iqbal Ali, Institute of environmental Engineering Research, NED University Karachi, Latest Edition
- Irrigation and Drainage Engineering, Iqtidar H. Siddiqui, Oxford University Press, Latest Edition
- Irrigation Engineering and Hydraulic Structures, Santosh Kumar Garg, Khanna Publishers, Latest Edition
- Irrigation and Water Power Engineering, Dr. B. C. Punmia and Pande B. B. Lal, Standard Publishers, Delhi, Latest Edition

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