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

Title of Subject	:	**Theory of Structures (Th)**
Code	:	CE221
Discipline	:	Civil Engineering (4th Semester)
Effective	:	19-Batch and onwards
Pre-requisite	:	Engineering Mechanics **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	ANALYZE shear force and bending moment in beams and frames.	C4	2
2	EVALUATE axial forces in Trusses; axial force, shear force and bending moment in arches; buckling of columns and influence lines and moving loads.	C5	2

Course outline:

1. Introduction
Definition of types of structures, Idealization of structural system, Loads on structures, serviceability and safety of structures.

2. Reactions, Shear and Bending Moments
Concept of bending and shear, Shear force and bending moment diagrams, Relation between loading intensity, Shear force and bending moment, Symbols and conventions.

3. Determinate Plane Frames
Analysis (sign convention) of shear force and bending moment diagrams of determinate plane frames.

4. Trusses
Analysis of forces in the trusses by the method of joints and method of sections.

5. Arches, Cables and Suspension Bridges
Three hinged parabolic and circular arches, Introduction to cables and suspension bridges.

6. Columns and Struts
Axial loading, Simple strut theory, Long columns, Empirical formula for long columns, combined direct and bending stresses.

7. Influence Lines and Moving Loads
Influence lines for statically determinate beams and girders, Influence lines for shear, Reaction, shear and bending moment for beams and girder, Influence lines for axial forces in trusses, Influence line for three hinged arches, Calculation of maximum reaction, shear and bending moment in a simply supported beam due to series of moving loads, Absolute maximum bending moment and its evaluation.

Recommended Books:

1. Mechanics of Structures Vol-I & Vol-II, Junarkar JB, Vivek Publication Mumbai. Latest Edition
2. Elementary Theory of Structures, Wang CK & Eckel CL McGraw Hill Book Company, Singapore. Latest Edition
3. Theory of Structures, Timoshenko SP and Young DH, McGraw Hill Book Company, Singapore. 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	:	**Applied Hydraulics (Th + Pr)**
Code	:	CE241
Discipline	:	Civil Engineering (4th Semester)
Effective	:	19-Batch and onwards
Pre-requisite	:	Fluid Mechanics and Hydraulics **Co-requisite:** Nil
Assessment	:	Theory: 20% Sessional, 80% Written Semester Examination (20% Mid, 60% Final)
		Practical: 40% Sessional, 60% Final 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	ANALYZE states of flow with respect to water surface and channel bed profiles due to sediment transport in open channels.	C4	2
2	DESIGN effective solution (flow computation) of pipes looping, branching, network and water hammer problems.	C6	3
3	MANAGE experimentally the open channel, pipe network flows and investigate technically the usage of hydraulic machines in daily life and their effect on environment.	P5	4

Course outline:

- **Gradually Varied Flow in Open Channels**
  Dynamic equation of gradually varied flow, Surface profiles, Computation of backwater curve length and surface profiles.

- **Sediment Transport in Open Channels**
  Importance of sediment transport, Bed load and suspended load, Threshold motion of the sediment, Use of different empirical methods/formulae to estimate sediment load in ppm, Open channel bottom deformation (theory and practical aspects).

- **Waterpower Development**
  Hydroelectric power, Important terms and definitions and principal components of a hydroelectric scheme, Classification of hydel plants, Runoff plants, Storage plants, Pumped storage plants, Tidal plants, Low head, medium head and high head schemes.

- **Flow in Pipes**
  Flow through simple pipes, Compound pipes, Pipes in series and parallel, Looping and branching pipes, Analysis of network of pipes and water hammer.

- **Steady Incompressible Flow in Pressure Conduits**
  Major and minor losses, Reynold's number and its significance, Viscous flow through circular pipes, Turbulent flow through pipes, Universal velocity distribution and Prandtil's mixing length theory.

- **Reaction and Centrifugal Turbine**
  Types, Construction features, Operations, Specific speed.

- **Pumps:**
  Centrifugal pumps their classification, Cavitation, Draft tube, Construction features and operation and specific speed, Reciprocating pumps their classifications (single acting and double acting pumps), Acceleration head, Maximum suction lift, Use of air vessels, Specific speed.

- **Introduction/use of the subject related software's.**

Practical Work to be carried out:

1. To determine the coefficient of weir for a broad –crested weir.
2. To determine the coefficient of weir for a Sharp –crested weir.
3. To determine the coefficient of discharge for an Ogee weir.
4. To determine the friction factor of a pipe by using fluid friction apparatus.
5. To determine the friction factor of a slanted seat valve using fluid friction apparatus.
6. To determine the friction factor of a socket shut-off gate valve using fluid friction apparatus.
7. To determine minor losses due to a pipe bend using fluid friction apparatus.
8. To determine minor losses due to a 90º elbow.
9. To determine minor losses due to a 45º elbow using fluid friction apparatus.
10. To determine minor losses due to gradual enlargement and constriction.
11. To determine minor losses due to Line and Branched flow at 90º Tee.
12. To determine minor losses due to a sharp 90º elbow.
13. To determine the loss coefficient of a bent pipe using Losses in pipes & bends apparatus.
14. To determine the real fluid flow using Laminar flow analysis table.
15. To perform an open-ended lab.

Recommended Books:
- Open Channel Hydraulics, Ven Te Chow, International Students Edition McGraw Hill Book Company
- Irrigation and Waterpower Engineering, Dr. B. C. Punmia and Pande B. B. Lal, Standard Publishers, Delhi, Latest Edition
- Applied Fluid Mechanics, Robert L. Mott and Joseph A. Untener, Pearson Education Inc, Latest Edition
- A Textbook of Fluid Mechanics and Hydraulic Machines, Er. R.K. Rajput. S. Chand & Company Ltd. Latest Edition
- A Textbook of Hydraulics, Fluid Mechanics and Hydraulic Machines, R.S. Khurmi, S. Chand & Company Ltd. Latest Edition

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

Title of Subject	:	**Construction Engineering (Th)**
Code	:	CE231
Discipline	:	Civil Engineering (4th Semester)
Effective	:	19-Batch and onwards
Pre-requisite	:	Civil Engineering Materials **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	DISCUSS different construction methodologies being used in construction industry.	C2	1
2	APPLY acquired knowledge to supervise different components of building works.	C3	2

Course outline:

1. Introduction
An overview of constructional aspects for different types of engineering projects, e.g. building retaining structures, bridges, pavements and special structures, General consideration common to all projects with special reference to building structures.

2. Layout Techniques
Building layout, De-watering Techniques, shoring to prevent excavations, Scaffolding techniques and their purposes, Introduction to earth walls, Use of bentonite etc., Form works for super structures, Types and costs involved (in construction), Thermal insulation of building and water proofing technique and materials, Use of admixtures to prevent efflorescence of brick and brick works, Dampness, Wall-dampness etc, Construction techniques etc.

3. Constructional Methodologies
Floor its types and construction, Floor finishing, Roofs and their construction types and Roofing Systems-finishes and waterproofing, Walls and their construction and types etc, Non-structural elements especially wood-construction and wood framing, Masonry, Stone-masonry, Brick works with sufficient details related to constructional aspects, Doors, and windows allied services, e.g. Acoustics and maintenance of buildings etc.

Recommended Books:
1. Building Construction, A. Kumar, Mir-Publisher Karachi, Latest Edition
2. Building Construction, S.K Sharma, S. Chand & Company New Delhi, Latest Edition.
3. Building Construction, Thomson J.F, Butter worth London, Latest Edition
4. Building Construction, Whitney C. Huntington, National Book Foundation Pakistan, Latest Edition

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

Title of Subject	:	**Strength of Materials-II (Th)**
Code	:	CE250
Discipline	:	Civil Engineering (4th Semester)
Effective	:	19-Batch and onwards
Pre-requisite	:	Strength of Materials-I **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	ANALYZE plane stress and strain in the members subjected to various loading conditions.	C4	2
2	ANALYZE the horizontal shear stress/force in thin walled sections and circular sections within the elastic limits; and describe unsymmetrical bending, curved beams, theories of failure, creep, fatigue and inelastic materials.	C4	2

Course outline:

- **Stress and Strain during General Loadings**
  Analysis of plane stresses, including principal stresses (Analytically and graphically), Principal stresses in beams. Analysis of plane strain (Analytically and graphically), Strain rosette, Stresses due to combined loading (bending and torsion).

- **Horizontal Shear Stress/Force**
  Horizontal shear stresses in beams, Stress in built-up beams, Shear flow and shear centre.

- **General Topics**
  Unsymmetrical bending, Analysis of curved beams, Theories of failure, Creep and fatigue fracture, Introduction to inelastic materials, limit torque, limit moment, position of neutral axis and residual stresses.

Recommended Books:
- Strength of Materials, F.L Singer, Harper & Row Publishers New York, Latest Edition
- Elements of Strength of Materials, S. Timoshenko &D.H Young, D Van Nostrand Company Inc. Princeton, New Jersey, Latest Edition
- Strength of Materials, R. L Ryder, Macmillan Education Limited, Latest Edition

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Mehran University of Engineering and Technology, Jamshoro
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Title of Subject	:	**Architecture and Town Planning (Th)**
Code	:	CE246
Discipline	:	Civil Engineering (4th Semester)
Effective	:	19-Batch and onwards
Pre-requisite	:	Nil **Co-requisite:** Nil
Assessment	:	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	EXPLAIN concepts of Architecture and its implications on Engineering and Design.	C2	1
2	APPLY the principles of town planning in the development of modern cities and towns based on best practices and guidelines.	C3	3

Course outline:

1. Architecture
Historical Development, General introduction to history of architecture, Emergence/Development of Islamic Architecture, Geographical, climatic, religious, social and historical influences, Architectural beauty.

2. Qualities, Factors and Use of Materials
Strength, Vitality, Grade, Breadth and scale, Proportion, Bolour and balance, Stone, Wood, Metals, Concrete, Composites, Ceramics.

3. Architectural Aspects of Building Planning
Walls and their construction, Openings and their position, Character and shape, Roofs and their development and employment, Columns and their position, Form and decoration, Moulding and their form decoration, Wind orientation of buildings, Energy efficient materials and thermal insulation, Modern Architecture and use of advance materials, Ornament as applied to any buildings.

4. Town Planning
Definitions, Trends in Urban growth, Objectives of town planning, Modern planning in Pakistan and abroad.

5. Preliminary Studies
Study of natural resources, Economic resources, Legal and administrative problems, Civic surveys, Preparation of relevant maps.

6. Land Use Patterns, Street Patterns
Various theories of land use pattern, Location of Parks and recreation facilities, Zoning and its aspects, Public and semi-public buildings, Civic centres, Commercial centres, Local shopping centres, Public schools, Industry & residential areas, Layout of street, Road crossing & lighting, Community planning.

7. City Extensions and Urban Planning

Sub Urban development, Neighbourhood Units, Issues related to inner city urban design and emergence/upgradation of squatter settlements, Satellite Towns and Garden City.

Recommended Books:

1. A History of Architecture, Dan Cruickshank, Sir Banister Fletcher's Architectural Press; Latest Edition
2. Origins of Modern Town Planning, Leonard Benevolo; MIT Press, Latest Edition
3. Town Planning in Practice, Sir Rymond Unwin, FQ Legacy Books, Latest Edition

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

Title of Subject   : **Complex Analysis, Statistical Methods & Probability**
Course Code   : MTH 206
Discipline   : **CE**
Semester   : 4th semester
Effective   : F16 Batch onwards
Pre-requisites   : Applied calculus, linear algebra & coordinate geometry
Assessment   : 20% sessional work   Mid-sem. Exam: 20%   End-Sem Exam: 60%
Marks   : TH: 100   PR: 00
Credit Hours   : TH: 03   PR: 00
Min. Contact Hours   : TH: 45   PR: 00

Course Learning Outcomes

After completion of this course the student should be able to:

CLO	Description	Taxonomy Level	PLOs
1	Determine complex number and complex variables. Complex differentiation and integration	C2	1
2	Apply Different statistical techniques to obtain the measure of central values of a data and their interpretation and Computation of regression and correlation	C2	1
3	Determine the Probability rules and various probability distributions	C2	1

Assessment Methods of CLOs of Subject name

CLOS	Sessional Tests and Assignments	Mid Exam	Final Exam	Learning Levels	PLOs
CLO 1	20%	70%	10%	C2	1
CLO 2	40%	30%	30%	C2	1
CLO 3	40%	-------	60%	C2	1

Contents

Complex numbers system and complex variable theory: Introduction to complex number systems. De Moiver's theorem and its applications. Complex functions, Cauchy-Riemann equations (in Cartesian and polar coordinates). Complex integration , singularities, poles, residues and contour integration and applications.

Data organization: Frequency distribution and geometrical representation of data..

Descriptive measures: Measures of central tendency, measures of dispersions.

Simple Regression and Correlation: Regression analysis by least squares method, testing the significance of the slope, simple correlation analysis, coefficient of correlation and coefficient of determination, testing the significance of r. Rank correlation.

Probability: Introduction to probability, counting techniques, dependent and independent events, conditional probability, additive rule of probability and its applications. Contingency tables, joint and marginal probabilities, the multiplication rule, Baye's theorem.

Probability Distribution: Concept of random variable, discrete probability distribution. Case study. Continuous probability distribution with examples, Probability destiny function, joint probability distribution, Examples. Mean of a random variable. Variance of a random variable. Binomial distribution. Mean and variance of binomial distribution. Examples. Poisson distribution, Normal distribution, area under the normal curve. Standard normal distribution, inverse use of table of areas under the normal curve.

Books Recommended:

- **H.K. Dass, Engineering Mathematics**
- **B.S.Grewall, Higher Engineering Mathematics, Khanna Publishers, latest edition.**
- **Erwin Kreyszig, Advance Engineering Mathematics, sixth edition, John wiley& sons, latest edition.**

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