Title of Subject	:	**<u>Structural Analysis (Th)</u>**
Code	:	CE306
Discipline	:	Civil Engineering (5th Semester)
Effective	:	18-Batch and onwards
Pre-requisite	:	Theory of Structures **Co-requisite:** Nil
Assessment	:	Theory**:** 20% Sessional, 80% Written Semester Examination (20% Mid, 60% Final)
Credit Hours	:	03 + 00 **Marks :** 100 + 00
<u>**Minimum Contact Hours:**</u>		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 beams, frames and trusses for deflections and slopes in determinate and indeterminate structures	C3	3
2	ANALYZE the structures by modern analytical methods.	C4	2

Course outline:

- **Introduction**

  Determinate and indeterminate structures, Degree of indeterminacy in beams, frames and trusses.

- **Determinate Structures:**

  Beams: Double integration, Moment area, Conjugate beam, Unit load method and theory of Castigliano, Frames: Unit load, Moment area method and movement of joints, Trusses: Unit load, Joint displacement, Graphical and angle weight method.

- **Indeterminate Structures:**

  Consistent deformation method: Statically indeterminate beams /frames of one and two redundant, Laws of reciprocal deflections, Theorem of least work, Three Moment Theorem Derivation of the theorem and application to statically indeterminate beams, Method of Slope Deflection Derivation of equation, Analysis of continuous beams and portal frames without joint movement/with joint movement, Analysis of continuous beams and portal frames due to yielding of supports, Moment Distribution Method Concept, distribution and carryover factors, Analysis of continuous beams and portal frames without joint movement/with joint movement, Analysis of continuous beams and portal frames due to yielding of supports, Introduction to matrix stiffness method Stiffness Methods Formation of element stiffness matrix for truss, beam and frame element, Deformation transformation matrix, Structures stiffness matrix for truss, beam and frame elements, Analysis of indeterminate structure using stiffness method.

Recommended Books:

- Statically Indeterminate Structure, Chu-Kia-Wang, Me Graw Hill International, Latest Edition
- Structural Analysis, Russel C Hibbler, Prentice Hall International, Latest Edition
- Matrix method of structural analysis, B. Fraeijs de Venbehe Pergmon Press Oxford, Latest Edition
- Intermediate structure analysis, Chu Kia Wang, Mc Graw Hill International, 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**

Title of Subject	:	**Plain and Reinforced Concrete (Th + Pr)**
Code	:	CE345
Discipline	:	Civil Engineering (5th Semester)
Effective	:	18-Batch and onwards
Pre-requisite	:	Civil Engineering Materials **Co-requisite:** Nil
Assessment	:	Theory**:** 20% Sessional, 80% Written Semester Examination (20% Mid, 60% Final)
		Practical: 40% 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	DESCRIBE various properties of concrete and its ingredients.	C2	1
2	DESIGN various structural elements of reinforced concrete.	C6	3
3	PRACTICE laboratory tests on concrete and its ingredients.	P3	4

Course outline:

- **Plain concrete:**

  Cement: manufacture of Portland cement, physical and chemical properties of cement, Aggregate: properties of aggregates, Admixtures, various types of aggregates, Design of concrete mixes, Production of concrete, batching, mixing, transportation, placing, compaction and curing of concrete, Properties of concrete in fresh state, Properties of concrete in hardened state, Durability of concrete structures, cracks and repair of concrete structures.

- **Reinforced concrete:**

  Basic principles of Reinforced concrete design, Design methods of reinforced concrete members, Basic concepts of working stress and ultimate strength design methods, Balanced, under reinforced and over reinforced section, Analysis and design of prismatic and non-prismatic sections in flexure, Slab and its types, Analysis and design of one-way solid slabs.

Practical Work to be carried out:

16. Introduction to Laboratory and HSE Measures.
17. To determine the soundness of a given sample of cement by Le-Chatelier's Apparatus.
18. To determine the zoning of a given sample of fine aggregate.
19. To determine the maximum size of a given sample of coarse aggregate.
20. To determine the quantity of silt and clay in a given sample of fine aggregate.
21. To determine the compressive strength of mortar cubes.
22. To prepare the concrete mix and determine the workability of fresh concrete by slump test method.
23. To determine the workability of fresh concrete by compaction factor test method.

24. To determine the workability of fresh concrete by Ve-Bee Consistometer test method.
25. To determine the workability of fresh concrete by flow table test method.
26. To determine the unit weight of fresh concrete.
27. To determine the unit weight of hardened concrete.
28. To determine the water absorption of hardened concrete.
29. To cast cubes and cylinders and determine the compressive strength of concrete cubes and cylinders.
30. To perform an open-ended lab.

Recommended Books:
- Concrete Technology, A. M. Neville and J.J. Brooks, Publisher: Longman, Latest Edition
- 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

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Approval:

Board of Studies: **Resolution No. 32.3**   **Dated: 03-10-2020**
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Title of Subject	:	**Project Management (Th)**	
Code	:	CE355	
Discipline	:	Civil Engineering (5th Semester)	
Effective	:	18-Batch and onwards	
Pre-requisite	:	**Nil**	**Co-requisite:** Nil
Assessment	:	Theory**:** 20% Sessional, 80% Written Semester Examination (20% Mid, 60% Final)	
Credit Hours	:	02 + 00	**Marks :** 50 + 00
Minimum Contact Hours:		30 + 00	

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

CLO	Description	Taxonomy Level	PLO
1	DESCRIBE primary theoretical knowledge of Project Management in the field of Engineering and construction industry.	C2	11
2	DEMONSTRTE essential theoretical knowledge of complete project life cycle of construction projects and their related issues.	C3	11

Course outline:

- Introduction to Engineering Management, Project Management, Objectives and Functions of management, Identification of Project, Project development and feasibility, identification of project stakeholders, SWOT analysis, Preparation and approval procedure of PC-1 and PC-2, Project Life cycle. Project roles and responsibilities, Design and project documentation, Introduction to Value Engineering & life cycle costing, Quality Management Systems, Human resource management, Procurement process and contractual relationship, Types of Engineering Contracts, Claims, Cost escalation, Arbitration and Litigation, Risk Analysis and management, Entrepreneurship and its types.

Recommended Books:
- Project Management- A managerial approach, Meredith, J.R and mantel S.J, John Wiley. Latest Edition
- Human Resource Management in Construction, Langford, D, Longman Group Ltd, UK, Latest Edition
- Construction Methods and Management, Nunnally S.W Prentice Hall, USA. Latest Edition
- Principles of Construction Management Roy Pilcher, Mc Graw Hill Company, 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**

Title of Subject	**:**	**Hydrology (Th)**
Code	**:**	CE362
Discipline	**:**	Civil Engineering (5th Semester)
Effective	**:**	**20-Batch and onwards**
Pre-requisite	**:**	Applied Hydraulics **Co-requisite:** Nil
Assessment	**:**	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	EXPLAIN hydrologic processes, their measurements and computations.	C2	1
2	ANALYZE the occurrence, movement and distribution of water in the atmosphere, at the ground surface and within sub-surface	C4	4

Course outline:

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

- **Hydrologic Measurements and Data Sources**
  Hydrologic measurements, Data networks, Telemetry systems and Remote sensing.

- **Hydrologic Processes and their Computation**
  Precipitation, Evaporation, Transpiration, Evapotranspiration and Runoff, their measurement / estimation. Hydrograph and Unit hydrograph their analysis and application.

- **Floods- 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, Well Hydraulics and Tube Wells**
  Basic terminology, Types of aquifers, Yield of a well, Well losses, Specific capacity of well, Interference among wells. Types and Parts of tube well, Tube well construction, Design of tube well for irrigation purposes, Comparison of Tube well irrigation and Canal irrigation.

- **Water Resource Management**

Water resources of Pakistan, Indus Basin Irrigation System (IBIS), Indus Water Treaty (IWT) 1960 and Water Accord (WA) 1991, Indus River System Authority (IRSA).

- **Sea water intrusion**

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:

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Board of Faculty: 23	**Resolution No. 23.09**	**Dated: 09-12-2021**
Academic Council:	**Resolution No.**	**Dated:**

Title of Subject	:	**Geometric Design of Highways and Airports**
Code	:	CE366
Discipline	:	Civil Engineering (5th Semester)
Effective	:	20-Batch and onwards
Pre-requisite	:	Transportation Engineering **Co-requisite: ---**
Assessment	:	Theory**:** 20% Sessional, 80% Written Semester Examination (20% Mid, 60% Final)
Credit Hours	:	02 + 00 **Marks :** 50 + 00
Minimum Contact Hours:		30 + 00

Specific Objectives of Course:
- To equip students with knowledge related to geometric design of highways and airports

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

CLO	Description	Taxonomy Level	PLO
1	DISCUSS design controls for geometric elements of highways and airports.	C2	1
2	DESIGN geometric parameters of Highways and airports.	C6	3

Course outline:

- **Design Controls**

  Introduction/Functional classification of highways and airports, Design controls, Design vehicle, Design speed, Design Driver, Design Volume, Sight Distances. Airport Geometric standards.

- **Horizontal and Vertical Alignment**

  Introduction, Horizontal curves, Transition, curves, Super-elevation, Attainment of super elevation. Types of Cross section, Cross section elements, Cross slopes. Introduction, Grades, Vertical curves.

- **Airport Design**

  Type & elements of airport planning, Factors affecting airport site selection, Airport classification, Various Runway configurations.

Recommended Books:
- Highway Engineering, Paul H. wright / Karen K Dixon, Latest Edition
- Traffic & Highway Engineering, Nicholas J Garber lester H. Hoel, Latest Edition
- Highways The Location, Design, Construction and Maintenance of Pavements, C. A. O'Flaherty, Latest Edition
- Planning and Design of Airports, Horonjeff, R. McGraw-Hill Professional; Latest Edition

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