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

Title of Subject	**:**	**Surveying-II (Th + Pr)**
Code	**:**	CE202
Discipline	**:**	Civil Engineering (3rd Semester)
Effective	**:**	19-Batch and onwards
Pre-requisite	**:**	Surveying-I **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	APPLY different survey techniques for indirect linear measurements in horizontal and vertical plane, and measurements in water bodies and larger areas.	C3	2
2	USE data for setting out of curves on highways and setting out works for different structures.	C3	3
3	CONDUCT the various survey tasks in groups.	P4	5

Course outlines:

- **Theodolite Traversing**
  Adjustment of transit theodolite, traversing with theodolite, Traverse computations, Closing error and its adjustment, Computation of Omitted measurements.

- **Tachometric Surveying**
  Tachometry, System of tachometry, Principles and field procedures of tachometry, Use of tachometry for traversing.

- **Trigonometric Levelling**
  Determination of Reduced levels of elevated objects when the base is accessible and inaccessible.

- **Highway Curves**
  Introduction to curves, Types of curves, Simple circular curves, Compound curves, reverse curves, transition curves, vertical curves, Computation and setting out of curves by different methods.

- **Hydrographic Surveying**
  Hydrographic Surveying and its applications, sounding and instruments used in soundings, Shore line survey and location of soundings.

- **Triangulation**

Classification of triangulation, Operations in triangulation, Selection of stations, Base line measurement.

- **Photogrammetry**
  Photographic surveying, Principles of aerial and terrestrial Photogrammetry, Arial surveying.

- **Setting out works**
  Setting out the buildings, roads, culverts, bridges.

- **Remote Sensing, GPS and GIS**
  Introduction to remote sensing, Use of GPS and GIS in the field of Survey.

Practical work to be carried out:

1. Introduction to Digital Theodolite and its temporary adjustment.
2. To determine the horizontal angles, vertical angles and bearing of lines.
3. To determine the latitudes and departures of lines and to calculate the Coordinates of Points.
4. To determine the Area of a Closed Traverse by Coordinates method.
5. To determine the horizontal distances by Tacheometric Surveying when the line of sight is horizontal.
6. To determine the horizontal distances and Vertical distances by Tacheometric Surveying when the line of sight is Inclined.
7. Orientation of total station and its adjustment.
8. To determine the independent coordinates of an existing building. Theodolite Traversing.
9. To draw the Plan of an existing building by plotting the Coordinates using Auto CAD software / Microsoft Excel.
10. To set out the Simple Circular Curve by deflection Angle method.
11. Measuring the Heights of buildings using Trigonometric Leveling.
12. To determine the R.L at top of elevated object by Trigonometric Leveling.
13. Introduction to GPS, Angular coordinates system, Base camp software and Google earth.
14. To record the World Geographic Coordinates System (WGS) / Angular Coordinates of points in the field by GPS.
15. To perform an open-ended lab.

Recommended Books:

- Plane Surveying, Dr A M Chandra, Latest Edition
- Surveying Vol: (I + II), B.C Punmia, Latest Edition
- Surveying Practice, Jerry. A. Nothanson and Philip Kissam, 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 : **Transportation Engineering (Th)**
Code : CE207
Discipline : Civil Engineering (3rd Semester)
Effective : 20-Batch and onwards
Pre-requisite : Nil **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	APPLY concepts of transportation systems and its planning in solving unban transportation problems.	C3	3
2	APPLY the principles of transportation engineering to solve the problems that are most likely to be encountered in the planning and design of railways and coastal structures based on best practices and guidelines.	C3	3

Course outline:

- **Introduction to Transportation Systems and Planning**
  Comparison of different modes of transportation, Phases of planning, Planning process and mode choice decisions, Urban transportation problems: Transportation and urban growth, Mass transit system, Comparison of different transit modes, Transit and environment, Transit and urban sustainability.

- **Railway Engineering**
  Introduction, planning, routes of railways, crossings and transfer, passengers' traffic and stations, planning of stations / platforms for passengers, Railway Track, gauge, Track components, Rail, rail fittings, fixtures, Sleepers and ballast requirements and specification per kilometre of track, Formation and cross- section details, drainage, track defects, signals, branching, classification and Marshall signals, other signals, maintenance and adjustment of railway.
  Design analysis: Geometric design of track, Points and Crossing, Station and Yards, Level crossing, Signalling and control, Suburban Railways, Metro railways system, Modernization of railways, Underground Railways.

- **Ports and Harbour Engineering**
  Water Transportation: Sea Port, Harbours, Ports and harbours of Pakistan Types and selection of site, Breakwaters, Jetties, Wharves, Navigation aids: Buoys and light houses, Inland water transportation. Components and classification, site investigation, waterway design. Design principles and requirements of harbours, and their construction, Transit sheds and warehouses.

Recommended Books:

- Transportation Engineering Introduction to Planning, Design and Operations, Jason C. Yu, Elsevier Science Ltd. Latest Edition

- Port Engineering Planning Construction Maintenance and Security, Gregory P. Tsinker, John Wiley, Latest Edition
- Urban Mass Transportation Planning, A. Black, McGraw Hill.
- Railway Engineering by Chandra and Agarwal, Oxford University Press
- Dock and Harbour Engineering, Oza and Oza, Charotar Publisher.

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	**:**	**Transportation Engineering (Th)**
Code	**:**	CE206
Discipline	**:**	Civil Engineering (3rd Semester)
Effective	**:**	17-Batch and onwards
Pre-requisite	**:**	--- **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

Specific Objectives of course:

- To provide background knowledge of transportation engineering with detailed and thorough understanding of framework of various modes of transportation systems.

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 transportation systems and its planning.	C2	1
2	CARRY OUT geometric design of various railway track components based on best practices and guidelines.	C6	3
3	CARRY OUT geometric design of external and internal components of airport and harbours based on best practices and guidelines.	C6	3

Course outline:

- **Introduction to Transportation Systems and Planning**

  Modes of transportation need and scope of comprehensive plan, Phases of planning, Principles of planning for communication facilities (road network, rail-road network & airport, port and harbour facilities), Planning process and mode choice decisions, Overview of Mass Transit Systems.

- **Railway Engineering**

  Elements of track, Types of gauges, Types of rail sections, rail joints, creep and wear of rail, Fish plate bearing plates and check rails, Types of sleepers, their merits and demerits, sleeper density, spacing and stiffness of track, Types of ballast, requirements for good ballast, renewal of ballast, Formation of single and double track, Selection of site for a railway station, Layout of stations and yards, Modern methods for construction of tracks, Maintenance, tools and organization, Introduction to design aspect, Points and crossings, Signalization and navigation.

- **Airport Engineering**

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

- **Ports and Harbour Engineering**

  Classification of harbours, Ports and harbours of Pakistan, Design principles and requirements of harbours, wharves and jetties, Breakwaters, Channel regulation and demarcation, Types of docks and their construction, Transit sheds and warehouses.

Recommended Books:

- Transportation Engineering Introduction to Planning, Design and Operations, Jason C. Yu, Elsevier Science Ltd. Latest Edition
- Planning and Design of Airports, Horonjeff, R. McGraw-Hill Professional; Latest Edition
- Port Engineering Planning Construction Maintenance and Security, Gregory P. Tsinker, John Wiley, Latest Edition

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Approval:

Board of Studies:	**Resolution No. 30.2**	**Dated: 07-08-2018**
Board of Faculty:	**Resolution No. 18.3**	**Dated: 11-09-2018**
Academic Council:	**Resolution No. 93.8(b)**	**Dated: 04-10-2018**

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

Title of Subject	**:**	**Strength of Materials-I (Th)**
Code	**:**	CE211
Discipline	**:**	Civil Engineering (3rd Semester)
Effective	**:**	19-Batch and onwards
Pre-requisite	**:**	Engineering Mechanics **Co-requisite:** Nil
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 problems related to simple stress and strain in members subjected to linear.	C3	1
2	ANALYZE simple beams subjected to simple bending loads and explain torsion and energy theory.	C4	2

Course outline:

- **Simple Stress and Strain**
  Types of stresses and strains, Stress-stain diagrams of different materials, Elastic constants, Load-deflection relation with respect to length, area of cross-section and Young's modulus of elasticity, Thermal stresses in restraint and compound bars.
- **Stresses in Beams**
  Centroid of general cross-section, second moment of area/Moment of inertia and Product of inertia on different axis including moment of inertia on principal axes, Theory of simple bending: position of neutral axis, Moment of resistance and section modulus, Application of flexural formula.
- **Strain Energy**
  Theory of torsion of solids and hollow circular shafts, Strain energy due to direct loads, Stresses due to gradual, sudden and impact loads.

Recommended Books:

- Strength of Materials, F.L Singer, Harper and Row Publisher New York, Latest Edition
- Elements of Strength of Materials, S. Timoshenko, D. Van Nostrand Company New Jersy, Latest Edition
- Strength of Materials, R. L Ryder, McMillan education limited, 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 : **Fluid Mechanics and Hydraulics (Th + Pr)**
Code : CE227
Discipline : Civil Engineering (3rd Semester)
Effective : 19-Batch and onwards
Pre-requisite : Engineering Mechanics **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 the concepts related to fluid statics, kinematics, dynamics and simulation model of a real hydraulic structure.	C2	1
2	SOLVE problems related to various open channel x-sections and flow based on hydraulic energy & momentum principles.	C3	2
3	PRACTICE experiments to verify the theoretical principles of fluid mechanics & hydraulics engineering.	P3	4

Course outline:

- **Properties of Fluid**
  Density, Specific weight, Specific volume, Specific gravity, Viscosity and Newton's law of viscosity, Bulk modulus of elasticity, Surface tension, Capillarity, Dimensions and Systems of units.

- **Fluid Statics**
  Pressure; Pressure head, Pressure-head relationship, Atmospheric pressure, Absolute pressure, Gauge pressure and Pascal's law. Equipment's for measurement of pressure, Piezometer, Manometers, Bourdon gauge and Mechanical gauges. Hydrostatic pressure, Buoyancy and stability of floatation.

- **Fluid Kinematics**
  Basic concepts of uniform and non-uniform, Flow rate and mean velocity, Acceleration in fluid flow.

- **Fluid Dynamics**
  Continuity equation in differential form for steady and unsteady flows, Continuity equation's integral form, Total head or energy (Bernoulli's) equation and its applications.

- **Hydraulic Similitude**
  Dimensions analysis of physical quantities (FLT or MLT system of measurement) by Releigh's or Buckingham's π-Theorem and its applications, Model analysis, Model and its prototype's geometric, kinematic, dynamic and hydraulic similarities, Dimension less number and their significance.

- **Open Channel Flow and its Classifications**
  Types of open channel and flow. States of flow and Regimes of flow, uniform flow (Chezys's and Manning's velocity equations) through various channel sections.

- **Design of Open Channels and Their Properties**
  Open channels Channel geometry, Design of most efficient, effective and economical open channel sections.

- **Energy and Momentum Principles**
  Non-uniform flow, Energy in open channels, Specific energy, Critical flow, Momentum principle and its applications, Hydraulic jump and its applications.

- **Flow Rate Measurement in Open Channels**
  Measurement of discharge through weirs, modular and non-modular venturi-flumes.
- **Introduction to subject relevant software's**

Practical Work to be carried out:

1. Introduction to Practical contents, Equipment's, and HSE (Health, Safety and Environment) measures.
2. To determine errors in the readings of a Bourdon pressure gauge.
3. To determine the metacentric height of floating body.
4. To investigate the validity of the formulas for resultant force on, and position of center of pressure of, a vertical rectangular surface.
5. To prove validity of Bernoulli's Theorem.
6. To determine coefficient of discharge for Venturimeter and Orifice meter.
7. To find the coefficient of velocity for a small orifice.
8. To find the coefficient of discharge for a small orifice.
9. To investigate relation between head over sill of a rectangular notch and flow rate through the notch.
10. To investigate relation between head over vertex of a Vee-notch and flow rate through the notch.
11. To determine Chezy's and Manning's coefficients for a rectangular smooth open channel.
12. To examine the quantitative characteristics of hydraulic jump formation on a horizontal floor of a rectangular channel.
13. To determine coefficient of discharge for a Venturi flume.
14. To draw specific energy curve for open channel with subcritical and super critical flow.
15. To perform an open-ended lab.

Recommended Books:

- Fluid Mechanics with Engineering Applications, Daugherty, Franzini and Finnemore, McGraw Hill Book Company, Latest Edition.
- Applied Fluid Mechanics, Robert L. Mott and Jaseph A. Untener, Pearson Education Inc, Latest Edition.
- A Textbook of Fluid Mechanics and Hydraulics Machines, Er. R.K. Rajput. S. Chand & Company Ltd, Latest Edition.
- A Textbook of Hydraulics, Fluid Mechanics and Hydraulic Machines, R.S. Khurmi, 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	:	**Differential Equations, Fourier Series and Laplace Transforms**
Course Code	:	MTH 204
Discipline	:	**CE**
Semester	:	3rd semester
Effective	:	17 Batch onwards
Pre-requisites	:	Applied Calculus, Linear Algebra & Co-ordinate 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 the formation and the solution of first and higher order differential equations	C2	1
2	Apply Fourier series of various functions	C2	1
3	Employ Laplace Transformation and its application	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:

First order linear and non-linear differential equations: Introduction, formation and solution first order first degree DE's.

Higher order linear differential equations: Homogeneous linear equations of order n with constants coefficients, solutions of higher order differential equations according to the roots of auxiliary equation. Non-Homogeneous linear equations. Cauchy Euler equation. Method of variations of parameters. Applications of higher order linear differential equations.

Fourier Series: Fourier coefficients. Convergence of Fourier series. Fourier series of odd and even functions.

Laplace Transforms: Laplace and inverse Laplace transform of elementary functions and their properties. Applications of Laplace transformation in various fields of engineering.

Books Recommended:

- D. Murray, Differential Equations
- H.K.Dass, Advance Engineering Mathematics
- B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, latest edition.
- S.M Yusuf, Mathematical Methods
- J.L.V Iwaarden, Ordinary Differential Equation with Numerical Techniques
- Erwin Kreyzig, Advance Engineering Mathem
- atics, sixth edition, John Wiley & sons, latest edition.

Approval:	**Board of Studies: 01/2018**	**Res. No. 01**	**Dated: 26-03-2018**
	Board of FOST&H,	**Res. No. 3.1**	**Dated: 11-04-2018**
	Academic Council:	**Res. No. 17 (ii)**	**Dated: 23-04-2018**