



UNIVERSITY OF ENGINEERING AND TECHNOLOGY

PESHAWAR, PAKISTAN

DEPARTMENT OF CIVIL ENGINEERING

UNDERGRADUATE SYLLABUS

SESSION 2013-14

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UNDERGRADUATE SYLLABUS

SESSION 2013-14

Course Contents for Scheme of Studies 2013-14

Department of Civil Engineering
University of Engineering and Technology, Peshawar, Pakistan

SEMESTER – 1

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| CE-107L: | Computer Programming for Civil Engineers, Lab. CH (0+1) |
| BSI-???: | English Composition and Communication skills, CH (3+0) |
| CE-106: | Civil Engineering Materials & Concrete Technology, CH (3+0) |
| CE-106L: | Civil Engineering Materials & Concrete Technology, Lab, CH (0+1) |
| BSI-101: | Islamic Studies, CH (2+0) |
| CE-115: | Introduction to the Civil Engineering Industry, Lab, CH(0+1) |
| BSI- 111: | Linear Algebra CH (3+0) |
| BSI-122: | Calculus |

CE-107L: Computer Programming for Civil Engineers, Lab. CH (0+1):

Programming for Civil Engineers:

Objective of this course is to learn basics of programming and its application to Civil Engineering. Programming language can be C++, SCILAB Scripting, MATLAB Scripting or VB.NET. Variables, Constant, Control Structures, Loop, Functions, Sub Procedure, Plotting, Matrix operations, Solving system of linear equations, Arithmetic Calculator, Solving simple numerical problems of engineering and mathematical subjects. Solving Calculus problems including differentials and integrals.

Recommended Books & Software:

1. Introduction to Matlab for Engineers.
2. Standard Textbook for Programming.

BSI-199: English Composition and Communication Skills, CH (3+0):

English Grammar:

Composition, Vocabulary Building skills, Words & expressions commonly misused, Articles; their use, Prepositions; Prepositional phrases, Punctuations, Common Grammatical mistakes, Elementary Principles of Composition, Relative Pronouns & Clauses, Conditional Sentences & Types, Adverbs & Adjective; their forms & uses.

Critical reading & thinking

Evaluating evidence and the author's credibility, rejecting faulty reasoning, reading across the curriculum; asking the right questions to get the most out of reading the natural sciences, social sciences & Humanities.

Drawing conclusions; putting it all together.

Communication skills

The nature of communication & communication in an organization, Power Point Presentations, Oral Presentations, Persuasive presentations, Resumes and Covering letters, Interview taking, Meetings, Negotiation Skills, Team Communication, Debate, Persuasive Presentations on Research Report, Listening (audio aids TOEFL & IELTS Practice Tests), Business letters, memos and minutes, Writing and Presenting Proposals, Class Presentations.

Recommended Books.

1. Effective Business Communications (7th Edition), by Herta A.Murphy, Herbert W.Hildebrandt & Jane P. Thomas
2. Technical Report Writing Today (4th Edition), by Pauley & Riordan

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University of Engineering and Technology, Peshawar, Pakistan

CE-106: Civil Engineering Materials & Concrete Technology, CH (3+0):

Civil Engineering Materials:

Paints and Varnishes, Bricks, Stone Glass, Timber, Asphalts, Bitumen, Asbestos and Adhesive, Steel, Geo-textile Uses.

Concrete Technology:

Historical Evolution of Concrete

Cement

Constituents of cement – Types of cement – Hydration – Heat of hydration, Setting of cement

Aggregates

Classifications of aggregate according to size, shape and weight, Gradation of aggregate – Sieve analysis – Fineness Modulus of aggregate Numerical.

Examples

Bulk density, Relative density – Absorption and moisture content, Bulking of sand and Soundness of aggregate

Admixture

Chemical Admixture, Plasticizers – Plasticizing action – Factor affecting plasticizers – Super plasticizer – Retarders – Accelerators – Air-Entrained Admixture – Mineral Admixture, Silica fume – Fly ash – Blast furnace slag – Rice husk ash – Volcanic ash

Properties of Concrete

Fresh Concrete, Workability – Setting time – Bleeding and Segregation – False Setting

Harden Concrete, Strength development – Dry shrinkage – Creep, Maturity of Concrete, numerical examples of maturity.

Durability of Concrete

Physical Durability, Permeability – Autogenous Shrinkage – Temperature stresses – Freezing and thawing – Deicing effect, Chemical Durability, Alkali aggregate reactivity – Sulphate attack – Delay ettringite formation – Chloride ingress – Corrosion of reinforcement

Types of Concrete,

Normal concrete – High performance concrete – Self compacting concrete– Roller compacting concrete – Air entrained concrete – Light weight concrete

Control Tests of Concrete

Batching, Mixing, Transporting and Handling Concrete, Hot Weather and Cold Weather Concreting

Mix Design

The requisite properties – Design criteria – Numerical examples, Cracks in Concrete and Repairing Techniques, Types of cracks - Crack depth measurement – Repairing of cracks

Special Topics

Autoclaved cellular concrete – Mass concrete – Shotcrete – Polymer Portland cement concrete - Ferro cement

CE-106L: Civil Engineering Materials & Concrete Technology, Lab, CH (0+1):

Specification for Portland Cement (ASTM C150), Specification for Concrete Aggregate (ASTM 33), Specification for Chemical Admixture (ASTM C 494, 778), Gradation of coarse aggregates, Gradation of fine aggregates, Test to determine the fineness of cement, Test to determine the density of cement, Setting Time, Initial setting time, Final setting time, Mortar Casting, Compressive strength of mortar cube, Test for determining the organic impurities in sand, Normal Consistency, Test for determining the specific gravity of coarse aggregates, Slump Test, Concrete Casting, Test for determining the tensile strength of briquette, Compressive strength of cylindrical concrete, Test to determine the soundness of cement, Test for Rebound Number of Hardened Concrete, Test for Pulse Velocity through Concrete.

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Recommended Books

1. Smith R. C. Material of Construction, McGraw-Hill
2. Properties of Concrete by Adam Neville.
3. Concrete Technology by Adam Neville
4. Design and Control of Concrete by Steven H. Kosmatka and B. Kerkhoff

BSI-101: Islamic Studies, CH (2+0):

- 1- کتب و سنت
- 2- دین اسلام- آیات قرآنی اور احادیث نبویہ کی روشنی میں۔
- 3- اسوۂ حسنہ:- حضور صلی اللہ علیہ وسلم کی سیرت طیبہ کا مطالعہ
- 4- اسلام کے اخلاقی اقدار اور اسلامی معاشرے کے بنیادی اوصاف
- 5- تہذیب انسانی کی تعمیر میں اسلام کا حصہ
- 6- ہمارے مسائل اور ان کا حل۔

CE-115: Introduction to the Civil Engineering Industry, Lab, CH (0+1)

COURSE OBJECTIVES

The objectives of this course include introducing students to: civil engineering works, the role of physical infrastructure in serving needs of the society within the contexts of natural and built environments, the profession of Civil Engineering, the application of concepts to be learnt over the course of the degree program.

COURSE OUTLINE

- Lectures including both from regular faculty and guest lectures introducing the students to the field of civil engineering. Moreover, guest lecturers, from major government line departments such as C&W, PHED, Irrigation, NHA, EPA, WAPDA, PDA, UPU, the oil & gas sector, will deliver lectures focused on the roles and responsibilities of the respective departments, their challenges and accomplishments, career paths, and scope for internship opportunities
- Documentaries related to current/historic civil engineering works in roads, buildings, bridges, water supply and sanitation, and irrigation.
- Field visits to ongoing/commissioned projects in roads, buildings, bridges, water supply and sanitation, and irrigation.
- Introduction to and practice in engineering workshops such as the Pattern shop, Elementary Machine Shop, Advanced Machine Shop, Fitting Shop, Welding Shop, Smith Shop and Foundry Shop.
- Course project involving fabrication of a physical model for civil engineering works.

Books recommended:

Civil Engineering Handbook.

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Department of Civil Engineering
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BSI- 111: Linear Algebra CH (3+0):

Linear Algebra:

Vector Algebra, Matrix Algebra, Determinants, Linear system of equations, Linear Transformations, Eigenvalues and Eigenvectors.

Books Recommended

1. David C Lay, Linear Algebra and its Application, 2nd Edition, Addison-Wesley Publication Jan 1998
2. Robert Davison, Addison Wesley, Mathematics for Engineers
3. Anton, H. Calculus and Analytic Geometry, John Wiley and Sons.
4. Toff and McKay, Practical Mathematics
5. S.A.H.Rizvi, Engineering Mathematics

BSI-122: Calculus, CH (3+0):

Calculus:

Single Variable Calculus, Differential Calculus, Integral Calculus, Multivariate Calculus.

Books Recommended

1. David C Lay, Linear Algebra and its Application, 2nd Edition, Addison-Wesley Publication Jan 1998
2. Robert Davison, Addison Wesley, Mathematics for Engineers
3. Anton, H. Calculus and Analytic Geometry, John Wiley and Sons.
4. Toff and McKay, Practical Mathematics
5. S.A.H.Rizvi, Engineering Mathematics

SEMESTER – 2

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|----------|--|
| CE-112: | Engineering Drawing for Civil Engineers, CH (2+0) |
| CE-112L: | Engineering Drawing for Civil Engineers, Lab, CH (0+1) |
| ME-191: | Mech. Technology & Heavy Construction Machinery, CH (2+0) |
| ME-191L: | Mech. Technology & Heavy Construction Machinery, Lab, CH (0+1) |
| CE-116: | Engineering Mechanics, CH (2+0) |
| CE-116L: | Engineering Mechanics, Lab, CH (0+1) |
| BSI-110: | Pakistan Studies, CH (2+0) |
| BSI-231: | Differential Equations, CH (3+0) |
| CE-210: | Introduction to Architecture and Urban Planning, CH (2+0) |

CE-112: Engineering Drawing for Civil Engineers, CH (2+0):

Drawing Instrument & their use. Types of lines & letters. Scales Dimensions & their Types. Planning of a Sheet. Types of Engineering Drawings. Geometric Constructions & Engineering Curves, Parabola, Ellipse & Hyperbola. Projections: Concept of Projection. Types of Projections, Orthographic Projection. 1st Angle & 3rd Angle Projection Orthographic Projection of Points, Simple lines, simple planes & simple solids. Three Views of an object. Sectional Views. Isometric Views from given orthographic Views. Free Sketches. Of solid objects. Mechanical Drawing

Books Recommended:

1. Essentials of Drafting by James D. Bethune.
2. Engineering Drawing by N.D. Butt.

CE-112L: Engineering Drawing for Civil Engineers, Lab, CH (0+1):

Planning of sheet & practicing lines & letters. Orthographic Projections of given model, Sectional Views. Steel Structure Connections detail. Preparation of Plan, Elevation & Section of Single story simple buildings. Isometric & other Three Dimensional Views. Free Hand Sketches.

ME-191: Mech. Technology & Heavy Construction Machinery, CH (2+0):

Basic Concepts: Fundamentals of Heat Transfer, Conduction, Convection, Radiation, Thermal Conductivity, Overall Heat Transfer Coefficients, Practical Equations, Laws of Thermodynamics, Internal Combustion Engines.

Heating Ventilation and Air Conditioning (HVAC): Introduction to HVAC components. Heating and cooling load and its calculations; Comfort charts; Outline of A.C. systems; Consideration for air-conditioning in buildings; natural Ventilations; Insulating materials. Thermodynamics, IC Engines, HVAC and different construction machinery its installation and operation, to the Civil Engineer's, who are dealing with these equipments present in the close vicinity of the civil structure.

Laws of Thermodynamics, Air Cycles, Internal Combustion Engines, Air Compressor's, Property of Steam and Steam Turbine.

Fundamental of Heat Transfer:

Conduction, Convection & Radiation. Thermal Conductivity, Overall Heat Transfer Coefficient.

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Heating, Ventilation and Air Conditioning (HVAC):

Introduction to HVAC components, Heating and Cooling Loads and its calculation, Comfort Charts, Psychometric Chart. Refrigeration Cycle like Vapor Absorption, Vapor Compression, Carnot & Bell-Colman Cycle, Outline of Air Conditioning System (Considering the Air Conditioning in Buildings), Natural Ventilation and Insulation Material.

ME-191L: Mech. Technology & Heavy Construction Machinery, Lab, CH (0+1).

Construction Machinery: Element of Operating Cost. Machine Equipment Power Requirement. Roads: Dumper, Excavator, Rollers, Dozers, Scrapers, Loader (Shoval), Paver, Grader, Water Truck/Tanker, Trenching Machine, Air Compressors and Pumps.

Buildings: Concrete Mixer, Concrete Pump, Concrete Conveying Truck, Vibrators, Cranes (Tower Crane, Truck Mounted Crane), Stone Crushing Plant, Core Cutting Machine, Asphalt/Concrete Cutter & Fork Lift.

Books Recommended

1. Ryner Joel , Applied Thermodynamics, Mc-Graw Hill(Latest Edition)
2. T. D. & McConkey, Applied Thermodynamics, Longman
3. Applied Thermodynamics by T.D Estop & A.McConky.
4. Applied Thermodynamics by Ryner Joel
5. Air Conditioning & Refrigeration by V.K Jain &
6. Air Conditioning & Refrigeration by Serversn & Fellows
7. Construction Planning, Equipment, and Methods by Peurifoy Schexnayder Shapira

CE-116: Engineering Mechanics CH. (2+0)

Concepts of measurement of mass, force, time and space, system of units, Fundamental & Derived units, conversion of units, required accuracy of results, General principles of statics, Vector addition, subtraction and products, Resultant of distributed (linear & non-linear) force systems, General conditions of equilibrium of co-planer forces, Laws of triangle, parallelogram and polygon of forces, Problem involving friction on flat surfaces, Geometrical properties of plane areas, Work, energy, power, impulse, momentum, conservation of momentum and energy, Rectilinear and curvilinear motions, Tangential and normal components of Acceleration, Simple harmonic motion.

Books Recommended.

1. Engineering Mechanics, 4th edition by Irving H. Shames, Prentice Hall

CE-116L: Engineering Mechanics, Lab, CH. (0+1)

Geometric properties of sections: centroid, moment of inertia, and product of inertia for simple and composite areas, To find the forces in various parts of roof truss, To find the forces in various parts of wall crane, To verify the law of polygon of various forces, To verify the principle of moment in the disc apparatus, To calculate Moment of inertia of Fly wheel, Measurement of reactions at supports in statically determinate beam.

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BSI-110: Pakistan Studies, CH (2+0):

- 1- نظریہ پاکستان
- 2- نظریہ پاکستان کا تاریخی پہلو
- 3- تحریک پاکستان
- 4- قیام پاکستان
- 5- پاکستان میں نظام اسلام کے نفاذ کی کوششیں
- 6- ارض پاکستان
- 7- پاکستان اور عالم اسلام

BSI-231: Differential Equations, CH (3+0):

Ordinary Differential Equations:

Basic concepts of ordinary differential equation, General and particular solutions, Initial and boundary conditions, Linear and nonlinear differential equations, Solution of first order differential equation by separable variables and its applications in our daily life situations, The techniques like change of variable, homogeneous, non-homogeneous, exact, non-exact, linear and nonlinear Bernoulli could be used in case of complications. Solution of second order differential equation by theory of operators and its applications as forced and free oscillations, The extension of second order solution criteria to higher order differential equations, Solution of the system of differential equations by theory of operators and its applications in our daily life situations.

Partial Differential Equations:

Basic concepts, Linear and nonlinear p.d.equations, Quasi linear and Quasi nonlinear p.d.equations, Homogeneous and non-homogeneous p.d.equations, Solutions of p.d.equations, Boundary and initial conditions as Dirichlet condition, Neumann condition, Robbins/Mixed condition, Classification of p.d.equations as Elliptic, Parabolic and Hyperbolic.

Analytic solution by separation of variables of the Steady-State Two-Dimensional Heat equation/Laplace equation and Unsteady-State One-Dimensional Heat equation/Diffusion equation with homogeneous and nonhomogeneous boundary conditions. D'Alembert's solution of Two-Dimensional Wave equation with homogeneous and nonhomogeneous boundary conditions.

Fourier Series:

Periodic waveforms and their fourier representations, Calculating a fourier series, Fourier series of odd and even functions, Half range fourier series, Fourier series solution for the above p.d.equations.

Books Recommended:

1. Kreyszig, E. Advanced Engineering Mathematics, Wayne and Erson.
2. Abell & Braselton, Brooks /Cole, Modern Differential Equations, Second edition

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University of Engineering and Technology, Peshawar, Pakistan

CE-210: Introduction to Architecture & Urban Planning, CH (2+0):

Objectives of urban planning, various theories of land use pattern, sub urban development, neighborhood units, satellite town and garden City, issues related to inner city urban design and emergence/up-gradation of squatter settlements

Role of transportation in urban planning, Factors affecting transportation, travel demand modeling, trip generation, trip distribution, modal split, level of service analysis, intelligent transport system.

Land use cover and land use, Land use and environment, factors affecting land use analysis, the process of land use analysis- a practical example. Research methods in land use analysis.

Energy & water conservation planning & management, waste management behavior, introduction to renewable energy technologies.

Architecture

Historical Development

General introduction to history of architecture; Emergence/Development of Islamic Architecture.

Influences

Geographical, climatic, religious, social, historical.

Principles

Truth or purpose & beauty.

Qualities

Strength, vitality, grace, breadth and scale.

Factors

Proportion, color and balance.

Use of Materials

Architectural use of Stone, wood, metals, concrete, composites, ceramics.

Case studies: Islamabad was designed by Doxiades (Greek Planner).

The city of Chandigar was designed by Carvouisier (French Planner).

Books Recommended

Brodbent, G. J.C. Anthony, Emerging Concept in Urban Space Design, Van Nostrand Reinhold Co. Ltd.

Snyter, J.C. Introduction to Urban Planning, Milwaukee McGraw Hill Book Co.

Fletcher, S.B. A History of Architecture. The Athlone Press.

SEMESTER – 3

| | |
|-----------|--|
| CE-213: | Building Construction & Drawing (CAD), CH (2+0) |
| CE-213L: | Building Construction & Drawing (CAD), Lab, CH (0+1) |
| CE-206: | Fluid Mechanics – I, CH (3+0) |
| CE-214: | Mechanics of Solids –I, CH (3+0) |
| CE-214L: | Mechanics of Solids –I, Lab, CH (0+1) |
| CE-205: | Surveying – I, CH, (3+0) |
| CE-205L: | Surveying – I, Lab CH (0+1) |
| BSI-242: | Numerical Analysis, CH (3+0) |
| EE-106L : | Electrical Technology Lab, CH (0+1) |

CE-213: Building Construction & Drawing (CAD), CH (2+0):

General: Need and requirement of drawings for civil Engineering projects. General nature of drawings, components, symbols and nomenclature needed for specific drawings such as architectural, structural, plumbing, electrical, air-conditioning, roads and earth work etc. Drawings at different stages of projects, Elements of perspective drawing.

Civil Engineering Drawing: General description of drawings related to civil Engineering projects. e.g. hydraulic structures, drainage structures, , highway and motor way drawings.

Building Drawing: Elements of architectural planning and design, conceptual, schematic and working drawings and details of residential, commercial, religious, recreational, industrial, clinical, hospital, and educational buildings, Details of doors, windows, staircases etc.

Elements of structural drawing and detailing: Preparation of foundation plan, structural framing, slab details, staircase details, water tanks, beam and column elevations and sections mostly pertaining to reinforced concrete structures. Details of steel roof truss, connection details and fabrication drawings. Plumbing and electrical detailing pertaining to small residential units.

Computer Aided Drafting: General and basic know how related to computer aided drafting, e.g. co-ordinate system, drawings setup procedure, basic draw commands, basic edit commands, Layers, creating text and defining styles options, block and drawing import/export options, Cross hatching, save and plot (2D) and isometric drawings.

Building Construction: Site Selection for a building, Orientation and Setting out for construction, Layout Techniques with special reference to buildings, Types of stone and brick masonry; bonds in brick masonry, Alignments, Plumbs, leveling & cambering, Brick, Mortar, Types of stones, Requirements of Good Building Stones, Requirements of Good Bricks, Types of mortars, Form work for general in-situ construction, props, bracing and horizontal shuttering platforms, Damp proofing in building, Interior and exterior surface finishes, Various types of floors & roofing systems, planner & non-planer roofing system, roof treatments, Expansion joints and construction joints, Joinery work in building construction (Doors Windows etc), Introduction to Construction specification, Common defects in building construction their causes and remedial measures.

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CE-213L: Building Construction & Drawing (CAD), Lab, CH (0+1):

Graphics

Architectural Drawings, Structural Drawings, Plumbing and Electrical Work. Computer Aided Drawing (AutoCAD), General and basic know how related to computer aided drafting, e.g., coordinate system, drawing setup procedure, basic draw commands, basic edit commands; Layers, creating test and defining styles options, block and drawing import/export options; Cross hatching, save and plot (2D) and isometric drawings. Use of Auto CAD in drawing plans, elevation and section of single and double-storey buildings, Building Drawings. Building symbols. Types of building drawings, proposed drawing, submission drawing, Working drawing & completion drawing.

Books Recommended:

1. M. Chakarborti, Civil Engineering Drawing, 3rd ed.
2. Gurcharan Singh, Civil Engineering Drawing, 2nd ed. Malik Book Dept., Lahore
3. George Ormura, Mastering AutoCad 2000, 1st ed. BPB Publisher
4. Boughton, B. Reinforced Concrete Details Manual (Reference Book), Crossby Lockwood Stamples Granada Publishing, London

CE-206: Fluid Mechanics – I, CH (3+0):

Introduction:

Introduction to fluid Mechanics & its classification.
History of fluid Mechanics
Application of Fluid mechanics in Civil Engineering.
Distinction between solids and fluids.

Physical Properties of Fluids:

Density, Specific weight, Specific Volume, Specific gravity, Viscosity.
Newton's Law of viscosity. Surface tension. Compressibility of fluids.

Fluid Statics:

Static pressure, Pressure height relationship, absolute and gauge pressure,
Measurement of Pressure, Barometer, Bourdon gauge, Pizometer tube, simple and differential manometer, Basic principal of various pressure measuring instruments.
Forces on submerged plane and curved bodies. Buoyancy and Stability of submerged and floating bodies.

Fluid Kinematics:

Basics Concept about steady and unsteady flow, Laminar and Turbulent flow, Path lines, stream line, stream tube, uniform and non uniform flow.

Basic Equations:

Continuity Equation, Energy Equation and Momentum Equation.
Application of Energy Equation and Continuity Equation to incompressible fluids.

Fluid Measurement:

Venturimeter, Orifices, Mouth pieces and Nozzles, pitot tube, Weirs and Notches.

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Recommended Books

1. Robert L. Daughetn, Joseph B. Franzini, Fluid Mechanics with Engineering applications, E.H.Lewitt, Hydraulics and Fluid Mechanics

CE-104: Mechanics of Solids – I, CH (3+0):

Simple stress and strain, Types of stresses and strains, Load extension diagram for different materials, Hook's law, Modulus of elasticity, Lateral and volumetric strain. Poisson's ratio, Temperature stresses and compound bars, Theory of torsion of solid and hollow circular shafts, Shear force and bending moment diagrams for statically determinate beams. Relationship between Load, Shear and Moment., Theory of simple bending, Neutral Axis, Resisting moments and section modulus, Shear stresses in mono-symmetric beams, methods.

CE-104L: Mechanics of Solids – I, Lab, CH (0+1):

Theoretical Background:

Hook's law, stress-strain curve, proportional limit, yield strength, ultimate strength, strain hardening, moduli of resilience, toughness, rupture.

Fatigue: low cycle and high cycle fatigue, S-N curves

Deflection of beams by double integration, moment area and conjugate beam methods.

Experimental Demonstration:

Tensile test of steel rebars: To determine yield strength, ultimate strength, and percent elongation of a steel rebar; To develop stress-strain curve for mild steel

Bend test on steel rebar,

Demonstration of fatigue phenomenon,

Determination of modulus of elasticity for mild steel, concrete and wood,

Determination of the deflections and rotations in beams.

Books recommended:

Strength of Materials by Andrew Pytel and Ferdinand L. Singer, Mechanics of Materials by E.P. Popov

CE-205: Surveying – I, CH, (3+0)

SURVEYING:

Introduction, Linear instruments: chains, tapes, steel bands, their types & uses, Incorrect length of chain, Types of errors, Precision and accuracy.

CHAIN SURVEYING:

Principles of Surveying, Ranging & Chaining of Survey lines, Offsets and their types, Chain traversing, Field work & Plotting.

COMPASS SURVEYING:

Prismatic & Surveyor compasses and their uses, Bearings, Meridians, Local attraction, Dip of needle, Declination and Variations in Declination, Fieldwork & Plotting.

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PLANE TABLE SURVEYING:

Parts and accessories, Methods of Plane Tabling, Two-point and three-point problems.

LEVELING:

General principle, Types of levels and their temporary and permanent adjustments, Differential and other Types of leveling, Reduction of levels, precise leveling, Profile leveling and cross-sectioning.

TRIGONOMETRIC LEVELING:

Theory and Object of Trigonometric Leveling, Computations.

TRANSIT AND THEODOLITE:

Types and uses of theodolite, Temporary and permanent adjustments, Measurement of horizontal and vertical angles.]

INTRODUCTION TO ADVANCED SURVEYING INSTRUMENTS:

EDMS, Total Stations, GPS.

TACHOMETRY:

Introduction, Stadia tachometry basic concept, Horizontal sights, Inclined sights, Surveying and computation.

COMPUTATION OF AREAS AND VOLUMES:

Computation of Areas from field Notes, Computation of Areas from plan, Areas along Boundaries by Trapezoidal Rule and Simpson's Rule, Computation of Earthwork from cross-sections.

CE-205L: Surveying – I, Lab CH (0+1)

Measurement of distances with linear instruments, Chain Surveying and plotting, Compass Traversing and plotting, Plane Table Surveying by radiation and Intersection methods, Two Points Problem, Three Points Problem, Level adjustments by two-peg method, Profile leveling, Cross-Sectioning and plotting, Theodolite Centering, Leveling and Observation of Horizontal and Vertical angles, Trigonometrical leveling and plotting.

Books Recommended

1. Elementary Surveying by "Paul R. Wulf & Russell C. Brinke", 8th Edition
2. Surveying principles and Application by "Barry F. Kavanagh", 7th Edition
3. Surveying for Construction by "William Irvin", 4th Edition. McGraw Hill
4. Surveying Theory and Practice by "Raymond E. Davis & Francis S. Foote", 4th Edition.
5. Surveying and Leveling by "T.P Kanetkar & S.V. Kulkarni" Part I and II

BSI-242: Numerical Analysis, CH (3+0):

Interpolation and extrapolation;

Finite differences, forward, backward and central differences and its operators form, Linear and higher order interpolating polynomials, Newton's Gregory forward & backward difference

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interpolation formulas and its utilization as extrapolation, Lagrange's interpolation, Numerical differentiation based on differences,

Numerical integration;

Trapezoidal and Simpson's approximations, Romberg integration process,

Numerical Solution of non-linear equations;

Bracketing and iteration methods and its applications as multiple root methods,

Direct solution of the system of linear equations;

Gauss-elimination, Direct and indirect factorization, symmetric factorization, tri-diagonal factorization, Iterative methods like Jacobi's iteration and Gauss-Seidel iteration,

Numerical solution of initial value problems;

Single-Step methods and its comparison with Taylor's series expansion, Multi-Step methods, Higher order differential equations, System of differential equations,

Numerical solution of linear and nonlinear boundary value problems.

Book Recommended

1. Prof. Mumtaz Khan, Numerical Methods for Engineering, Science and Mathematics, 2nd Edition
2. Prof. Mumtaz Khan, Ordinary & Partial Differential Equations With Numerical Techniques for Engineering, Science and Mathematics, 2nd-edition
3. Schaun's series, Numerical Analysis. McGraw Hill.

EE-106L : Electrical Technology Lab, CH (0+1):

Electrical Elements and Circuits: Electric current, voltage, power and energy, Ohm's law, inductance, capacitance, Kirchoff's laws. Introduction to node voltage and loop current methods, AC single and poly-phase system, DC machines, AC Synchronous Machines, AC Induction Machines, Transformers, Converting Machines.

Power Plant Installations and Distribution System: Power Systems layout, generation, transmission, distribution and utilization of electric power, Introduction to domestic electrification.

Electronics: Diode. Transistor and simple rectifier circuit. Principles of House wiring and Industrial wiring, Illumination. Electrical know how related to experimental design instrumentations like corrosion rate measurements, strain gauges, LDT's, LVDT's. etc.

Books Recommended

1. Theraja, B.L. Electrical Technology, S. Chand. (Latest Edition)
2. Basic Electrical Engineering by Daltoro(Latest Edition)

SEMESTER – 4

| | |
|----------|---|
| CE-212: | Fluid Mechanics – II, CH (3+0) |
| CE-212L: | Fluid Mechanics – II, Lab, CH (0+1) |
| CE-209: | Geotechnical Engineering-I, CH (2+0) |
| CE-209L: | Geotechnical Engineering-I, Lab, CH (0+1) |
| CE-207: | Surveying – II, CH (3+0) |
| CE-207L: | Surveying – II, Lab CH (0+1) |
| CE-201: | Mechanics of Solids – II, CH (3+0) |
| BSI-351: | Probability and Statistics, CH (3+0) |

CE-212: Fluid Mechanics – II, CH (3+0):

Flow through Pipes:

Laminar Flow through pipes, Darcy's Weisbach equation for flow through pipes, Hydraulic and Energy gradient lines, Losses in Pipe lines. Transmission of Energy through Pipes, Reynolds Number and its significance, instability of viscous flow, turbulent flow through pipes, velocity profile in turbulent flow, pipe roughness, Nickurade's experiments, Moody diagram, branching of pipes in series and parallel.

Introduction to Hydrodynamics:

Ideal and real fluids, differential equation of continuity, rotational and irrotational flow, stream function and velocity potential function. Circulation and vorticity, brief description of flow fields, flow net and its limitations

Forces on Immersed bodies:

Development of boundary layer on immersed bodies, elementary theory of friction drag and pressure drag, simple lift and drag equations and their application to engineering problems, separation of boundary layer.

Unsteady Flow:

Flow through pipes and orifices and over weirs under varying heads, water hammer and its elementary analysis.

Hydraulic Machinery:

Impulse momentum equation, forces on moving flat and curved vanes, impulse and reaction turbines, specific speed, characteristics curves, cavitations and draft tube, governing of turbines, turbine efficiencies. Centrifugal pumps, classification, specific speed, characteristic curves and cavitations.

CE-212L: Fluid Mechanics – II, Lab, CH (0+1):

Demonstration of various parts of Hydraulic Bench. Calibration of pressure gauge (Bourdon gauge) by using Dead weight pressure gauge calibrator. Determination of Metacentric height. Forces on submerged bodies Experimental Study of laminar and turbulent Flow. Calibration of Orifices by Various Methods. Verification of Bernoulli's theorem. Calibration of Venturimeter. Calibration of Rectangular and Triangular Notch Study of Various losses through piping arrangements. Reynolds number experiment Impacts of jet on various blades Efficiency of

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Pelton wheel. Efficiency of single stage centrifugal pump. To investigate the variation of friction head along a circular pipe with the mean flow velocity in the pipe

Books Recommended

1. Fluid Mechanics with Engineering Applications, 8th Edition, by Robert L. Daugherty, Joseph B. Franzini, and E. John Finnemore
2. Fundamentals of Fluid mechanics by Bruce R. Munson, Donald F. Young, and Theodore H. Okiishi

CE-209: Geotechnical Engineering-I, CH (2+0).

Soil Formation

Soil and its constituents, weathering of rocks and types of soils. Description and Identification of soil (Visual-Manual Procedure), Mineralogy of soil solids.

Physical Properties

Water content, void ratio, porosity, degree of saturation, specific gravity, unit Weight and their determination, Atterberg limits, sieve analysis, hydrometer and Pipette analysis, Stoke's law, grain size distribution.

Soil Classification, Grain size classification, Bureau of soils, M.I.T., Unified, AASHTO and ASTM Classification systems. Textural Classification by triangular chart, united soil classification system, AASHTO soil classifications.

Permeability and Seepage

Definition, Hydraulic gradient, Darcy's Law, Factors affecting permeability, Permeability of stratified soils, Laboratory and field determination of coefficient of permeability.

Seepage force, quick sand condition, flow nets, boundary conditions, graphical method of flow net construction, determination of quantity of seepage, two dimensional flow, Laplace Equation, seepage through earth dams, design of filters

Compaction

Definition, Compaction fundamentals, Moisture density relationships, Standard Proctor test and modified AASHTO test for compaction, Factors affecting compaction, Compaction equipment, properties and structure of compacted soils, Specifications, field control and measurement of in-situ density, CBR test.

Vertical stresses in soils

Definition, stresses caused by self weight of soil, Geostatic stresses, stresses caused by point loads and uniformly distributed loads: Boussinesq and Westergaard theories, Pressure bulb, stress distribution diagram on horizontal and vertical planes; stress at a point outside loaded area, Newmark's charts and 2:1 Method

Soil Exploration

Importance of soil exploration, soil exploration methods; probing, test trenches and pits, auger boring, wash boring, rotary drilling, Percussion drilling and geophysical methods, soil samples, Disturbed and undisturbed samples, In-situ tests (SPT, CPT and PLT), Introduction of related Software

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CE-209L: Geotechnical Engineering-I, Lab, CH (0+1).

Identification of Soil (Visual Manual Procedure), Determination of Moisture content of soil, Determination of specific gravity of soil, Determination of liquid limit of soil, Grain-size analysis of soil (including both mechanical and hydrometer analysis), Determination of Plastic limit and Plasticity Index of soil, Determination of shrinkage limit of soil, Classification of soil according to AASHTO and USCS, Modified/Proctor Compaction Test, Constant Head Permeability test (Granular Soil), Falling Head Permeability (Granular and Fine grained soils), Chemical Analysis of soil,

Books Recommended

1. An Introduction to Mechanics of Soils and Foundation by "John Atkinson"
2. Soil Mechanics by R.F.Craig
3. Principles of Geotechnical Engineering by Braja M. Das.

CE-207: Surveying – II, CH (3+0)

THEODOLITE TRAVERSING:

Method of Running Traverses with Theodolite, Traverse computations, Transformation of Co-ordinates, Omitted Measurements.

CURVES:

Computations and setting out of Simple Circular Curves, Compound Curves, Reverse curves, Transition curves and Vertical curves

GEODETTIC SURVEYING:

(a) Triangulation, Classification of triangulation systems, Base Line and corrections to measured length, Methods of observation of Horizontal Angles, Satellite Stations,
(b) Precise Traversing

CONTOURING:

Method of contouring, Characteristics of Contour lines, Interpolation
Plotting of Contour Maps

HYDROGRAPHICAL SURVEYING:

Object of hydrographical surveying, Horizontal & Vertical Control, Shore line Surveys
Sounding, Methods of Sounding

TUNNELING:

Surface Alignment, Setting out from Ends, Transferring Alignment Under ground, Transferring levels under ground, Under Ground Bench Marks

Photogrammetry:

Introduction, Types and uses of photogrammetry, Types of aerial photograph, Aerial Surveying, Mosaics, Photogrammetric Stereoscopic plotting Techniques.

Astronomy :

Definition of various Astronomical Terms, Co-ordinate Systems, Local and standard time
Methods of Determining Azimuth, Latitude and Longitude by solar observations.

Computer Programming for Traverse Computation.

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CE-207L: Surveying – II, Lab CH (0+1)

Study and Use of advanced surveying equipment, Theodolite Traversing, Contouring Simple Curve. Compound Curve, Transition Curve, Operation of Total Station, Operation of GPS.

Books Recommended

1. Elementary Surveying by "Paul R. Wulf & Russell C. Brinke", 8th Edition
2. Surveying principles and Application by "Barry F. Kavanagh", 7th Edition
3. Surveying for Construction by "William Irvin", 4th Edition. McGraw Hill
4. Surveying Theory and Practice by "Raymond E. Davis & Francis S. Foote", 4th Edition.
5. Surveying and Leveling by "T.P Kanetkar & S.V. Kulkarni" Part I and II

CE-201: Mechanics of Solids – II, CH (3+0).

Analysis of stresses and strains at a point due to combined effect of axial force, shear force and bending moment, Stress and strain transformation, Mohr's circle for stresses and strains, Relationship between elastic constants, Theories of Failure, Unsymmetrical Bending, Shear Stresses in mono-symmetric beams, Shear stress distribution in unsymmetrical beams, Shear flow, shear center, concentration of stresses, Thick and thin walled cylinders, Analysis of curved beams and beams on elastic foundation, Short eccentrically loaded columns, Core of a section, Rankine-Gordon formula for columns, slenderness ratio, Eccentrically Loaded Columns, Inelastic behavior of beams in flexure, Shape factor of a section.

Books Recommended:

Strength of Materials by Andrew Pytel and Ferdinand L. Singer.
Mechanics of Materials by E.P. Popov

BSI-351: Probability and Statistics, CH (3+0):

Probability:

Sets, Applications of Venn Diagrams, Introducing probability, Mutually exclusive events, The addition law of probability, Complementary events, Concepts from communication theory, Problems related to engineering, Conditional probability, The multiplication law, Independent events, Baye's formula, Permutations and combinations, Multiplication principle, Problems related to engineering, science and management, Applications of counting, Bernoulli trials, Binomial probability, Markov chains, Probability distribution, Expected value, Decision making, Problems related to engineering and management.

Statistics:

Mean value, Measures of central tendency, Measures of variation, Standard deviation, Expected value of a random variable, Standard deviation of a random variable, The poisson distribution, The uniform distribution, The exponential distribution, The normal distribution, The standard normal, The unstandard normal.

Books Recommended

1. Blind, D.A. & R.D. Mason, Basic Statistics for Business & Economics, Irwin Publishers
2. Erwin Kreyszig, Advanced Engineering Mathematics, 8th Edition, John Wiley & Sons Publication

SEMESTER – 5

| | |
|----------|---|
| CE-312: | Engineering Geology and Seismology: CH (3+0) |
| CE-318L: | GIS/RS Application to Civil Engineering, CH (0+1) |
| CE-313: | Geotechnical Engineering-II, CH (2+0) |
| CE-313L: | Geotechnical Engineering-II Lab, CH (0+1) |
| CE-401: | Environmental Engineering – I, CH (3+1) |
| CE-303: | Hydraulics, CH (3+0) |
| CE-215: | Structural Analysis – I, CH (3+0) |
| CE-215L: | Structural Analysis – I Lab, CH (0+1) |

CE-312: Engineering Geology and Seismology: CH (3+0):

Engineering Geology

Importance of Geology for Civil Engineering Projects, Physical properties and identification of common rocks forming minerals, Rocks formation and classification, Weather and erosion, Weather classification, Discontinuity classification, Description of Rock masses as thickly bedded or thinly bedded, Geological classification and identification of Rocks by geological names, Classification of Durability of Rocks in Dry and wet condition with durability test, Engineering and physical properties of rocks, Role of geology in selection of sites for dams, reservoirs, tunnels and other civil engineering structures.

Engineering Seismology

What is an earthquake, Plate Tectonics with respect to the global application, earthquakes, causes of earthquakes, protective measures against earthquakes and zoning of earth quakes in Pakistan?

Ground motion, Magnitude, Intensity, Epicenter, Focus, Hazard, Vulnerability, Risk, Peak, Ground Acceleration, Base shear, Attenuation, Shear Wave velocity, Soil Profile types, Site amplification, Earthquake duration effects, near fault effect.

Earthquake generation: Earth Structures, Plate tectonics, fault rupture and elastic rebound, seismic waves and rays theory.

Earthquake observation: seismographs and seismogram, hypo central location, fault plane solution, magnitude and seismic moment, instrumental and historical seism city, macro seismic scales and isoseismal maps.

Earthquake strong motion: Accelerograph and Accelerograms, strong motion parameters, attenuation relationships,

Basic of Seismic hazard Analysis: hazard mapping and zonation, site effects.

Book Recommended:

A Text Book of General & Engg. Geology by K.M Banger Reprinted 1988

Earthquakes newly revised and expanded by Bruce A. Bolt University of California, Berkeley

Rock Mechanics by Alfred's R. Jumikis (2nd Edition)

Analysis of Geological Structures by N.T Price & I.W Cosgrove (Printed in 1990)

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CE-318L: GIS/RS Application to Civil Engineering, CH (0+1).

Geographic Information System (GIS): Fundamentals of GIS, Spatial Data types and acquiring consideration . Data models and structures. Coordinate System, Datum and map projection and their transformation. Attribute-based operation, Introduction to Spatial Analysis.

Field and Laboratory Work: Training on GPS instruments based surveys, Integration GPS data in GIS. Exercise on Image processing software and recent GIS software. Demonstration on RS / GIS applications in engineering disciplines.

CE-313: Geotechnical Engineering-II, CH (2+0)

Shear Strength of Soil:

Definition, peak, Ultimate, and residual shear strength, analysis of stress using Mohr circle, Pole method of finding stress along a plane, Mohr-Coulomb failure criterion and shear strength parameters, Direct shear test, tri-axial compression test, unconfined compression test, vane shear test, Mohr's envelopes for different types of soils under different test conditions stress path, critical state concept

Consolidation Settlement

Definition of effective stress, total stress, and pore water pressure and their relationship, response of effective pressure with change in total stress, definition of 1-D consolidation, consolidation analogy wrt spring system, consolidation test, definition of pre-consolidation pressure, normally consolidated clay, over-consolidated clay, under consolidated clay.

Lateral Earth Pressure

Active, Passive earth pressure and at-rest earth pressures, Rankine's theory, Coulomb theory and Culmann method for determining lateral earth pressure, Coulomb's and Rankine's theories. Lateral earth pressure due to surcharge load, effect of water table on earth pressure, sloping ground, Culman's method, types of retaining structures, failure criteria of earth retaining structures, stability analysis of earth retaining structures

Stability of slopes

Basic Definition, types of failure, analysis of plane transnational slip, finite slope with circularly cylindrical failure surface, modes of cylindrical failure, untrained/total stress analysis.

Earth Dams

Types of earthen dams, components and their functions. Stability of earth dam, steady seepage, and rapid draw down design, considerations and typical cross-section. Method of seepage control.

Introduction to Geotechnical Software package

CE-313L: Geotechnical Engineering-II Lab, CH (0+1)

Direct shear test, Unconfined compression test, Tri-axial compression test, Vane shear test, Consolidation test, Standard penetration test, Plate load test, Pile load test (Field Visit), Introduction to Soil investigation Report.

References for Laboratory Work:

1. Soil Properties, Testing, Measurement, and Evaluation by Cheng Liu, and Jack B. Evett
2. Relevant ASTM Standards

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CE-401: Environmental Engineering – I, CH (3+1):

Introduction to environmental engineering

Water Quantity

Population Forecast; Water uses & consumption; Types and variations in demand; Maximum demand & fire demand. Rural Water Supply, Appropriate Technology.

Water Quality

Water impurities & their health significance; Water quality standards, (U.S. & WHO, etc); water quality monitoring.

Water Distribution

Layout and design of water transmission works and distribution networks, service reservoirs, Fixtures and their installation; Tapping of water mains.

Water Treatment

Treatment of surface & ground water, screening, sedimentation, coagulation, coagulants & dosages; Filtration, design aspects of slow sand and rapid sand filters; Filtration rates, operation head loss, backwash and filter efficiency; Pressure filters; Fluoridation, hardness removal; Iron & Manganese removal; Water softening methods; Water disinfection and chemicals; Use of chlorine, quantity, dosage and efficiency; Emergency treatment methods.

Water Sampling and Testing

Sampling techniques and examination of water (physical, chemical and microbiological parameters).

Disease, Water borne, foodborne, milkborne and vectorborne diseases.

Pollutants

Effects and control of environmental pollution; Toxic/hazardous wastes. Introduction to Relevant Software packages

Recommended Books:

1. Mackenzie L. Davis, David A. Cornwell, McGraw-Hill, Introduction to Environmental Engineering
2. Terence J. McGhee, McGraw Hill, Water Supply and Sewerage, 6th edition.

CE-303: Hydraulics, CH (3+0):

Flow Through Open Channel: Uniform flow through open channels, Chezy's and Manning's formula for uniform Flow through open channels. Most efficient cross section of open channel, specific energy and critical depth, dynamic equation of gradually varied flow, surface profile, humps and constrictions, abruptly varied flow cases, hydraulic pump, flow measurement in open channels, broad crested weirs, venture flumes & critical depth flumes.

Sediment Transport In Open Channels: Properties of individual particles, fall velocity, movement of bed and suspended load, collect and analysis of field data.

Hydraulic Similitude And Dimensional Analysis: Similarity laws, various dimensionless numbers and their significance, model analysis and scale ratio, Raleigh's method and Buckingham pie-theorem of dimensional analysis.

Books Recommended: Fluid Mechanics with Engineering Applications, 8th Edition, by Robert L. Daugherty, Joseph B. Franzini, and E. John Finnemore.

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CE-215: Structural Analysis – I, CH (3+0):

Introduction to Structural Analysis:

Definition of structure, types of structures: pin jointed and rigid jointed. Types of structural members. Types of beams, supports and loads. Stability of structures. Redundancy. Determinate and indeterminate structures, Degree of indeterminacy. etc.

Analysis Of Statically Determinate Rigid Jointed Plane Frames:

Definition. Analysis of determinate frames.

Analysis Of Determinate Plane Trusses:

Definition and common types of trusses. Classification of co-planar trusses. Methods of analysis of trusses; Method of joints, Method of sections, Graphical method.

Rotations And Deflections:

Deflection diagrams and elastic curves. Castigliano's theorem for trusses beams and frames. Unit load method. Theorem of virtual work for trusses beams and frames.

Classical methods for indeterminate structures' analysis: Force and displacement based methods

Three Moment Equation, Consistent Deformation, Slope Deflection Equation, Moment Distribution, Column Analogy.

CE-215L: Structural Analysis – I, Lab, CH (0+1):

Theoretical background:

Influence Lines:

Definition. Influence lines for statically determinate beams and paneled girders. Influence lines for reaction, shear and bending moment of statically determinate beams and paneled girders. Influence lines for axial forces in trusses. Influence lines for composite structures.

Travelling Loads:

Maximum bending moment and shear force at any section. Criterion for maximum moment and shear. Absolute maximum bending moment.

Arches:

Definition. Linear arch. Eddy's theorem. Three hinged parabolic and circular arch. Bending Moment and shear force diagrams. Influence lines for shear, thrust and moment.

Column Buckling:

Revision of elastic buckling, Euler buckling equation

Cables And Suspension Bridges:

Cables. Stiffened suspension bridges with three hinged stiffening girders. Shear force and bending moment diagrams.

Experimental demonstration:

Influence Lines and Rolling Loads: Demonstration of influence line.

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Arches: Determination of the horizontal thrust and maximum bending moment in a three hinged parabolic arches. Determination of the horizontal thrust and maximum bending moment in a two hinged parabolic arches.

Column Buckling: Investigation of buckling strut
Forces in stays with respect to different supports (same and offset levels)

Recommended Books

1. Wang, C.K. Intermediate Structural Analysis, McGraw Hill
2. West, H.H. Analysis of Structures, John Wiley & Sons.
3. Hibbeler, R.C. Structural Analysis, Prentice Hall.

SEMESTER – 6

| | |
|---------|---|
| CE-320: | Reinforced Concrete Design-I, CH (3+0) |
| CE-301: | Structural Analysis – II (Matrix Methods), CH (3+0) |
| CE-414: | Hydrology & Water Management, CH (3+0) |
| CE-319: | Foundation Engineering, CH (3+0) |
| CE-310: | Transportation Engineering – I, CH (3+0) |
| CE-408: | Environmental Engineering – II, CH (3+0) |

CE-320: Reinforced Concrete Design-I, CH (3+0)

Basics and mechanics of reinforced concrete design: Concepts of capacity and demand, behaviour of reinforced concrete members under axial, flexural and shear demand, familiarization to ACI code. Analysis and design of Singly reinforced, rectangular and T-type single and multi-span beams, for flexure and shear demand: This portion will cover analysis and design of single and multi-span beams, that are singly reinforced using ACI approximate method(s). Design of doubly reinforced rectangular and T-type single and multi-span beams for flexure and shear demand. Analysis and design of one-way slab (simply supported and continuous): This portion will cover analysis and design of simply supported and continuous one-way slabs using ACI approximate method(s). Analysis and design of two-way slabs supported on walls and stiff beams. Bond, anchorage and development length: This portion will cover basics of bond strength and development length, ACI code provisions for development length, bar cutoff & bar splices. Serviceability Requirements: This portion will cover basics of cracking in flexural members, ACI provisions for crack control & ACI provisions for control of deflections. Project: Design of RC roof of a simple building.

Recommended Books

1. George Winter, Design of Concrete Structures
2. Hassoun, M.N. Design of Reinforced Concrete Structures.
3. Nilson, Design of Concrete Structures.

CE-301: Structural Analysis – II (Matrix Methods), CH (3+0).

Introduction to Various Analysis Methods and Structure Types

Types of Structures, frame structures, trusses, grids and arches
Idealization of structures for analysis purpose
Equilibrium and compatibility
Introduction to Flexibility Method and Stiffness Method.

Introduction to Energy Methods for Solution of Structural Analysis Problems

Casigtilano's Theorems, Principle of Minimum Potential Energy and Principle of Virtual Work.

Introduction to Flexibility Method

Indeterminacy, Formulation of Flexibility Equations and applications for analysis of structures.
Limitations of Flexibility Method

Introduction to Stiffness Method

Coordinate systems, degrees of freedom
Member stiffness matrix for truss and frame elements
Coordinate transformations

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Formulation of global stiffness matrix for structure using destination arrays
Analysis procedure

Analysis of Beams Using Stiffness Method

Analysis of Frame Structures and Trusses

Use of Symmetry and Anti-Symmetry for problem simplification
Analysis for support settlements
Temperature loadings
Member Force Releases

Special Topics

Static Condensation of stiffness equations
Sub-structuring
Imposition of constraints
Numerical techniques for solution of Equilibrium Equations

Introduction to Finite Element Analysis

Introduction to shape functions
Derivation of stiffness matrix for a frame element
Computer applications of analysis of frame structures and trusses
Introduction to 2-Dimensional Elasticity Problems
Finite Element Analysis of 2-D Elasticity problems

CE-414: Hydrology & Water Management, CH (3+0)

Introduction: Hydrology, hydrologic cycle and the hydrologic equation, practical uses of hydrology, importance of hydrology.

Meteorology: The atmosphere and its composition, relative humidity, dew point and their measurement devices. Saturation deficit. The general circulation of wind system, the monsoons and western disturbances. Measurement of air temperature, relative humidity, radiation, sunshine, atmospheric pressure and wind velocity & direction.

Precipitation: Types of precipitation, factors necessary for the formation of precipitation, measurement of precipitation, interpretation of precipitation data, computation of average rainfall over a basin.

Evaporation and Transpiration: Factors affecting evaporation, measurement of evaporation, evapo-transpiration.

Stream Flow: Water Stage and its measurement, selection of site for stage recorder, selection of control and metering section, methods of measurement of stream flow, interpretation of stream flow data.

Runoff & Hydrographs: Factors affecting runoff, estimating the volume of storm runoff. Characteristic of Hydrograph, components of a hydrograph, hydrograph separation, estimating the volume of direct runoff, introduction to unit hydrograph concept, S-curve, Application of probability in determining maxima/minima of discharge. Types of histogram and distribution.

Stream Flow Routing: Introduction to floods and its causes, frequency and duration analysis. Reservoir routing, channel routing. Flood Control.

Groundwater: Introduction, sources and discharge of ground water. Water table and artesian aquifer, ground hydraulics, pumping test.

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Water Management: Water management practices at basin level, canal level and farm level.

Book Recommended

1. Warren Viessman, Jr. and Gary L. Lewis, Introduction to Hydrology, 4th Edition
2. R. K. Linsley, Max A. Kohler, and Joseph L. Paulhus, Hydrology for Engineers by (Latest edition)
3. Linsley, R. K., J. Franzini, Water Resources Engineering, McGraw Hill.
4. David, A. Chin, Water Resources Engineering, John Wiley & Sons.

CE-319: Foundation Engineering, CH (3+0)

Introduction to Foundation.

Introduction to course, Definition, Purpose and types of foundations, General requirement of foundations, Selection of foundation type, Load on foundation

Bearing Capacity For Shallow Foundations

Definition and types of bearing capacities, Mode of shear failures, Factors effecting bearing capacity, Sources of obtaining bearing capacity, Presumptive values, Terzaghi's theory and proof

Solved Examples on Terzaghi's theory, Meyerhof's theories of bearing capacity,

Additional considerations in use of bearing capacity equations, Effect of water table, Solved examples.

Effect of load eccentricity on bearing capacity, Inclined loads, Solve examples. Bearing capacity of Rock

Standard penetration test (SPT), Test procedure, Corrections, SPT correlations, Design N value, Bearing capacity calculation, Solved example

Cone penetration test, Test procedure, Correlations, Bearing capacity calculation, Solved example

Bearing capacity from plate load test.

Settlement Of Shallow Foundation

Definition, Type, Components, Causes, Remedial measures, Stresses in the soil, Simple (2:1) method, Boussinesq equation, Examples.

Mat settlement, Size effects on settlement and bearing capacity, Primary consolidation settlements, Examples

Proportioning footings for equal consolidation settlement, Secondary settlements, Reliability of settlement computations, Structure on fills, Structure tolerance to settlement and differential settlements.

Factor to be Considered In Foundation Design

Footing depth and spacing, Displaced soil effects, Net versus gross pressure (design soil pressure), Erosion problem for structure adjacent to flowing water, Water table fluctuation, Foundation in sand and silt deposits, Foundations on clays and clayey silts

Pile Foundation

Types of pile foundations, Methods of construction pile foundations, Methods of load capacity of piles, Types of hammers, Dynamic load formulas.

Examples on dynamic load formulas, Static capacity of single bored/driven piles.

Negative skin friction, Pile load test, Efficiency of pile groups of driven/bored piles in cohesion less/cohesive soil.

Group capacity of piles, Settlement of piles

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Special Topics

Soil improvement, Dewatering of foundation, Introduction to soil dynamics

Recommended Books.

Principles of Foundation Engineering by Braja M. Das
Soil Mechanics by RF Craig, 4th Edition.

CE-310: Transportation Engineering – I, CH (3+0)

Introduction to transportation Systems: Mode of transportation; Need and scope of comprehensive plan; Phases of planning, Principles of planning; Communication (rail-road network & airport), port and harbor facilities, street traffic and design.

Traffic Engineering: Operating and Design speeds; Traffic Survey; Traffic Safety At-grade and grade-separated intersections; Traffic Control Device; Capacity analysis; Traffic Management.

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 a good ballast. Renewal of a ballast. Formation of single and double track. Formation failures; Selection of site for a railway station. Layout of stations and yards; Modern methods for construction of track. Maintenance, tools and organization.

Airport Engineering: Type & elements of Airport planning, Factors affecting Airport Site Selection; Airport Classification; Airport Drainage Systems; Various Runway Configurations.

Recommended Books:

1. Jason C, Yui, Transportation Engineering Introduction to Planning, Design and Operations, Elsevier, Latest Edition.
2. Horon Jeff, R. Planning and Design of Airports, McGraw Hill, Latest Edition. Gregory P. Tsinker, Port Engineering Planning Construction Maintenance and Security, John Wiley, 2004.
3. Traffic Engineering MC Shane, Rogers P. Roess, Elena. S. Prassas.
4. Traffic Flow theory “ By A.D May Prentice Hall Publishers.
5. Salter R. J., Traffic Engineering and Design, McGraw Hill, Latest Edition.
6. Meshane, W.R. Roses, R.P. Principles of Highway Engineering and Traffic Analysis, 2nd ed. John Wiley Sons.

CE-408: Environmental Engineering – II, CH (3+0):

Environmental legislation and regulation
Environmental Impact Assessment

Estimation of sewage quantities

Rainfall intensity formulas, hydrograph & weather flow, sewage quantities; Variations and rates of flows; Velocity gradient & limiting velocities.

Characteristics of Sewage

Sampling and testing Techniques

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Sampling techniques and examination of waste water (Physical, chemical and microbiological parameters). Design, construction and maintenance of sewage system Separate & combined systems; Types, shapes, size and materials of sewers; Sewer appurtenances, pipe strengths and tests.

Construction & maintenance of sewer system and analysis; Diameter and gradient, sewer joints, grading, laying, jointing and testing of sewers.

Municipal and industrial wastes; Water pollution, causes and control parameter; Effluent disposal guideline and standards; Pakistan National Environmental Quality Standards (NEQS).

Sewage Treatment and Disposal

Primary, secondary & tertiary treatment; Screening grit chamber, skimming tanks & sedimentation tanks; Activated sludge treatment, tricking filters, oxidation ponds, etc.

Receiving body, assimilation capacity; Stream pollution and self recovery, sludge handling & disposal; Effluent re-use, Control and management of industrial waste waters.

Requirements and arrangement of building drainage

Soil pipes, anti-syphon pipes and waste water pipes; sanitary fixtures and traps; House connection and testing of house drainage; Cross connection and back syphonage control.

Solid waste management

Types, characteristics, sources and quantities of solid waste; Collection disposal and recycling.

SEMESTER – 7

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|----------|--|
| CE-407: | Project Planning, Management & Engg. Economics, CH (2+0) |
| CE-407L: | Project Planning, Management & Engg. Economics, Lab, CH (0+1) |
| CE-409: | Steel Structures, CH (3+0) |
| CE-311: | Transportation Engineering – II, CH (3+0) |
| CE-311L: | Transportation Engineering – II, Lab, CH (0+1) |
| CE-309L: | Structural Engineering Software Application, Lab, CH (0+1) |
| CE-411a: | Project, CH (0+3) |
| CE-419: | Sustainable Development and Disaster Risk Management, CH (3+0) |

CE-407: Project Planning, Management & Engg. Economics, CH (2+0):

Project Planning and Management

Introduction to Project Planning & Management, Definition of Engineering Project, Role of Engineer in Project Management, Job Description of Project Manager, Project Cycle, Project Appraisals applied to Irrigations Schemes, Roads, Dams and Bridges, Project Activities & Introduction to Activity Based Management (ABM), Deterministic Models (Bar Charts & CPM) with relative details. Probabilistic Models (PERT) & Statistical tools like Mean, Variance and Standard Deviation, Probability Distribution. Scheduling Resources, Delivering Materials, Scheduling manpower, Project Control during Execution, Project Supervision, International quality Movement, Quality Management in Pakistan, Introduction to ISO 9000:2000 with respect to Project Planning and Management, The Auditing Process, Use of computer software in Project Planning & Management.

Engineering Economics

Basic Concepts, Introduction to Engineering Economics, Time Value of Money, Different Methods of Analysis (Present worth Analysis, Annual worth Analysis etc.), Concept of Internal Rate of Return & Its use in Engineering Projects, Various Types of Costs (Maintenance, Repair, Other Overhead Costs etc.) & Benefits & Its Use in Engineering Projects, Inflation, Depreciation & Its Types, Introduction to Break Even Analysis & Its Application to Engineering Project, Sensitivity Analysis, Funding, Funding Agencies and Planning Commission, Types of Business Organizations, Laws of Return, Labor problems, Labor Organization, Prevention and Settlement of Disputes.

CE-407L: Project Planning, Management & Engg. Economics, Lab, CH (0+1):

Use of computer software in Project Planning & Management (Primavera or MS Project)

Recommended Books:

1. Harold Derzner, Project Management
2. Donald G. Newman
3. E.Peul Degarmo

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CE-409: Steel Structures, CH (3+0):

Introduction to structural design, design loads, safety factors and load factors. Specifications and codes of practice. Introduction to ASD (Alternate Stress Design) and LRFD (Load and Resistance Factor Design) methods. Fabrication and erection methods of steel structures; Design of members in tension, compression and flexure; Riveted, welded and bolted connections; Design of roof truss and plate girder. Introduction to relevant software packages.

Recommended Books:

1. Lothers, J.E. Steel Structures, National Book Foundation
2. Geylord, E.H. and C. N. Gaylord, Steel Structures, McGraw Hill Spiegel & Burner. Steel Structures, McGraw Hill.

CE-311: Transportation Engineering – II, CH (3+0).

Introduction to Road Systems: Location Survey in Rural and Urban Areas; Urban Location Controls; Highway Planning. Roads in Hilly Areas.

Highway Engineering: Highway Components, Elements of a typical cross-section of road. Types of cross-section; Highway location, Classification of Highways.

Highway Materials. Types & Characteristics, Specifications & tests, Introduction to resilient behavior.

Geometric Design: Design controls and criteria,; Sight Distance requirements; Horizontal curves; Super Elevation; Transition curve; Cure Widening; Grade line; Vertical curves.

Pavement Design: Types of pavements. Wheel loads. Equivalent single axle load. Repetition and impact factors. Load distribution characteristics; Design of flexible and rigid pavements, Highway Drainage, Pavement Failures, Introduction to non-destructive testing, Pavement evaluation; Construction and Maintenance and rehabilitation;

Introduction to relevant software packages.

CE-311L: Transportation Engineering – II, Lab, CH (0+1).

Modified Proctor Test, To determine density in place by sand core method, Determination of California Bearing Ratio, Aggregate crushing value test, Determination of aggregate impact value, Determination of Sand Equivalent, Determination of Soundness value Determination of Los Angeles Abrasion Value, Determination of Penetration Value of Bitumen, Determination of Viscosity of Bituminous Material, Determination of Softening Point of Bituminous Material, Determination of Ductility of Bituminous Material, Determination of Flash point and Fire Point of Bituminous Material, Determination of Bitumen content by centrifuge extractor, Determination of stripping value of road aggregate, Determination of Marshall stability value.

Books Recommended

1. Khisty, C. Jotin, Transportation Engineering, Prentice Hall Inc. USA, Latest Edition.
2. Paul H. Wright, Highway Engineering, McGraw Hill, Latest Edition.
3. Jason C. Yui, Transportation Engineering Introduction to Planning, Design and Operations, Elsevier, Latest Edition.

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4. Kadyali L.R. Highway Engineering- Theory and Practice, Latest Edition.
5. Croney D. The Design and Performance of Road Pavements, HMSO.
6. The ASSHTO's Green Book.

CE-309L: Structural Engineering Software Application, Lab, CH (0+1):

Introduction to various utilities of finite element based software for analysis and design, Analysis and Design of Concrete Structure, Model preparation, Plane, space frame, Plane truss, Shell Element, Foundation.

CE-411a: Project, CH (0+3):

A Project Evaluation Committee (notified by the Department of Civil Engineering) will assess the project through four student presentations, each carrying 5% marks. In the first presentation students will present the project proposal on prescribed format, while in the other presentations progress reports will be presented.

CE-419: Sustainable Development and Disaster Risk Management, CH (3+0):

COURSE OBJECTIVES

Sustainable Development: The objective is to encourage the students in exploring the challenges facing the society and Civil Engineers both locally and globally and to study the role of Civil Engineers in the society. To study the interactions between the Civil Engineering profession, physical infrastructure, and social institutions.

Disaster Risk Management: The purpose of this course is to provide an introduction to the roles of Engineers and Planners in preparing for and rebuilding after disasters. Engineers and Planners are concerned with the long-term aspects of disaster: the processes of pre-disaster mitigation and post-disaster recovery. The course will only minimally touch on disaster response and emergency preparedness.

COURSE OUTLINE

Sustainable Development: Introduction to the environment and its state; public policy; role of Civil Engineers in the society; Definitions: Sustainable Development, Triple Bottom Line; Life Cycle Analysis; distribution of benefits and risks; tolerability and ethical concerns; Multi-criteria decision analysis.

Disaster Risk Management: Overview of disasters as phenomena, basic disaster concepts and social context of disasters; Hazard, Vulnerability and Risk; A broad understanding of disaster risk management, including prevention / preparedness before disasters and recovery / reconstruction after disasters, Disaster Mitigation-Recovery policy and disaster risk management of national level with practical system and laws. Creation of Pakistan emergency management system; introduction to risk management tools.

SEMESTER – 8

| | |
|----------|---|
| CE-412: | Introduction to Structure Dynamics & EQ Engineering, CH (3+0) |
| CE-421: | Quantity Surveying & Civil Engineering Practice. CH (3+0) |
| CE-402: | Irrigation Engineering, CH (3+0) |
| CE-416: | Reinforced Concrete Design-II, CH (3+0) |
| CE-411b: | Project, CH (0+3) |

CE-412: Introduction to Structure Dynamics & EQ Engineering, CH (3+0).

Structural Dynamics

Free and Forced vibration, SDOF and MDOF systems, Un-damped and damped structural systems, Formulation of equation of motion for SDOF systems, Determination of Frequency and time periods of SDOF systems, Introduction to MDOF and modal analysis.

Earthquake Engineering

Introduction to causes and motions associated with earthquakes, earth quake response of SDOF and MDOF systems, Elastic response spectra. Effect of mass and stiffness on time period and forces produced in SDOF system due to earthquake induced ground motions.

Methods of analysis for lateral forces produced due to earthquake excitations. Response modification factor and use of inelastic response spectrum, Earthquake resistant design philosophy. Types of lateral force resisting structural systems / elements. Planning of earthquake resistant structural systems. Selection of material for specific use of a structure. Different codes for earthquake resistant design structures with emphasis on building structures. Design of masonry, concrete and steel buildings with codified approach

Books Recommended:

1. Engineering Mechanics, "Dynamics" by Hibbler
2. "Seismic Design" Hand Book by Farzad Naeim
3. Uniform Building Code, NEHRP

CE-421: Quantity Surveying & Civil Engineering Practice. CH (3+0):

Technical writing related to feasibility studies, proposals, and progress reports. Preparation & Interpretation of Specifications for various Civil Engineering Works, Rate & Cost Analysis for Construction Materials, Introduction to Various Types of Civil Engineering Contracts, Tendering Process for Various Engineering Contracts, Proposal Evaluation & Bid Evaluation, Contract Evaluation, Introduction to Claims, Escalation, Indexation, Arbitration and Litigation. Valuation, depreciation and sinking fund.

Quantity Surveying and Estimation:

Scope of Civil Engineering Works, Introduction to Measurement & Cost Estimation, Rough Cost Estimates & Detailed Cost Estimates and use of Drawings, Preparation of Bill of Quantities & Engineers' Estimate, Schedule of Rates & Its use in Various Government Departments, Measurement & Costing of Excavation, Retaining Walls, building items, Concrete Piles, Roads, irrigation and sanitary projects, maintaining of measurement books.

Types and methods of estimates, Working out quantities, rates and cost analysis of construction materials.

Course Contents for Scheme of Studies 2013-14

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Books Recommended

1. S. Dutta, Estimating and Costing in Civil Engineering, 22nd ed. S. Dutta & Co. Lakhnow
2. D.D.Kohli, Estimating, Costing and Accounts, 9th ed. S.Chand & Co. Pvt. Ltd.
3. Keith Collier, Fundamentals of construction. Estimating & Cost Accounting, Mc Graw Hill Book Co.
4. B.W Dutta, Civil Engineering Practice
5. E.W. Steel and Terence J. Mc GHEE, Estimating & Costing.

CE-416: Reinforced Concrete Design-II, CH (3+0)

- Concrete building systems: This portion introduces various reinforced concrete floor and roof systems.
- Analysis and design of isolated, combined and raft footing.
- Analysis and design of beam for torsion.
- Analysis and design of reinforced concrete cantilever retaining wall.
- Analysis and design of reinforced concrete stairs.
- Design of axial, uni-axial and bi-axial columns.
- Analysis and design of following two-way slab systems using Direct Design Method:
 - Slab with beams,
 - Flat slabs and flat plates,
 - Waffle slab.
- Seismic design and detailing requirements for reinforced concrete frame structures: This portion introduces nature and causes of earthquake forces, effect of earthquake forces, ACI requirements for design and detailing for SMRF (special moment resisting frame) and IMRF systems,
- Introduction to Bridge Engineering: Various bridge types, design of simply supported reinforced concrete bridge deck,
- Introduction to Pre-stressed Concretes: Discusses pre-stressing types, concretes used for pre-stressing, reinforcements used for pre-stressing.

CE-402: Irrigation Engineering, CH (3+0)

Water Resources: Planning and development of water resources projects. Water resources in Pakistan.

Diversion Head works. Elementary concept about canal head works, selection of their site and layout, weirs and barrages, various components and functions. Measures adopted to control silt entry into canals, silt ejectors and excluders. **Canals:** Design of irrigation Canals, Kennedy's and Lacey's Theories. Rational methods for design of irrigation Canal.

1. Canal Lining: Advantages and types
2. Design of lined canals,
3. Maintenance of Irrigation canal.
4. Computer Aided design of irrigation canals.

Irrigation Works: Canal head regulators, falls flumes, canal outlets. Cross drainage works: types and functions. Monitoring of flows- telemetry system.

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Water logging and salinity: Causes and effects of water logging, reclamation of water logged soils. Drains and tube wells, Causes and effects of salinity and alkalinity of lands in Pakistan. Reclamation methods. Drainage network in irrigated areas.

DAMS

Brief description of various types of Dams, Environmental impact of Dams.

Recommended Books.

1. Ali, I. Irrigation and Hydraulic Structure?
2. Sharma, R.K. and T.R.Sharma, Irrigation and Drainage, Vol-I to V. Oxford and IBH Pub. Co.
3. Linslay, R.K. and Joseph, B.F Water Resources Engineering, McGraw Hill.
4. Siddiqui, Iqtidar H. Irrigation and Drainage Engineering, Oxford University Press.
5. Irrigation and water power engineering Do. B.C. Punmia.
6. Design of small Dams- US Bureau of reclamation.

CE-411b: Project, CH (0+3):

A Project Evaluation Committee (notified by the Department of Civil Engineering) will assess the project through four student presentations, each carrying 5% marks. In the first presentation students will present the project proposal on prescribed format, while in the other presentations progress reports will be presented.