



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

Title of Subject	: <u>Hydrology (Th + Pr)</u>	
Code	: CE361	
Discipline	: Civil Engineering (6 th Semester)	
Effective	: 18-Batch and onwards	
Pre-requisite	: Applied Hydraulics	Co-requisite: ---
Assessment	: Theory: 20% Sessional, 80% Written Semester Examination (20% Mid, 60% Final) Practical: 30% Sessional, 60% Final Examination	
Credit Hours	: 02 + 01	Marks : 50 + 50
Minimum Contact Hours:	30 + 45	

Course Learning Outcomes (CLOs):

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

CLO	Description	Taxonomy Level	PLO
1	EVALUATE the occurrence, movement and distribution of water in the atmosphere, at the ground surface and within the sub-surface.	C5	4
2	DESCRIBE various methods of flood estimation, flood routing and flood control.	C2	2
3	CONDUCT the laboratory and software based experiments regarding surface and sub-surface hydrology.	P4	5

Course outline:

• **Introduction**

Hydrology, The world's freshwater resources, Hydrologic cycle, Hydrologic equation, Importance and Scope of hydrology.

• **Hydrometeorology**

Constituents of atmosphere, viz., Ozone, Carbon Dioxide, Water vapour, and Relative humidity, etc. Solar radiation, Transitory systems, viz., Air mass, Air front, Cyclone, Anticyclone, Thunderstorm and Tornado. Meteorological observations, viz., Atmospheric pressure, Wind velocity & direction, Temperature, Humidity, Radiation and Sunshine.

• **Precipitation**

Precipitation, Measurement of Rainfall, Computation of Average Rainfall over a Basin.

• **Stream Gauging**

Methods of measuring stream flow, Current meter gauging, Probe method, Stage-discharge rating curve, Selection of site for stream gauging station.

• **Runoff**

Components of stream flow, Catchment characteristics, Mean and Median elevation, Classification of streams, Isochrones, Factors affecting runoff, Estimation of runoff.



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- **Hydrographs**
Hydrograph components, Hydrograph separation, Estimating the volume of direct runoff, Unit hydrograph, S-curve, Application of Unit hydrograph.
- **Flood- Estimation, Routing and Control**
Size of floods, Estimation of peak flood, Flood frequency studies, Introduction to Reservoir routing and Channel routing, Methods of flood control, Flood forecasting and warning.
- **Groundwater Hydrology**
Basic terminology, viz. Permeability, Storage Coefficient, Transmissivity, Specific yield, Specific retention and Hydrogeological formations, etc., Aquifer and its types.
- **Well Hydraulics**
Yield of a well, Well Losses, Specific Capacity of Well, Interference among Wells.
- **Tube Wells**
Types and Construction of tube well. Comparison of Tube Well Irrigation and Canal Irrigation.
- **Open Wells**
Yield of an open well.
- **Water Resource Management**
Planning and development of water resources projects- Domestic, Industrial, Agricultural and other water usages, Water resources in Pakistan, Indus basin irrigation system (IBIS), Indus water treaty 1960 and water accord 1991, Indus river system authority (IRSA), Planning and development of water resources projects, The future of water resources.
- **Computer Application**
Development of design worksheets and use of software.

Practical Work to be carried out:

1. Introduction to Practical contents, Equipment's, and HSE (Health, Safety and Environment) measures.
2. To study the rainfall-runoff characteristics of a long duration single storm rainfall.
3. To study the rainfall-runoff characteristics of a short duration single storm rainfall.
4. To study the rainfall-runoff characteristics of multiple storm rainfalls.
5. To study the effects of reservoir storage on runoff hydrograph.
6. To investigate the effect of upper-half urban catchment on runoff hydrograph.
7. To investigate the effect of lower-half urban catchment on runoff hydrograph.
8. To study the rainfall-runoff characteristics of an urban catchment.
9. To draw a drawdown curve for a single well in an unconfined aquifer pumping at a constant discharge.
10. To observe drawdown at the observation wells using water level indicator during pumping of a well at field.
11. To investigate the pumping test of a tube well.
12. Introduction to HEC-HMS software.
13. To create a basin model of any catchment using HEC-HMS software.
14. To modify existing basin model by adding sub-basin elements using HEC-HMS software.
15. To perform an open-ended lab.



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Recommended Books:

- Hydrology: Principles, Analysis and Design, H. M. Raghunath, New Age International Publishers, India, Latest Edition.
- Introduction to Hydrology, Warren Viessman, Jr. and Gary L. Lewis, Prentice Hall, Latest Edition
- A Textbook of Hydrology, Dr. P. Jaya Rami Reddy, University Science Press, India, Latest Edition.
- Hydrology for Engineers, R. K. Linsley, Max A. Kohler, and Joseph L. Paulhus McGraw-Hill Education (ISE Editions); Latest Edition.

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	:	<u>Soil Mechanics (Th + Pr)</u>	
Code	:	CE326	
Discipline	:	Civil Engineering (6 th Semester)	
Effective	:	18-Batch and onwards	
Pre-requisite	:	Engineering Geology	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	DEMONSTRATE index properties of soils and carry out classification of soils.	C3	4
2	ANALYZE the range of soil related problems especially those involving in-situ stresses, flow of water through soils and consolidation settlement of soils.	C4	4
3	PRACTICE laboratory testing to determine index properties of soil, flow of water through soil and consolidation parameters of soil.	P3	4

Course outline:

• **Introduction**

Importance of mechanics of soils in Civil Engineering, Difficulties in predicting the behaviour of soils as a construction and load bearing material, Formation and type of soils.

• **Index Properties of Soil**

Phase diagrams of soil, Phase relations of soil: water content, void ratio, porosity, degree of saturation, air content, percentage air voids, unit weights and specific gravity, Weight-Volume relationships and their derivations, Consistency of soils, States of consistency and Atterberg's limits, Determination of Atterberg's limits and consistency indices, Grain Size distribution of soils: particle size distribution curves, sieve analysis, Stoke's law, hydrometer analysis.

• **Soil Classification**

Particle size classification systems, AASHTO classification system, Unified soil classification system, Identification and classification of expansive soils, Collapsible and dispersion soils.

• **Soil Water**

Modes of occurrence of water in soil absorbed / adsorbed water, Capillary water.

• **In Situ Stresses**

Stress condition in soil: effective and neutral stresses, stresses in saturated soils with upward and downward seepages.



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- **Permeability of Soil**

Permeability, Darcy's law, Factors affecting permeability, Permeability of stratified soils, Laboratory and field determination of permeability.

- **Seepage in Soils**

Seepage, Hydraulic potential, Hydraulic gradient, and seepage pressure, Quick sand condition and critical hydraulic gradients, Introduction to Flow nets: Flow lines, equipotential lines, seepage calculation from a flow net, Liquefaction, Piping.

- **Consolidation**

Settlement and its types, Consolidation and its importance, Mechanics of consolidation, Spring water analogy, Theory of one-dimensional consolidation: assumptions and validity, Laboratory consolidation tests, Graphical representation of data, Compression index, Coefficient of compressibility, Time factor, Calculation of voids ratio and coefficient of volume change, Degree of consolidation, Primary and secondary consolidation, Normally and pre-consolidated clays, Determination of pre-consolidation pressure and over consolidation ratio.

Practical Work to be carried out:

1. Introduction to the Soil Mechanics Laboratory and HSE (Health, Safety and Environment) measures.
2. Collection of soil samples from field and to prepare the representative soil sample for laboratory testing:
 - a). Quartering Method
 - b). Riffle Box Method
3. To determine the water content of soil sample by:
 - a). Oven Drying Method
 - b). Hot Plate Method
 - c). Sand Bath Method
 - c). Speedy Moisture Tester
 - d). Infrared Moisture Tester
4. To determine the particle size distribution of coarse grained soil by Sieve Analysis.
5. To determine the particle size distribution of fine grained soil by Hydrometer Analysis.
6. To determine the liquid limit of fine grained soil by Casagrande Apparatus
7. To determine the liquid limit of fine grained soil by Fall Cone (Penetrometer) Method.
8. To determine the plastic limit of the fine grained soil by Glass Plate/Fall Cone Method.
9. To determine the shrinkage limit of fine grained soil.
10. To determine the specific gravity of fine grained soil by Density Bottle Method.
11. To determine the coefficient of permeability of coarse grained soil by Constant Head Method.
12. To determine the coefficient of permeability of fine grained soil by Falling Head Method.
13. To determine consolidation parameters of saturated fine grained soil by One Dimensional Consolidation Test.
14. To determine free swell of clayey soils.
15. To perform an open-ended lab.

Recommended Books:

- Soil Mechanics and Foundations, Punmia, B.C, Standard Book Company, Delhi, 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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Title of Subject	:	<u>Reinforced and Prestressed Concrete (Th + Pr)</u>	
Code	:	CE336	
Discipline	:	Civil Engineering (6 th Semester)	
Effective	:	18-Batch and onwards	
Pre-requisite	:	Plain and Reinforced Concrete	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	DESIGN basic reinforced concrete structural members.	C6	3
2	DESIGN various prestressed concrete members.	C6	3
3	PRACTICE experiments on hardened properties of concrete.	P3	4

Course outline:

• **Reinforced Concrete**

Analysis and design of doubly reinforced and continuous beams, Shear stress in reinforced concrete sections, Columns, types of columns, Analysis and design of short columns subjected to combined flexural and axial loading, Footing, types of footings, Analysis and design of isolated, combined, strip and raft/mat footing, Preliminary design of two-way solid slabs, Design of stair case.

• **Prestressed Concrete**

Basic concepts of prestressing, Classification and methods of prestressing, Advantages and applications of prestressed concrete, Properties and importance of high strength materials used in prestressed concrete, Losses of prestressing: Immediate and time dependents losses, lump sum and detailed estimation of prestress losses, Analysis and design of simply supported prestressed beams for flexure and shear.

Practical Work to be carried out:

1. To determine the loose and compacted bulk density and % age voids of fine and coarse aggregates.
2. To determine the crushing strength of a given sample of coarse aggregate by UTM.
3. To determine the compressive strength of concrete sample by Schmidt Hammer.
4. To cast cylinders and determine the splitting tensile strength of concrete.
5. To cast plain concrete beams/prisms for modulus of rupture test.
6. To determine the flexural strength of plain concrete by centre point loading method.
7. To determine the flexural strength of plain concrete by third point loading method.
8. To determine the modulus of elasticity of concrete.
9. To determine the yield and ultimate strength of steel bars.
10. To determine the percentage elongation of steel bars.



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11. To perform the bend test of steel bars.
12. To take out the concrete core by core cutting machine and determine its compressive strength.
13. To cast reinforced concrete beam for determining the flexural strength.
14. To determine the flexural strength of reinforced concrete beam.
15. To perform open-ended lab.

Recommended Books:

- Advanced Concrete Technology: Constituent Material, J. Newman and B.S. Choo, Publisher: Butterworth Heinemann, Latest Edition
- Design of Concrete Structures, A.H. Nilson, D. Darwin and C.W. Dolan, Publisher: McGraw Hill Company, Latest Edition
- Structural Concrete: Theory and Design, M.N. Hassoun and A.A. Manaseer, Publisher: John Wiley & Sons. Inc., Latest Edition
- Reinforced & Prestressed Concrete. F.K. Kong, R.H. Evans, Van Nostrand Reinhold U.K., Latest Edition
- Prestressed Concrete Design, T.Y. Lin, Mc Graw Hill Company, Latest Edition

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Mehran University of Engineering and Technology, Jamshoro
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Title of Subject	:	<u>Steel Structures (Th)</u>	
Code	:	CE316	
Discipline	:	Civil Engineering (6 th Semester)	
Effective	:	18-Batch and onwards	
Pre-requisite	:	Strength of Materials-II	Co-requisite: -----
Assessment	:	Theory: 20% Sessional, 80% Written Semester Examination (20% Mid, 60% Final)	
Credit Hours	:	03 + 00	Marks : 100 + 00
Minimum Contact Hours:		45 + 00	

Course Learning Outcomes (CLOs):

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

CLO	Description	Taxonomy Level	PLO
1	DISCUSS the properties of steel and basic concepts related to design of steel structures along with design loads.	C2	1
2	DESIGN main structural members and connections of steel structures.	C6	3

Course outline:

• **Design Methods and Specifications**

Properties of Steel, Variation of stress-strain diagram with different percentage of carbon, Advantages and disadvantages of steel structures, Various steel sections used in the design of steel structure, Use of steel table, Introduction to AISC steel construction manual, Basic concepts and specification related to Allowable Stress Design (ASD) and Load and Resistance Factor Design (LRFD) methods.

• **Design Loads and Analysis**

Different loads considered in the design such as dead load, live load, wind load, earth quake load and traffic load on bridges, Load calculation and analysis of main structural members.

• **Design of Structural Members**

Euler's column theory, slenderness ratio, effective length, buckling of columns, Design of column using different steel sections, Design of hot rolled I- beam, floor beams and girders, purlins, beam with additional flange plates, Web buckling and web crippling in steel beams, Design of plate girder, stiffeners and steel truss, Types and strength of steel connections, Significance of steel connection design, Fabrication and erection methods involved in the construction of steel structures.

Recommended Books:

- Structural Steel Design, Jack C. McCormac, Stephen F. Csernak, Prentice Hall, Latest Edition
- Steel Structures: Design and Behavior, Charles G. Salmon, John E. Johnson, Faris A. Malhas, Prentice Hall, Latest Edition
- Design of Steel Structures, Gaylord, E.H. and C. N. Gaylord, McGraw-Hill Companies; Latest Edition

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Mehran University of Engineering and Technology, Jamshoro
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Title of Subject	:	<u>Quantity Surveying and Estimation (Th)</u>	
Code	:	CE341	
Discipline	:	Civil Engineering (6 th Semester)	
Effective	:	18-Batch and onwards	
Pre-requisite	:	---	Co-requisite: ---
Assessment	:	Theory: 20% Sessional, 80% Written Semester Examination (20% Mid,60% Final)	
Credit Hours	:	03 + 00	Marks : 100 + 00
Minimum Contact Hours:		45 + 00	

Course Learning Outcomes (CLOs):

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

CLO	Description	Taxonomy Level	PLO
1	SOLVE the numerical related to quantities of various civil engineering works.	C3	2
2	ANALYZE cost of construction project and discuss contract award procedure	C4	4

Course outline:

• **Introduction**

Estimate and its' types, Scope of civil engineering works and its' impact on cost estimate, Role of quantity surveyor at different organizational levels, Main requirements for preparing an estimate, Factors to be considered while preparing a detailed estimate, Importance of preliminary estimate in administrative approval of public sector projects, Preliminary estimate of various buildings, Significance of cost estimation in construction industry.

• **Quantity Calculation in Various Civil Engineering Works**

Load Bearing Structures: Calculation of quantities for different items of work using spate wall and centre line method, R.C.C Structures: Quantity calculation related to column, beam, slab, staircase and retaining wall, Road works: Lead and Lift, Earthwork calculation in road works using different methods, Calculation of quantities related to bridges, steel truss, sewerage and water supply works.

• **Rate Analysis and Bill of Quantities**

Task or Out-turn work, Importance of rate analysis in construction industry, Significance of productivity calculation in rate analysis, Factors influencing rate analysis, Specification for various items in construction, General practice in government departments for schedule of rates, Rate Analysis of different construction works: Earthwork in excavation, lean concrete in foundation, brickwork, plastering and R.C.C work, Bill of Quantities (B.O.Q) for construction project, Maintaining measurement book.

• **Tendering and Award of Works**

Introduction to types of contracts, Preparation of civil engineering contracts and tender documents, Evaluation of bids, Security deposit and earnest money, General procedure for award of works in public sector departments, Valuation of buildings and its' purpose.



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Recommended Books:

- Estimating and Costing in Civil Engineering, S. Dutta, Latest Edition, S. Dutta & Company, Lucknow, Latest Edition
- Estimating, Costing and Accounts, DD Kohli, S. Chand & Company (Pvt) Ltd, Latest Edition
- Fundamentals of construction. Estimating & Cost Accounting, Keith Collier, McGraw Hill Book Company, Latest Edition

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