

UNDERGRADUATE PROGRAMME

SYLLABUSES

**Civil Engineering along with
Specialization in
Construction Engineering**

SEMESTER SYSTEM

BATCH: 2018

1st Year

2nd Year

3rd Year

4th Year

Offered by

DEPARTMENT OF CIVIL ENGINEERING

SCHEME OF STUDIES

Batch 2018 FIRST YEAR ----- SEMESTER SYSTEM					
Course Code	Course Title	Crd Hrs			
		Th	Pr	T	
Construction Engineering					
FALL	CE-107	Engineering Drawing-I	1	2	3
	CE-102	Statics and Dynamics	3	1	4
	EE-123	Basic Electrical Engineering	2	2	2
	CE-108	Engineering Materials	2	1	3
	MT-114	Calculus	3	0	3
	HS-106	Pakistan Studies OR	1	0	1
	HS-127	Pakistan Studies (for foreigners)			
 					
SPRING	CE-109	Engineering Surveying-I	2	1	3
	CE-110	Chemistry for Civil Engineers	1	1	2
	CE-111	Introduction to Computing for Civil Engineers	1	2	3
	ME-110	Basic Mechanical Engineering	2	0	2
	HS-111	Functional English	2	0	2
	MT-221	Linear Algebra & Ordinary Differential Equations	3	0	3

SYLLABUS – FE FALL SEMESTER ENGINEERING

CN-107

ENGINEERING DRAWING-I

Introduction:

Use and care of Drawing Instruments, Standard Drawing Office Practice, Principles of Orthographic Projection related to Simple Solids.

Descriptive Geometry:

Lines in Space and in Planes showing their traces and true inclination to planes of projection, Plane curves, Cycloid, Hypocycloid, In-volute, Curves of Interpenetration of Solids, Development of Surfaces, Isometric Views, Shadows.

Machine Drawing:

Representation of Riveted Joints, Screwed Fastenings, Keys and Cotters, Preparation of fully Dimensioned Working Drawing of component parts of machines, Practice in reading of drawing and deduction of new views from those given.

Symbols and Abbreviations:

Building materials, Electric and Plumbing symbols and Abbreviations.

CN-102

STATICS AND DYNAMICS

Static of Particles:	Forces in a Plane, Newton's First Law, Free Body Diagram, Forces in Space (Rectangular components), Equilibrium of a Particle in Space.
Kinematics of Particles:	Rectilinear and Curvilinear motion of particles, Components of Velocity and Acceleration, Motion relative to a frame in translation.
Kinetics of Particles:	Newton's Second Law, Dynamic Equilibrium, Rectilinear and Curvilinear motion, Work and Energy, Kinetic energy of a particle, Principle of Work and Energy, Conservation of Energy, Impulse and Momentum, Impulsive Forces and Conservation of Momentum, Impact; Direct and Oblique, Conservation of Angular Momentum.
Rigid Bodies:	Equivalent Systems of Forces, Principle of Transmissibility, Moment of a Force, Couple, Varignon's Theorem, Centre of Gravity of a three dimensional body and Centroid of a Volume, Moments of Inertia, Radius of Gyration, Parallel Axis Theorem.
Equilibrium of Rigid Bodies:	Free-Body Diagram, Equilibrium in two and three Dimensions, Reaction at Supports and Connections, Equilibrium of 2-Force and 3-Force Bodies.
Kinematics of Rigid Bodies:	General Plane Motion, Absolute and Relative Velocity and Acceleration.
Plane Motion of Rigid Bodies:	Forces and Acceleration, Energy and Momentum, Conservation of Linear and Angular Momentum.
Friction:	Basic Principles relating to Friction between Solid bodies, Friction angle and Wedges.
Analysis of Structures:	Internal Forces and Newton's Third Law, Planar and Space Trusses, Methods of Joints and Sections, Forces in Cables, Introduction of Shear force and Bending moment in Simply Supported beams and Cantilever beams.

EE-123

BASIC ELECTRICAL ENGINEERING

Electric and Magnetic Circuits:

Electric Circuits, Kirchoff's Laws, Superposition Theorem, Substitution Theorem Thevenin's Theorem Norton's Theorem, Rosen's Theorem of Star/mesh Transformation, Proof for DC circuits and their application to Circuit Analysis, Magnetic Circuits, Series and Parallel circuits, Principles of calculation of Ampere-turns for Magnetic Circuits of Electromagnets, Transformers, Bipolar and Multi-polar DC machines, Inductances in Series and Parallel, Hysteresis Loss, Eddy Current Loss, Lifting Power of a Magnet.

AC Single Phase and Poly phase Systems:

Single Phase systems, Series, Parallel and Series Parallel Circuits, J Operator Method and Polar Method, Resonance and Measurement of Power and Power Factor, Poly-phase Systems, Poly-phase Generation, Star and Delta Connections, Voltage and Current relations, Measurement of Power and Power Factor, Balanced and Unbalanced Load Analysis.

DC Machines:

Construction, Simple Lap and Wave Windings, Equalizing Connections and Dummy Coils, Elementary concept of Armature Reaction and Commutation, Cross and Demagnetizing Ampere-turns. DC Generators, Types, EMF Equation, Losses, Efficiency Performance Curves, Characteristics, Critical Resistance, Speed and Effect of Armature Reaction of OCC, Internal and External Characteristics from OCC neglecting and accounting Armature Reaction, Calculation of Series Ampere-turns for Level and Over, Compounding, Motors, Principle, Back EMF, Torque, Speed and Speed Regulation, Types, Characteristics, Performance Curves. Losses and Efficiency, Speed and Torque problems involving Magnetization Curve, Charging and Ignition Circuits of Automobiles

AC Synchronous:

Construction, Stator Single Layer, Double Layer and Concentric Windings, Damping Windings, Coil Span Factor, Distribution Factor, Leakage and Armature Reaction, Synchronous Impedance, Alternation, Types, EMF Equation, Speed and Frequency, Losses and Efficiency, Alternator on Load, Voltage Regulation by Synchronous Impedance Method, Synchronous Motors, Types, Principle of Working, Vector Diagram on Load and its analysis for Stator Current, Power Factor, Torque and Mechanical Output, Effect of Variation of Excitation, Losses and Efficiency.

Machine AC Induction

Induction Motors, Construction, Types, Rotating Field Theory, Principle of Working.

Machines:

Slip and its effect on Motor Current Quantities, Losses, Efficiency and Performance Curves, Starting, Full Load and Maximum Torque relations, Torque Slip Characteristics.

Transformers:

Construction, Principle of Working, EMF Equation, Transformation Ratings, No Load Working and Vector Diagram, Magnetizing Current, Vector Diagram on Load, Equivalent Circuit, Open Circuit and Short Circuit Test, Losses, Efficiency and Performance Curves, All-day-efficiency, Percentage and Per Unit R, X and Z, Voltage Regulation and Kapp's Regulation Diagram, Transformer as a Mutually Inductive Circuit.

Converting Machines:

Rotary Converters, Construction, Principle of Working, Transformer Connections, Voltage and Current Ratings of Single and 3 Phase Converters, Mercury Arc Rectifiers, Construction, Operation, Transformer Connections, Voltage and Current Ratios of Single Phase and 3 Phase Rectifiers

CN-108

ENGINEERING MATERIALS

Classification and General Aspects of Construction Materials:

Overview of Materials used in construction, General aspects related to Weight, Density, Specific gravity, Strength, Hardness, Durability, Workability and Cost of Materials, Classification of Materials, Ceramics, Metals and Organics.

Concrete Materials:

Introduction to Concrete, Manufacturing, Types and Properties of Cement, Types and Properties of Fine and Coarse Aggregates, Quality of Water, Mixing, Transportation & Placing of Concrete, Mix Design, Quality Control, Additives and Admixtures, Air Entrainment, Lightweight Concrete, Hot and Cold Weather Concrete, Precast Concrete with special reference to Cement Concrete Blocks.

Metals and Alloys:

Composition, Manufacturing, Properties and Uses of Ferrous Metals and their Alloys, Pig Iron, Cast iron, Wrought Iron and Steel, Types of Steel, Effects of Heat Treatment of Steel, Steel sections and bars, Corrosion and Method of its prevention.

Natural Stones, Bricks and Tiles:

General Characteristics, Varieties and Uses of Building Stones, Manufacture, Varieties, Properties and Uses of Bricks and Tiles.

Timber:

Varieties, Properties and Uses of Timber, Grain and Moisture in Wood, Methods of Sawing, Defects, Decay and Insect Attack, Seasoning and its Methods, Preservation and its Methods, Glued Laminated Timber, Plywood, Hardboard, Chipboard, Particle board, Fibre board.

Rubber, Plastics and Bituminous Materials:

Composition, Varieties, Properties and Uses of Bitumen, Asphalt Glass, Rubber Laminates, Adhesives, Asbestos, Fibre Glass, Paints and Varnishes.

Insulating Materials:

Waterproofing and Heat Insulating Materials, Acoustical Materials.

MT-114**CALCULUS**

Set and Functions:	Define rational, irrational and real numbers; rounding off a numerical value to specified number of decimal places or significant figures; solving quadratic and rational inequalities in involving modulus with graphical representation; Definition of set, set operations, Venn diagrams, De Morgan's laws, Cartesian product, Relation, Function and their types (Absolute value, greatest integer and combining functions). Graph of some well known functions. Limit of functions and continuous and discontinuous functions with graphical representation.
Propositional Logic:	Definition of Proposition, Statement and Argument, Logical Operators, Simple and Compound proposition, various types of connectives, Truth table, tautology, Contradiction, Contingency & Logical equivalence.
Boolean Algebra:	Definition, Boolean function, duality, some basic theorems & their proofs, two valued Boolean algebra, Truth functions, Canonical sum of product form, Digital logic Gates & Switching circuit designs
Complex Number:	Argand diagram, De Moivre formula, root of polynomial equations, curve and regions in the complex plane, standard functions and their inverses (exponential, circular and Hyperbolic functions)
Differential Calculus:	Differentiation and Successive differentiation and its application, Leibnitz theorem, Taylor and Maclaurin theorems with remainders in Cauchy and Lagrange form, power series, Taylor and Maclaurin series, L' Hopitals rule, extreme values of a function of one variable using first and second derivative test, asymptotes of a function, curvature and radius of curvature of a curve, partial differentiation, exact differential and its application in computing errors, extreme values of a function of two variables with and without constraints, Solution of non linear equation using Newton Raphson method
Integral Calculus:	Indefinite integrals and their computational techniques, reduction formulae, definite integrals and their convergence, Beta and Gamma functions and their identities, applications of integration, Centre of pressure and depth of centre of pressure
Solid Geometry:	Coordinate Systems in three dimensions, Direction cosines and ratios, vector equation of a straight line, plane and sphere, Curve tracing of a function of two and three variables, Surfaces of revolutions, transformations (Cartesian to polar & cylindrical)

HS-106

PAKISTAN STUDIES

Historical and Ideological

Two-Nation Theory: Definition and Significance, Factors Leading towards

Prospective of Pakistan Movement:

the Creation of Pakistan, Quaid-e-Azam and the Demand of Pakistan.

Land of Pakistan:

Geo-Physical Conditions, Geo-Political and Strategic Importance of Pakistan, Natural Resources, Minerals, Water and Power.

Constitutional Process:

Early efforts to make a Constitution: Problems and Issues, Constitution of 1956 and 1962 and their Abrogation, Constitutional and Political Crisis of 1971, Constitution of 1973, Recent Constitutional Developments.

Contemporary Issues in Pakistan:

A brief survey of Pakistan's Economy, Discussion on Social and Environmental Issues.

Foreign Policy:

Relations of Pakistan with Neighbours, the Muslim World and Super Powers.

Human Rights:

Conceptual Foundations of Human Rights, Definition, Significance and Importance, Comparison of Islamic and Western Perspectives of Human Rights, An overview of UN Systems for Protection of Human Rights, Review of Important International Treaties and Conventions, Pakistan's Response to Human Rights Issue at National and International Levels.

HS-127

PAKISTAN STUDIES (FOR FOREIGNERS)

Land of Pakistan:

Land and People, Strategic Importance, Important and Beautiful Sights: Natural Resources (some portion of Economics of Pakistan)

A Brief Historical Background:

A brief historical survey of Muslim Community in the Sub- Continent, British Rule and its Impacts, Indian Reaction, Two-Nation Theory, its Origin and Development, Factors leading towards the Demand of a separate Muslim State, Creation of Pakistan.

Government & Political Development in Pakistan:

Constitution of Pakistan, A brief outline, Governmental Structure, Federal and Provincial, Local Government Institutions, Political History and its brief account.

Pakistan & the Muslim World:

Relations with Muslim Countries

Language and Culture:

Origin of Urdu Language, Influence of Arabic and Persian on Urdu Language and Literature, A short history of Urdu Literature, Dominant Cultural Features.

SYLLABUS –FE FALL SEMESTER ENGINEERING

CE-109

ENGINEERING SURVEYING – I

Introduction:

Introduction to land surveying, Definitions of basic surveying terms branches and their application, Instruments used

Survey Techniques

Distance measurement techniques, Compass survey, Traversing and triangulation, Plane table surveying, Computation of areas and volumes by various methods, Tacheometry, Theodolite survey

Modern Methods in Surveying:

Principles of EDM operation, EDM characteristics, Total stations, field procedures for total stations in topographic surveys, Construction layouts using total station

Levelling and Contouring:

Methods and types of levels, precise levelling, Methods and applications of contouring.

CE-110

CHEMISTRY FOR CIVIL ENGINEERS

Electrochemistry:

Laws of Electrolysis, E.M.F. series, corrosion (Theories, inhibition & protection)

Cement & aggregates:

Chemical composition, Hydration, Structure of hydrated cement, Influence of the compound composition on properties of cement, Alkali- silica reaction in aggregates, Alkali- carbonate reaction, Tests for aggregate reactivity

Durability of Concrete:

Diffusion and absorption, Carbonation, Acid attack on concrete, Sulfate attack on concrete, Effects of sea water on concrete

Water-related chemistry:

pH, Chloride, TDS, Hardness

Soil-related Chemistry:

Chemical formation of soils, pH, organic content, salt content, Mica content

CE-111

INTRODUCTION TO COMPUTING FOR CIVIL ENGINEERS

Computer and System:

Computer hardware fundamentals, Operating Systems: DOS, WINDOWS.

Fundamentals:

Spreadsheets, Flow Chart techniques.

**Structured programming
Language:**

Character set, keywords, identifiers, data types and size, variable declaration, expression, labels, statements, formatted input output statements, types of operators, data type operators, data type conversion, mixed mode arithmetic, control structures, Functions, library functions, parameter passing, recursion, arrays declaration, initialization and usage, multi-dimensional arrays. Files, function for file handling, I/O Operations.

Selected topics in Programming, with emphasis on numerical techniques as applied to civil engineering problems

Matlab:

Import / export data, Create and manipulate variables, Program and run simple scripts, graphics tools to display data.

HS-111

FUNCTIONAL ENGLISH

Study Skills:	Reading, dictionary, library skills, speed reading, writing outlines, note taking
Advanced reading Comprehension:	Using texts dealing with science, literature and human rights
Oral Communication:	Confidence building, class discussion, speeches, verbal interaction
Précis Writing:	Rules of précis writing, practice précis
Controlled and guided writing:	Pre writing (planning, information gathering, preparing to write), writing, search for topic sentences, developing a theme, following up ideas and arguments, outline plans etc.
Essay Writing:	a) Types of writing – narrative, descriptive, expository, argumentative etc. b) Using guided writing to organize essays. c) Include human rights as essay topics
Writing short reports:	a) Short background of report and its importance, b) memo report, c) brief reports on events seen / experienced like visit to an exhibition etc.
Letter writing:	a) format and layout, b) formal letters, c) types of letters – invitations (acceptance and refusals), condolence, thanks, congratulations, to the editor, chairman, class advisor, Dean, Vice Chancellor etc.
Applied Grammar:	Morphology, Types of sentences, Sentence analysis, Tenses, Jumbled sentences, Question tags, Homonyms and Homophones, and their use in sentences, Punctuation – sentences and paragraphs, Use of idioms

CN-109

COMPUTING FUNDAMENTALS FOR ENGINEERS

Introductory Concepts	Computer Classification, Computer Characteristics, Modes of Operation.
Operating System Concepts	Basic Operating System Concepts; With GUI; Without GUI; UNIX; DOS; Windows.
Spreadsheet Calculations	Use of MS Excel as a Construction Engineering & Management Problem-Solving Tool
Database Concepts	Basic Database Concepts; Distributed Computing; Client-Server Computing
Management Information Systems	MIS Concepts; MIS Application for Engineers
System Analysis and Design	Basic Concepts; Need and Effectiveness
Programming Methodology and Program Development	Algorithm Development, Programming Basics, High and Low Level Languages, Creating; Compiling and Executing a Program on a Programming Language, Data Types, Variables, Constants, Expressions and Operators, Program Control Statements, Exploring Arrays and Strings, Functional Programming, Specific Applications in Construction Engineering and Management Problem-Solving.

ME-110

BASIC MECHANICAL ENGINEERING

Thermodynamic Properties:	Working Substance, System, Pure Substance, PVT Surface, Phases, Properties And State, Units, Zeroth Law, Processed and Cycles, Conservation of Mass.
Energy and its Conservation:	Relation of Mass and Energy, Different Forms of Energy, Internal Energy and Enthalpy Work, Generalized Work Equation Flow and Non-Flow Processes, Closed Systems, First Law of Thermodynamics, Open Systems and Steady Flow, Energy Equation for Steady Flow, System Boundaries, Perpetual Motion of the First Kind.
Energy and Property Relations:	Thermodynamic Equilibrium, Reversibility, Specific Heats and their Relationship, Entropy, Second Law of Thermodynamics, Property relations from Energy Equation, Frictional Energy.
Ideal Gas:	Gas Laws, Specific Heats of an Ideal Gas, Dalton's Law of Partial Pressure, Thermodynamic Processes.
Fundamentals of Heat Transfer:	Conduction and Convection, Radiation, Thermal Conductivity, Overall Heat Transfer Coefficients, Practical Equations.
Thermodynamic Cycles:	Cycle Work, Thermal Efficiency Carnot Cycle, Reversed and Reversible Cycles, Most Efficient Engine.
Two-Phase Systems:	Two-Phase System of a Pure Substance, Changes of Phase at Constant Pressure, Steam Tables, Superheated Steam, Liquid and Vapour Curves, Phase Diagrams, Rankine Cycle, Components of Steam Power Plant.
Internal Combustion Engines:	Otto Cycle, Diesel Cycle, Dual Combustion Cycle, Four-stroke and Two-stroke Engines, and Types of Fuel.
Reciprocating Compressors:	Condition for Minimum Work, Isothermal Efficiency, Volumetric Efficiency, Multi-Stage Compression, Energy Balance for a Two-Stage Machine with Intercooler.
Introduction To	Heating and Cooling Load and its calculations, Comfort Charts, Outline of A.C. Air-Conditioning and Systems, Consideration for Air – Conditioning in Buildings, Natural Ventilation, Refrigeration: Insulating Materials.

MT-221

LINEAR ALGEBRA & ORDINARY DIFFERENTIAL EQUATIONS

Linear Algebra:

Linearity and linear dependence of vectors, basis, dimension of a vector space field, Matrix and type of matrices (singular, non-singular, symmetric, non-symmetric, upper, lower, diagonal), Rank of a matrix using row operations and special method, Echelon and reduced echelon forms of a matrix, determination of consistency of a system of linear equation using rank, matrix of linear transformations, eigen value and eigen vectors of a matrix, Diagonalization, Applications of linear algebra in relevant engineering problem

1st Order Differential Equations:

Basic concept, Formation of differential equations and solution of differential equations by direct integration and by separating the variables, Homogeneous equations and equations reducible to homogeneous form, Linear differential equations of the order and equations reducible to the linear form. Bernoulli's equations and orthogonal trajectories, Application in relevant Engineering

2nd and Higher Orders Equations:

Special types of 2nd order differential equations with constant coefficients and their solutions, The operator D, Inverse operator 1/D, Solution of differential by operator D methods; Special cases, Cauchy's differential equations, Simultaneous differential equations, simple application of differential equations in relevant Engineering

Partial Differential Equation:

Basic concepts and formation of partial differential equations, Linear homogeneous partial differential equations and relations to ordinary differential equations, Solution of first order linear and special types of second and higher order differential equations, D' Alembert's solution of the wave equation and two dimensional wave equations, Lagrange's solution, Various standard forms.

Fourier Series:

Periodic functions and expansion of periodic functions in Fourier series and Fourier coefficients; Expansion of function with arbitrary periods, Odd and even functions and their Fourier series; Half range expansions of Fourier series.

SCHEME OF STUDIES

Batch 2018 SECOND YEAR ----- SEMESTER SYSTEM					
Course Code		Course Title	Crd Hrs		
			Th	Pr	T
Construction Engineering					
FALL	CE-201	Engineering Surveying-II	3	1	4
	CE-205	Mechanics of Solids-I	3	1	4
	CE-220	Geology for Engineers	2	1	3
	HS-205	Islamic Studies OR	2	0	2
	HS-209	Ethical Behavior (for Non-Muslims)			
	HS-218	Business Communication	2	1	3
 					
SPRING	CE-222	Engineering Drawing-II	1	2	3
	CE-221	Structural Analysis-I	3	0	3
	CE-219	Fluid Mechanics-I	3	1	4
	MT-331	Probability & Statistics	3	0	3
	HS-219	Professional Ethics	2	0	2
	CF-223	Fundamentals of Applied Economics for Engineers	3	0	3

SYLLABUS – SE FALL SEMESTER ENGINEERING

CE- 201

ENGINEERING SURVEYING – II

Surveying Drafting and Computations:

General, Maps and Plans, Plotting, Contour Maps, Profiles, Cross- sections, End areas and Volumes, Prismoidal formula, Calculation of volumes, Area computations, Area by graphical analysis, Use of surveying software.

Highway and Railway Curves:

Route surveys, Circular curves, Deflections and Chord calculations, Setting out circular curve by various methods, Compound curves, Reverse, Vertical, Parabolic curves, Computation of the high or low point on a vertical curve, Design considerations, Spiral curves, Spiral curve computations, Approximate solution for spiral problems, Superelevation.

Construction Surveys:

Introduction, Horizontal and Vertical control, Buildings, Rail Road, Pipelines and other construction surveys.

Hydrographic Surveys:

General, Objectives of hydrographic survey and electronic charting, Planning, Survey vessels, Vertical control, Depth and Tidal measurements, Position-fixing techniques, Sounding plan, Horizontal control, Processing and Presentation of data.

Photogrammetry:

Introduction, Aerial photogrammetry and its Applications, Flying heights, Flight planning, Relief displacement, Photograph overlap, Ground control for mapping, Mosaics, Stereoscopic viewing and Parallax, Stereo plotting instruments, Analytical plotters, Orthophotos, Photogrammetric mapping.

Control Surveys:

General, Geodesy Universal Transverse Mercator grid system, Modified Transverse Mercator grid system, State plane coordinate grid system, Lambert projection, Computations for the Lambert projection, Computations for the Transverse Mercator Secant Projection, Use of grid coordinates, Horizontal control techniques, Triangulation, Control survey markers, Direction of a line by observations on Polaris, Time and procedure for Observing Polaris, Computation technique for azimuth determination, Gyro theodolite.

Global Positioning System (GPS):

Background information, Global positioning, Receivers, Satellites, Errors, GPS surveying techniques and applications, Survey planning, Initial ambiguity resolution, Vertical positioning.

CE-205

MECHANICS OF SOLIDS – I

Different Stress States:

Uniaxial state of stresses and strains, Relationships between elastic Constants, Response of materials under different sets of monotonic loading, Normal and shearing stress and strains, Gradually and suddenly applied loads, Distribution of direct stresses on uniform and non-uniform members, Thermal stresses and strains

Bending Theory:

Theory of simple bending, position of neutral axis, moment of resistance and section modulus, Bending and shearing stress distribution in beams, Relationship between load, shear force and bending moment, Stresses in composite sections.

Slope and Deflection:

Curvature, slope and deflection of beams using integration methods

Theory of Torsion:

Theory of torsion of solids and hollow circular shafts, shearing stress distribution, angle of twist, strength and stiffness of shaft.

Biaxial state of stress:

Biaxial state of stresses, resolution of stresses, Principal plane, principal stresses and strains, Graphical representation of stress and strains, Mohr's circle of stresses and strains.

CE-220

GEOLOGY FOR ENGINEERS

**General Geology
Definition and Scope:**

The earth as planet, Process of external origin, weathering, erosion, transportation and deposition, of rock material by geological agents, Processes of internal origin volcanism, earthquakes, intrusion, metamorphism and the rock cycle, diastrophism and isostasy.

**Elements of
Structural Geology:**

Folds and faults, joints, fractures and cleavages, unconformities, primary and secondary structural features of rock, Expression of these features on geological field maps and construction of cross sections and geological mapping.

**Elements of
Crystallography:**

Crystallographic system, Important rock and soil forming minerals, and their identification Igneous Sedimentary and metamorphic rocks, fossils, Basic principles of stratigraphy, Geologic time scale, Brief introduction of local geology from bore logs.

Applied Geology:

Application of geology to planning and design of dams, reservoirs, bridges and tunnels, Application of geology to building materials and soils.

Rock Classification:

Litho logical classification, Classification by field measurements and strength tests by rock testing, Physical and mechanical property of rocks.

Earthquakes:

Theory of plate- tectonics, seismic waves, seismology, prediction of earthquakes and preventive measures against earthquakes, Ground subsidence and land slides.

HS-218

BUSINESS COMMUNICATION

Communication Skills:

Definitions and Conditions, Modes: verbal, non-verbal, vocal, non-vocal, sender, Receiver, en-coding, decoding, noise, context, emotional maturity, relationships, etc, Language, perception, Non-verbal, body language, physical appearance, cultural differences etc., Personal and interpersonal skills/ perceptions, Communication dilemmas and problems, Public Speaking – speaking situation, persuasion, Making presentations, Interviews.

Business Writing:

Formal / Business letters, e-mails: a) job applications and resumes / CV, b) enquiries, c) complaints / adjustments, d) orders, e) quotations, f) banking etc. Memos: layout, language, style. Meeting management: notice, agenda, conducting/ participating, writing minutes. Contracts and agreements (basic theoretical knowledge and comprehension), Research / scientific reports: types, structure, layout / presentation, writing process etc, Tenders (basic theoretical knowledge and comprehension)

Engineering / Business Ethics:

Need and objectives for code of ethics and its importance, Types of ethics, involvement and impact in daily life, Problems / conflicts / dilemmas in application (case studies), Sexual Harassment / discrimination in the workplace: a) why it occurs, b) myths regarding sexual harassment, c) how to deal with it, d) gender equality e) respect etc. Codes of conduct: Code of Pakistan Engineering Council, Code for Gender Justice, Brief study of other codes of conduct.

HS-205

ISLAMIC STUDIES

Fundamentals of Islam:

Tauheed, Arguments for the Oneness of God, Impact of Tauheed on human life, Place of Man in the Universe, Purpose of creation, Textual study of Surah Al-Rehman and Sura Al-Furqan, Prophet hood, Need for prophet, Characteristics of prophet, Finality of Prophet hood, Seerat life of the Prophet as embodiment of Islamic-Ideology, Faith in Here-after (AKHRAT), Effects of the beliefs on worldly life

Ibadah:

Concept of Ibadah, Major Ibadah, Salat, Zakat, Hajj and Jihad

Basic Source of Shariah:

The Holy Quran, Its Revelation and Compilation, The Authenticity of the Text, Hadith, Its Need, Authenticity and Importance, Consensus (Ijmaa), Analogy (Qiyas)

Sources of Knowledge:

Islamic Approach to Intuition, Reason and Experience, Revelation (Wahi) as a Source of Knowledge

**Moral and Social
Philosophy of Islam:**

The concept of Good and Evil, Akhlaq-e-Hasna with special reference to Surah Al-Hujrat, Professional Ethics (Kasb-e-Halal)

HS-209

ETHICAL BEHAVIOUR

Introduction to Ethics:

Definition of Ethics, Definition between normative and positive science, Problem of freewill, Method of Ethics, Uses of Ethics

Ethical Theories:

History of Ethics: Greek Ethics, Medieval, Modern Ethics, Basic concept of right and wrong: good and evil, Utilitarianism, hedonism, self-realization: egoism, intuitionism, rationalism, Kant's moral philosophy

Ethics & Religion:

The relation of Ethics to religion, Basic ethical principles of major religions: Hinduism, Judaism, Buddhism, Zoroastrianism, Christianity, Islam

Ethics, Society and moral theory:

Society as the background of moral life, Ethical foundation of Rights and Duties, Universalism and Altruism, Applied Ethics, Theories of punishment

SYLLABUS – SE SPRING SEMESTER ENGINEERING

CE-222

ENGINEERING DRAWING – II

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.

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.

CE - 221

STRUCTURAL ANALYSIS - I

Introduction:

Introduction of Structural forms, two dimensional pin connected and flexural forms, three dimensional pin connected and flexural forms: Surface structures, Simplification for analysis and design.

External Loads:

Techniques of evaluation of estimated external loads, Dead, Live, Wind and Earthquake loads, Use of codes in estimating different types of external, Static, Dynamic and Moving loads, Load combinations.

Determinacy of Structure:

Determinate and indeterminate structures, Static and kinematics determinacy, Compatibility and boundary conditions: Structural safety, Stress and deformation characteristics, Small deflection theory.

Evaluation of Deformation Using Geometric Methods:

Principal of superposition, Moment area method, Conjugate beams method and Newmark's method

Evaluation of Deformation Using Energy Principles:

Unit load method, Principal of real work, Principal of virtual work: Castigliano's theorems

Arches and Suspension Structures:

Analysis of arches, Introduction to suspension type structures: Importance of stiffened girders.

CE- 219

FLUID MECHANICS – I

Basic Concepts and Definitions:

Units, Density, specific weight, mass, viscosity etc.

Fluid statics:

Pascal's Law, Measurement of pressure, Pressure head, Manometers, Hydrostatics forces on submerged areas (vertical, inclined and curved), Buoyancy of fluids.

Fluid Kinematics:

Types of flow, Streamline and streak lines, Velocity and acceleration in steady & unsteady flow, Continuum, Lagrange and Eulerian description, Equation of continuity, mass flow rate, weight flow rate, stream function and velocity potential function and orthogonality, flow net, Rotational and irrotational flow.

Energy Consideration in Steady Flow:

Concept of Energy and head, General equations of energy and Bernoulli's assumption for incompressible fluids, Hydraulic grade line and energy line, power consideration, cavitation

Impulse-Momentum:

Basic principle, Force on pressure conduits, reducers and bends, jet of water, Structure in open channel.

Similitude:

Definitions, Geometric, Kinematic and Dynamic similarities, dimensionless numbers, Buckingham-Pi Theorem.

Fluid Properties Measurements:

Fluid properties, Hydrostatic Pressure, velocity measurements, Orifices meter, free and forced vortex, venturimeter, notches & weirs,

MT-331

PROBABILITY & STATISTICS

Statistics:

Introduction, types of data & variables, presentation to data, object, classifications, Tabulation, Frequency distribution, Graphical representation, Simple & Multiple Bar diagrams, Sartorial & Pie-Diagram, Histogram, Frequency Polygon, Frequency Curves & their types

Measures of Central Tendency and Dispersion:

Statistics Averages, Median, Mode, Quartiles, Range, Moments, Skewness & Kurtosis, Quartile Deviation, Mean Deviation, Standard Deviation, Variance & its coefficient, Practical Significance in related problems

Curve Fitting:

Introduction, fitting of a first and second degree curve, fitting of exponential and logarithmic curves, related problems, Principle of least squares, Second order Statistics & Time series not in bit detail.

Simple Regression & Correlation:

Introduction, Scatter diagrams, Correlation & its Coefficient, Regression Lines Rank Correlation & its Coefficient, Probable Error (P.E), Related problems

Sampling and Sampling Distributions:

Introduction, Population, Parameter & Statistic, Objects of sampling, Sampling distribution of Mean, Standard errors, Sampling & Non-Sampling Errors, Random Sampling with & without replacement, Sequential Sampling, Central limit theorem with practical significance in related problems

HS-219

PROFESSIONAL ETHICS

Introduction to Professional & Engineering Ethics:

Definitions - Ethics, Professional Ethics, Engineering Ethics, Business Ethics; Ethics & Professionalism. Need and scope of Engineering and Professional Ethics through Case Studies. Development of Engineering Ethics & Major issues in Engineering & Professional Ethics

Moral Reasoning & Ethical Frameworks:

Ethical Dilemma: Resolving Ethical dilemmas and making Moral Choices. Codes of Ethics (of local and international professional bodies). Moral Theories: Utilitarianism, Rights Ethics and Duty Ethics, Virtue Ethics Self-Realization & Self Interest. Ethical Problem Solving Techniques: Line drawing, flow Charting, Conflict Problems. Case Studies and applications.

Contemporary Professional Ethics

Professional Responsibilities. Risk and Safety as an Ethical Concern for Engineers Workplace Responsibilities and Ethics: Teamwork, confidentiality and conflicts of interest, Whistleblowing, Bribe and gift, risk and cost - benefit analyses, gender discrimination and sexual harassment. Environmental Ethics. Computer Ethics & the Internet. Honesty: Truthfulness, trustworthiness, academic and research integrity

Statistical Inference and Testing of Hypothesis:

Introduction, Estimation, Types of estimates, Confidence interval, Tests of Hypothesis, Chi-Square distribution/test, one tails & two tails tests, Application in related problems

Probability:

Basic concepts, Permutation & Combination, Definitions of probability, Laws of probability, Conditional probability, Baye's rule, Related problems in practical significance

Random Variables:

Introduction, Discrete & Continuous random variables, Random Sequences and transformations, Probability distribution, Probability density function, Distribution function, Mathematical expectations, Moment Generating Function (M.G.F) Markove_random walks chain/Related problems

Probability Distributions:

Introduction, Discrete probability distributions, Binomial, Poisson Hyper geometric & Negative binomial distributions, Continuous probability distribution, Uniform, Exponential & Normal distributions & their practical significance.

CE- 223

FUNDAMENTALS OF APPLIED ECONOMICS FOR ENGINEERING

Introduction

Basic Concepts and principles of Economics, Branches of Economics, Macro- and Micro-economics theory, Problems of scarcity, Basic concept of Engineering Economy.

Economic Environment:

Consumer and Producer goods, Goods and services, Demand and supply concept, Equilibrium, Elasticity of demand, Elasticity of supply, Measures of Economic worth, Price-supply-demand-relationship.

Macroeconomics

Introduction, National Income Accounting, Theories of Income and Employment (Classical and Keynesian), Consumption Function, Theory of Investment.

Microeconomics

Introduction, Consumer Theory, Theory of Cost, Theory of Production, Theory of Firm.

Economic Applications of Maximization and Minimization

An Overview of Mathematical Optimization for Engineers; Profit aximization, Cost Minimization; Linear Programming Problems, Graphic Solution, Simplex Method, Duality.

SCHEME OF STUDIES

Batch 2018 THIRD YEAR ----- SEMESTER SYSTEM					
Course Code	Course Title	Crd Hrs			
		Th	Pr	T	
Construction Engineering					
FALL	CE-320	Reinforced Concrete Design-I	3	0	3
	CE-321	Construction Engineering	3	0	3
	CE-323	Quantity & Cost Estimation	3	0	3
	CN-323	Construction Contracts	3	0	3
	AR-309	Architecture and Town Planning	3	0	3
	CN-336	Accounting and Financial Management	3	0	3
 					
SPRING	CE-302	Transportation Engineering-I	3	1	4
	CE-305	Soil Mechanics-I	3	1	4
	CN-331	Construction Jobsite Engineering and Management	3	0	3
	CN-333	Construction Economic Analysis	2	0	2
	CN-433	Introduction to Entrepreneurship and Opportunity Assessment	2	0	2

SYLLABUS – TE FALL SEMESTER ENGINEERING

CE-321

CONSTRUCTION ENGINEERING

Introduction:	Construction Projects, Project Life Cycle Phases, Key Players, Project Success Parameters, Normal Tracking and Fast Tracking, Project Categories, Building Permits; Codes and Regulations, Construction Standards, Sustainability.
Construction Equipment:	Types of Equipment used specifically in Building Construction, Analysis of Capital; Operating; Investment; Maintenance; Repair Costs, Equipment Productivity and Cost Effectiveness.
Over-view of Constructional Aspects:	An over view of constructional aspects for different types of engineering projects, e.g. building retaining structures, bridges, pavements and special structures, General consideration common to all projects with special reference to building structures.
Layout Techniques:	Site Selection and Orientation of Buildings, Grading Considerations, Layout techniques with special reference to buildings.
Excavation:	Excavation in deferent types of soils, stability of excavation and solution of particular problems arising out of condition of sub-soil at site e.g. de-watering, shoring and bracing, sheet piling etc.
Placement of Concrete:	Methods of preparation pouring, placement and curing of concrete in foundations. Construction joints in raft foundations, mass concreting, Plinth joints in raft foundations, mass concreting, Plinth beams and plinth protection, damp proof course.
Construction Methodologies:	In-Situ and Pre-Cast Concrete Construction of Buildings, Slab on Grade, Plain Cement Concrete Floors, Planar and Non-Planar Roofing Systems. Doors, Windows, Masonry, Brickwork, Glazing, Cladding, Façade, Curtain Wall, Floor Finishing, Interior and Exterior Building Finishes, and Water Proofing. Protection of adjacent Structures. Mechanized construction. Design and use of formwork for various building units/members. Methods of Concreting Vertical and Horizontal Members, including Mechanized Placement, Ready Mix Concrete etc. Construction Joints, Mass concreting, Plinth Beams and Plinth Protection. Planar and Non-Planar Construction Aspects related to Services.

CE-320

REINFORCED CONCRETE DESIGN – I

**Constituent Materials
& Properties:**

Concrete constituent material and its mechanical properties, Properties of hardened cement concrete. Durability aspects and factors contributing towards durability

**Basic Principles of
Reinforced Concrete:**

Basic principles of reinforced concrete design and associated assumptions, Behavior of reinforced concrete members in flexure, Design philosophy, design codes, factor of safety and load factors, Prevailing methods of design of reinforced concrete members.

**Working Stress
Method of Analysis:**

Working stress method, serviceability criteria and checks for deflection, crack width, and crack spacing, Importance of working stress method related to pre stress.

**Ultimate Strength
Method:**

Ultimate strength method, analysis of prismatic and non-prismatic sections in flexure, Compatibility based analysis of sections and code requirements for flexure, Analysis of one-way solid and ribbed slabs, two way solid slabs with general discussion on other slab systems, Design for flexure

**Shear in Beams:
Bond, Anchorage &
Development Length:**

Shear stress in reinforced concrete sections, models and analogies towards solution of diagonal tension problem, Design for diagonal tension Design and detailing for bond, anchorage, development length, laps and splices.

Columns & Footings:

Analysis of sections in pure compression, Design of short columns under pure compression and with eccentric loading, Isolated footings, structural design of simple rectangular footing and combined footing.

AR-309

ARCHITECTURE & TOWN PLANNING

Architecture

Historical Development:	Egyptian, Asiatic, Greek, Roman Byzantine and Gothic Architectures, Modern trends with emphasis on Muslim architecture.
Influences:	Geographical, climatic, religious, social, historical.
Principles:	Truth or purpose & beauty.
Qualities:	Strength, vitality, grace, breadth and scale.
Factors:	Proportion, colour and balance.
Use of Materials:	Stone, wood metals, concrete, Composite, ceramics.
General Treatment to Plan of Buildings:	Walls and their construction, Openings and their position, character and shape, Roofs and their development and employment, Columns and their position, form and decoration, Molding and their form and decoration, Ornament as applied to any buildings.

Town Planning

Purpose and Scope:	Definitions of town planning, Trends in Urban growth, Objectives of sound planning, Modern planning in Pakistan and abroad.
Information Required:	Maps, natural resources, economic resources, legal and administrative problems, civic survey.
Urban Ecology:	Need and scope of comprehensive plan, Phases of planning, Principles of planning, Communication (rail road network & airport etc.), port and harbour facilities, street traffic and design.
Urban Zoning and Land Use Control:	Parks and recreation facilities, location of public and semi-public buildings, civic centers, commercial centers, local shopping centers, public schools, Location of industry & residential areas, Lay out of street, road crossing & lighting, Community planning, Suburban development, Slum areas and their upgrading.

CN-323

CONSTRUCTION CONTRACTS

- Introduction to Contracts:** General Description, Construction Contracts, Elements, Form, Intent, Privity, Format and Major Components, Key Drafting Considerations.
- Contract Award Mechanisms:** Open vs. Sealed Bids, Bids vs. Negotiated Best Value Awards, General Considerations in Bids for Public Projects, Overview of PPRA Bidding Rules, Responsible and Responsive Bidder, Lowest Cost Bidding, Multi-Parameter Bidding, General Considerations in Bids for Private Projects, Bid Bonds, Bidding Advantages and Disadvantages, Bid Issues.
- The Bidding Process:** Bid Advertisement, Prequalification, Bid Decision, Bidding Period, Bid Package, Accuracy of Bidding Information, Instructions to Bidders, Addenda, Alternates, Modification and Withdrawal of Bids, Award, Mistakes in Bids, Bid Qualification.
- Subcontractors & Subcontracts:** GC-Sub and Owner-Sub Relationships, Subcontractor Bidding and Selection Process, Bid Shopping, Advantages and Disadvantages. of Subcontracting, Insurance and Bonding Requirements, Subcontract Agreement and Terms, *Subcontract Management:* Contract Provisions; Flow-Down Clauses; Back charges; Changes; Extra Work; Delays; Safety and Waste Management, Supplier Contracts.
- Contract Conditions:** General and Supplementary Conditions of Contract, Overview and Discussion on Use of Standard Contracts in Construction – PEC, AIA, FIDIC, etc.
- Contract Specifications:** Role; Relationship with Drawings; Organization; Types; CSI Divisions; Basic Writing Principles; Division 01 – General Requirements, Sample Specifications from other CSI Divisions, Specifications Resources, Writing Procedures.
- Contract Interpretations and Modifications:** Interpreting Contract Documents, Common Rules of Contract Interpretation, Contract Modifications, Substitutions, Feedback.

CE-323

QUANTITY & COST ESTIMATIONS

General:	Scope of civil engineering works, General practice in industry or schedule of rates and specifications, Rates analysis, Procedure and Application to Concrete, Description of Schedule of Values, Specifications for various items in construction.
Estimating Basics:	Concept, Need and Significance, Estimate Categories and Project Life Cycle (PLC), Role of Estimates in PLC, Estimate Types, Estimate Accuracy vs. Time, Scheduling the Estimating Process, Estimating Data Needs; Sources; and Data Collection Approaches, Estimating Considerations, Estimating Procedure, Computerized Estimating Overview.
Developing Preliminary Estimates:	Development Process and Illustrative Examples of Conceptual and Assemblies Estimates.
Quantity Takeoff Basics:	Process, Measurement Units, Takeoff Rules, Measurement Accuracy, Organization of Takeoff, Overview of Takeoff by Computer, Review of Estimate Math.
Pricing Basics:	Pricing Parameters, Pricing Sources, Contractor's Risk of Pricing Low or High, Direct and Indirect Cost, Labor Productivity, Overview of the Process and Considerations of Pricing; Labor; Equipment; Materials; Subcontracted Work; and General Conditions.
Definitive Estimates:	Working out quantities, rates and costing analysis of construction works.
Bill Processing:	General principle, Contents and preparation of bills of quantities for a project and maintaining of Measurement Books.
Estimating Worked Examples:	Quantity Takeoff and Pricing of Labor, Material and Equipment for; Sitework, Concrete, Masonry, Carpentry, and Finishes Works; Overview and Discussion of Estimating Procedures and Considerations for Concrete Retaining Wall, Piles, Steel Truss, Road, Sewer and Water Mains Pipe Works.
Further Estimating Concerns:	Estimate Setup, Overhead, Profit, Sources of Estimating Errors, Escalation, Contingency, Life-Cycle Costing.
Contract & Tender:	Preparation of civil engineering contracts and tender documents; Evaluation of proposals and contracts.
Use of Estimating Software / Spreadsheets:	

CN-336

ACCOUNTING AND FINANCIAL MANAGEMENT

Introduction to Construction Financial Management	Overview of Financial Management, Description of Construction Financial Management, Responsibilities of a Financial Manager.
Construction Accounting Systems	Cost Reporting, General Ledger, Methods of Accounting, Balance Sheet, Income Statement, Job Cost Ledger, Equipment Ledger.
Accounting Transactions	Accounting various types of Construction Job Transactions.
Analysis of Financial Statements	Depreciation and Financial Analysis, Quick Ratio and various others Ratios, Collection Period, Average Age of Accounts Payable, Profit Margin, Return on Assets, Return on Equity.
Managing Costs and Profits	Monitoring and Controlling Construction Material, Labor, Subcontract, Equipment, General Overhead, and Other Costs; Determining Labor Burden; General Overhead Budget, Estimating General Overhead; Setting Profit Margins for Bidding; Profit Center Analysis.
Managing Cash Flows	Cash Flows for Construction Projects with Progress Payments and with a Single Payment; Cash Flows for Construction Companies: Incorporating Construction Operations, General Overhead, Income Taxes, Interests, Loan Payments, Cash Balance, Determining the Minimum Monthly Balance, Fine Tuning, What-If and Sensitivity Analysis.
Uncertainty and Future Events:	Expected Value, Economic Decision Trees, Risk versus Return.
Capital Allocation	Capital Budgeting, Allocation of Capital Among Independent Projects, An overview of a Typical Construction Corporation Capital Budgeting Process.

SYLLABUS – TE SPRING SEMESTER ENGINEERING

CE-302

TRANSPORTATION ENGINEERING-I

Transportation Planning:

Modes of transport, Development of various modes in Pakistan, Role of highways within a Transport System, Highway classification, Highway planning and economic appraisal, Network planning, origin and destination studies

Highway Engineering:

Geometric design including cross section elements, Highway materials, tests and construction practices, Flexible and rigid pavement design, Highway drainage, Highway maintenance.

Traffic Engineering:

Traffic flow characteristics, Traffic studies, Capacity analysis, Traffic control Devices

CE-305

SOIL MECHANICS-I

Nature of Soils:	Origin, Formation, Soil minerals, Clay mineralogy, Soil structures, Particle shapes and sizes.
Composition and Physical Properties:	Phase diagram, water content, void ratio, porosity, degree of saturation, specific gravity, unit weights, mass-volume relationships, Formation, structural & physical properties of clay minerals.
Index Properties and Classification Tests:	Particle size distribution by sieving and sedimentation, In-Place density test, relative density, Atterberg's limits and their determination, plasticity and liquidity index: Sensitivity and Activity of fine soils
Soil Classification Systems:	Unified soil classification system, M.I.T. system and AASHTO classification systems
Water in Soils:	Free energy (pressure and heads), Capillarity and its effect on soil behavior, Electro-Osmosis, Darcy's law, Seepage forces and their effect on soil stability, Design of filters, Factors effecting permeability, Permeability tests, Laplace's Equation and its solution (Flow Nets), Methods of drainage and dewatering of soils.
Stress Acting in Soils:	Soil mass stresses, effective stress and neutral stress, stress at a point and Mohr's circle, Westergard's and Boussinesq's solutions, Pressure distribution in the soil mass resulting from different vertical surface loadings, Newmark's influence charts.
Shearing Strength of Soils:	Basic principle relating to friction between solid bodies, Coulomb's law, Shear strength parameters, Shearing strength of granular and cohesive soils, Shearing strength tests and their results, effect of strain, rate and drainage conditions on shearing strength.
Compressibility and Consolidation:	Mechanics of consolidation, One - dimensional consolidation equation, coefficient of consolidation, compression index, Consolidation tests and graphical representation of data, Degree of consolidation. Determination of preconsolidation pressure, swelling clays and clay-shale
Soil Compaction:	Requirements, principle and methods including standard and modified AASHTO tests.

CN-331

CONSTRUCTION JOBSITE ENGINEERING AND MANAGEMENT

Project Team Responsibilities During Construction:	Roles, Responsibilities, and Authority of Project Participants during Construction Operations for: 1) Traditional Project Delivery System; 2) CM Delivery System; and 3) Design-Build Delivery System, Communications.
Use of Construction Documents on the Jobsite:	Use of Construction Documents, Familiarization with a Project, Contract Requirements for Site Visits and Associated Responsibilities for A/E; Contractor; Owner; and Authorities having Jurisdiction, Preparing Crew Assignments.
Submittals, Samples, and Shop Drawings:	Types; Requirements; and Review of Submittals, Shop Drawings and Samples, Procurement Schedule, Subcontractor Submittals.
Documentation and Record Keeping at the Jobsite:	Record Types and Content, Event and Conversation Documentation, Periodic Reports, Diaries, Logs, Accident Reports, Progress Photographs, Video Recordings, Time-lapse Photography, Progress Schedules and Schedule Updates, Cost Documentation, Labor, Material, Equipment, Correspondence, RFIs, Change Order Logs, etc., Contractual Requirement for Documentation.
Jobsite Layout and Control:	Material and Equipment Handling, Labor Productivity, Equipment Constraints, Site Constraints, Elements of the Jobsite Layout Plan, Material Storage, Temporary Facilities, Jobsite Offices, Jobsite Security, Perimeter Fencing, Access Roads, Signs and Barricades, Organizing Jobsite Layout.
Meetings, Negotiations, and Dispute Resolution	Types of Meetings, Partnering Meeting, Preconstruction Meetings – Contractors; Subcontractors; Project, Construction Phase Meetings, Staff Meetings, Specialized Meetings, Closeout Meetings, Post-project Evaluation, Partnering, Negotiations.
Jobsite Labor Relations and Control:	Impact of Changes on Labor Productivity, Poor Weather, Material Problems, High Labor Turnover, Accidents and Unsafe Conditions, Working Overtime, Projects in Existing Facilities or Congested Areas, Jobsite Labor Organization, Labor Supervision and Control, Supervisor, Foreman, Employee Relations, Employee Training, Labor Records.
Site Management:	Owner Relations, Subcontractor Relations, Conduct at the Project Site, Coordinating Construction Activities, Sequencing the Work on Site, Jobsite Quality Control Team, Testing and Inspection, Coping with Defective and Nonconforming Work, Quality Control in Subcontracted Work, Jobsite Safety Plan, Safety Management in Subcontracted Work, Cleaning and Construction Waste Management, Noise Control, Dust and Mud Control, Environmental Protections, Protecting Installed Construction.
Project Closeout:	The Closeout Process. Punch Lists, Substantial Completion. Paperwork Requirements, System Testing and Documentation, Operating and Maintenance Manuals and Inspection, Miscellaneous Certifications and Releases, Consent of Surety, Financial Resolution of the Project, Subcontractor Payment, Resolution with the Owner, Cost Control Completion, As-Built Drawings, Affidavits of Payment, Archiving Records.

CN-333

CONSTRUCTION ECONOMIC ANALYSIS

Making Economic Decisions	Nature of Economic Problems, Role of Engineering Economic Analysis, The Decision-Making Process, Engineering Decision Making for Current Costs
Nature of Construction Costs	Fixed, Variable, Marginal and Average Costs, Sunk Costs, Opportunity Costs, Recurring and Non-Recurring Costs, Incremental Costs, Cash Costs versus Book Costs, Life-Cycle Costs
Cash Flow Diagrams	Categories of Cash Flows, Drawing a Cash Flow Diagram
Interest and Equivalence	Computing Cash Flows, Time Value of Money, Rate of Return, Equivalence, Compound Interest Formulas, Relationships between Compound Interest Factors, Arithmetic and Geometric Gradients, Nominal and Effective Interest, Continuous Compounding
Selections Between Alternatives:	Present Worth Analysis, Future Worth Analysis, Annual Cash Flow Analysis, Rate of Return Analysis, Incremental Analysis, Cost-Benefit Analysis, Payback Period, Sensitivity and Breakeven Analysis.
Depreciation and Taxes:	Basic Aspects of Depreciation, Methods of Depreciation, Depreciation and Asset Disposal, Capital Gains and Losses for Non-Depreciated Assets, Depreciation as a Tax shield, Depletion
Replacement Analysis:	The Replacement Problem, Decision Maps, Replacement Analysis
MARR:	Sources of Capital, Cost of Funds, Opportunity Cost, Selecting a Minimum Attractive Rate of Return (MARR), Adjusting MARR to Account for Risk and Uncertainty.
Economic Analysis in the Public Sector	Investment Objective, Viewpoint for Analysis, Selecting an Interest Rate, Benefit-Cost Ratio, Incremental Benefit-Cost Analysis.

CN-433

INTRODUCTION TO ENTREPRENEURSHIP AND OPPORTUNITY ASSESSMENT

Introduction to	Definition and Philosophy; Need and Significance of Innovation and
Entrepreneurial Process:	Entrepreneurship; Role within the Economy; Social Implications; Entrepreneurs as Role Models; Past and Future of Entrepreneurship; Overview of the Entrepreneurial Management Process; Idea Generation; Opportunity Evaluation; Making a Strategy; Gathering Resources; Launching the Business; Growing the Business; Harvesting Returns, Entrepreneurship in different contexts; Social (donating profits, “doing good”, non-profit); Organizational (start-ups, corporate, public sector); Individual (career management).
Introduction to Innovation:	What is Innovation?, Innovations in Organizations, Decision Making and Strategy, Sources of Innovation, Fostering Innovation and Entrepreneurship.
Entrepreneurial Traits:	Entrepreneurial Mind-Set; Entrepreneurial Strategy; Personal Potential for Entrepreneurship; Career Paths for Entrepreneurs.
From Idea to Market – An Overview:	Research and Invention, Innovation, Introduction to Technology Transfer; Background; Technology Transfer Cycle; Pitfalls in Commercialization, Invention Evaluation and Assessment; Review of Inventions – Novelty and Utility; Understanding your Invention, Intellectual Property Basics – Patent; Copyright; Trademark, Assessing Licensing/ New Business Opportunities, Technology Development, Technology Marketing; Product and Market Assessment; Marketing Strategy; Targeting Companies, Technology Licensing; Valuation; Licensing Agreements; Negotiation; Technology Assessment Report.
Entrepreneurial Assessment:	Identifying the Purpose of the Proposed Business; Developing and Communicating the Business Idea; Identifying and Analyzing the Potential Business Market; Delineating a Product or Service; Evaluation of Expected and Requisite Revenue Generation.
Legal Considerations and Liabilities:	Intellectual Property; Legal Issues in Establishing an Organization; Patents; Trademarks; Licensing; Product Safety and Liability; Insurance and Contracts

SCHEME OF STUDIES

Batch 2018 FINAL YEAR ----- SEMESTER SYSTEM					
Course Code	Course Title		Crd Hrs		
			Th	Pr	T
Construction Engineering					
FALL	CN-428	Sustainable Construction	3	0	3
	CN-435	Systems in Building Construction	3	0	3
	CE-418	Hydraulics and Water Resources Engineering-I	3	1	4
	CN-416	Legal and Regulatory Environment in the Construction Industry	3	0	3
	EN-301	Environmental Engineering-I	2	1	3
	CE-409	Civil Engineering Project	0	3	3
SPRING	CE-###	Civil Engineering Elective	3/2/1	0/1/2	3
	CN-429	Building Information Modeling	1	2	3
	CN-427	Quality and Safety Aspects in Construction Engineering	2	0	2
	CN-434	Temporary Structures in Construction	3	0	3
	CN-436	Heavy Construction Equipment and Operations	3	0	3
	CE-409	Civil Engineering Project	0	3	3
Civil Elective Streams					
CE-419	Applied Hydraulics	3	0	3	
CE-422	Structural Design & Drawing	3	0	3	
CE-423	Masonry Structures	3	0	3	
CE-429	Geosynthetics and their Applications	3	0	3	
CE-431	GeoInformatics Applications	2	0	3	
CE-433	Coastal and Harbour Engineering	3	0	3	
CE-438	Hydraulics and Water Resource Engineering-II	3	0	3	
CN-424	Environmental Issues in Construction	3	0	3	
CN-430	Disaster and Reconstruction Management	3	0	3	

SYLLABUS – BE FALL SEMESTER ENGINEERING

CN-428

SUSTAINABLE CONSTRUCTION

Foundations of Sustainability: Defining Sustainable Construction, Whole Systems Thinking, Collaboration as Sustainability in Action, Key Features of Sustainable Construction, The Green Construction Movement, Emerging Directions.

Material Technologies: Recycling of Conventional Construction Materials, Overview of Emerging Construction Materials and Products with Specific Reference to their Effectiveness towards Sustainable Construction.

Construction Technologies: Overview of Latest Developments in Construction Technology, such as Trenching e.g. Trench-less Technology; Specialized Formworks; Technologies for Building Deep Waterproof Basements; Mechanized Construction Methods & Equipment, Slip Forms, Effectiveness of Technologies towards Sustainable Construction.

Disaster Management: Monitoring of Infrastructure facilities; strategies for protection against possible damages; maintenance for different infrastructure facilities. Rehabilitation and repair strategies for reinforced concrete, repair and rehabilitation of pipe networks; sewers; roads and drainage facilities, Predictions and preparedness strategies for natural disasters such as Earthquakes etc; Emergency management; Awareness Programs; Follow-on Disasters; Recovery plans; Strategies for protection; Loss estimation; Risk and Vulnerability Analysis; Disaster Mitigation.

CN-435

SYSTEMS IN BUILDING CONSTRUCTION

Concepts in Building Science: Building Science, Building Envelope, Thermal Insulation, Windows, Thermal Testing, Quality of Indoor Air, Ventilation, Moisture in Buildings.

HVAC Systems: An Introduction to Equipment used in HVAC Systems: HVAC; Space Heating; Refrigeration; Ventilation; Air Humidification; and Air Dehumidification, Overview of HVAC Systems in Buildings: Air Distribution; Water (Hydronic); Electric Heating; and Solar Thermal, Safety Considerations.

Electrical Systems: Overview of Building Electrical Materials; Equipment; and Lighting Systems, Safety Considerations.

Other Systems: Life Safety Systems: Fire in Buildings; Passive Fire Protection; Active Fire Protection and Suppression; Overview of Fire Detection and Alarm Systems; Building Security. Telecommunication Systems: Overview of Structured Building Telecommunication Systems. Acoustical Control Systems: Fundamentals of Sound; Sound Ratings; Overview of Acoustical Systems in Buildings. Conveying Systems: Introduction to Installation of Elevators, Escalators, Walkways; Ramps; and Other Systems, Safety Considerations.

CE-418

HYDRAULIC AND WATER RESOURCES ENGINEERING-I

Introduction to Water Resources Engineering:

Hydrogen cycle; Overview, Rain, Surface and sub-surface water hydrology, and water resource estimates

Open Channels and Sediment Transport:

Erosion and Sediment yield; Design of open channels - Kennedy's and Lacey's theories

Surface Water Hydrology:

Rainfall – Local Rainfall, Spatially – Averaged Rainfall, Design Rainfall Interception, Depression storage, Infiltration Rainfall – Runoff Analysis-Runoff Models; Time of Concentration, Peak- Runoff Models.

Irrigation:

Irrigation, Indus Basin Irrigation System (Indus water treaty; water apportionment accord etc.), Soil –water-plant relationship, Irrigation methods (Pressurized and non-pressurized).

Subsurface hydrology/ Drainage:

Unsaturated and saturated subsurface water and its movement- Darcy's Equation, Water wells and its construction. Waterlogging and Salinity, Surface & subsurface drainage and its methods.

Dams and Barrages:

Types, components, and function of barrages and Dams ; Reservoirs

Introduction to Coastal Engineering:

Basic terminologies within coastal engineering; Importance of coastal engineering to coastal zone management; Linear wave theory; Wave transformation and attenuation processes; Waves of unusual character.

CN-416

**LEGAL AND REGULATORY ENVIRONMENT IN
THE CONSTRUCTION INDUSTRY**

- Legal Context of Construction:** Introduction to Legal System and Maxims of Law, Legal Relations, Law; Ethics and Morality, *Contract Law*: Express Terms; Implied Terms; Breach of Contract; Liability for Negligence, Statutory and Regulatory Laws affecting Construction, *Rights and Liabilities of*: Owner; A/Es; CMs; GCs; Subs and Suppliers.
- Preparation to Work:** Overview of: Engineering and Professional Registration, Contractor Licensing, Building Permits and Codes, *Insurance and Bonds*: Types, Contract Requirements, Overview of Payment Bonds and Performance Bonds, Discussion on Current Insurance and Bonding Scenario in the Pakistani Construction Industry, Comparison with Developed Nations (e.g. US).
- Matters of Time:** Notice to Proceed, Construction Duration, Calendar Days, Working Days, Concept of Liquidated Damages and Penalty/ Bonus Clauses, Introduction to: Types of Delays; Acceleration; Suspension of Work Clauses; Termination.
- Payments:** Schedule of Values, Payments in Unit Price Contracts; Cost-Plus Contracts; Lump Sum Contracts, Payment Obligations, Payment Intervals, Progress Payments, Retainage, Changes, Fluctuations, Subcontractor Payments, Concept of Liens, Substantial Completion, Partial Occupancy, Final Acceptance and Payment.
- Warranty:** Contractor's Obligations after Project Completion, Express Warranty, Implied Warranty, Owner's Acceptance of Work, Uncovering and Correction of Work.
- Changes, Claims and Disputes:** *Introduction to Changes*: Changes Clauses; Change Orders; Minor Changes; Constructive Changes; Cardinal Changes, Documentation of Changes. *Introduction to Claims*: Entitlement; Time Extension; Disputes and their Nature.
- Dispute Resolution:** Negotiation, *Overview of ADR Techniques*: Partnering; Mediation; Arbitration; Adjudication; Disputes Review Board; Mini-trials, Importance of Documentation, Concept of Litigation.
- Introduction to Regulatory Environment:** Local Industry Organizations Regulating Construction Business, Coordination between Civic Agencies, Consultation with Authorities; Line departments and Allied Agencies, Approvals; Completion Certificate.

EN-301

ENVIRONMENTAL ENGINEERING-I

Communicable Disease Control:

Water borne, foodborne and vectorborne diseases, Water supply and sanitation.

Environmental Pollution:

Sources, Pollutants, Effects and remedation of air, water, land and noise pollution, Toxic/hazardous wastes

Water Demand & Supply:

Population forecast, Water uses & consumption, Types and variations In demand, Maximum & fire fighting related demand, Urban & rural water supply, Appropriate technology.

Water Quality:

Water impurities & their health significance, Water quality standards, (U.S. & WHO & Local etc.), Water quality monitoring, Sanitary survey.

Water Treatment:

Treatment of surface & ground waters, screening, sedimentation, coagulation. Filtration, design aspects of slow and rapid sand filters, Filtration rates, operation head loss, backwash and filter efficiency, Pressure filters, hardness removal, Water softening methods, Water disinfection, Emergency treatment methods.

Building Water Supply:

Layout of water supply arrangement, Fixtures and their installation, Tapping of water mains.

Energy Conservation:

Introduction to concepts of energy conservation, energy management in industry and construction activities and green buildings.

Laboratory Works:

Related to the above, sampling techniques and examination of water (physical, chemical and microbiological parameters).

CE-409

CIVIL ENGINEERING PROJECT

SYLLABUS – BE SPRING SEMESTER ENGINEERING

CN-429

BUILDING INFORMATION MODELLING

BIM Fundamentals:	BIM Overview; BIM vs. Traditional CAD; Common BIM Terminology; Value of BIM; BIM as a Communication and Collaboration Tool; BIM Benefits; Typical BIM Process; BIM Implementation Needs and Challenges.
BIM Technology:	Phased Structure of a BIM project; Classes of BIM Tools; Common BIM Applications; Planning and Organizing the Use of BIM Tools; Embedding BIM Tools into Processes; Identifying and Selecting BIM Tools.
Application of BIM	Developing an Architectural Model; Walls; Slabs; Roofs; Ceilings; Floor
Technology on a Real Time	Coverings and Wall Coverings; Doors and Windows; Speciality Items,
Project of Challenging Scope:	Developing a Structural Model; Foundations; Columns; Beams/ Slabs; Roof Systems; Trusses, Developing an MEP Model; HVAC only, Developing a Site Plan, Developing Project Schedule (4D), Develop understanding of how BIM models are integrated with schedules, Developing Templates for Estimating (5D), Performing Energy Analysis, Develop understanding of how BIM models are applicable to the Energy Analysis, Construction Management and Facilities Management; Develop understanding of how BIM models are applicable to the Construction Management and Facilities Management processes, Performing Walkthroughs/ Flythroughs/ Animation, Presentation Issues/ Rendering, Following software may be used; Revit Architecture, Revit Structure, Revit MEP, Tekla, Constructor, Estimator, Control, Navisworks, EcoTect, etc.
Discussion on BIM Benefits	Stakeholder and Site Coordination, Sustainable Design and Construction,
Using Real Time Project:	Construction Detailing, Pre-Construction Tasks such as Analyzing Constructability, Cost Estimation, Scheduling, Clash Detection, Materials and Methods, Site Safety Improvement, Quality Assurance, Documentation of the Construction Process, Integration of Design and Construction Models, Facilities Management, Improved Trade Coordination, More Accurate Quantity Surveying, Change Management, Risk Analysis, Energy Analysis, etc.
Further Aspects:	Process Change from BIM Use, BIM as an Underlying Enabler of Effective Team Communication.

CN-427

QUALITY AND SAFETY ASPECT IN CONSTRUCTION

ENGINEERING

Quality:	Concepts, Principles, Views, Relationship with Value and Organizational Excellence, Supporting Elements, Process Analysis and Improvement, Quality and Global Competitiveness, Cost of Poor Quality, Quality and Contractor Selection, Quality Management Practices in Pakistani Construction Industry.
Quality Assurance and Quality Control:	Examples of Quality Assurance and Quality Control, Concurrent Quality Assurance/Quality Control Processes, Quality Established by the Contract, Quality Control in Subcontract Work, Team Approach, Introduction to ISO 9000.
Total Quality:	From QA to TQM, TQM Approach, Key Elements, Relation of TQM with Trust; Values; Integrity; and Responsibility, Establishing and Maintaining a Total Quality Culture, Innovative Alliances and Partnerships, ISO 9000 and TQM.
Partnering, Customer Partnering– Satisfaction and Employee	Internal; with Suppliers; with Customers; with Potential Competitors, Understanding Customer-Defined Quality, Identifying External and Internal
Empowerment:	Customer Needs, Communicating with Customers, Customer Satisfaction Process, Customer Retention, Value Perception and Customer Loyalty, <i>Employee Empowerment: Rationale, Inhibitors, Management’s Role.</i>
Overview of Quality Tools:	Pareto Charts, Cause-and-Effect Diagrams, Check Sheets, Histograms, Scatter Diagrams, Run Charts and Control Charts, Stratification, Other Tools, Selecting the Right Tool for the Job.
Construction Safety:	Safety and Health in the local and International Construction Industries, OSHA in the USA, Overview of Cost of Accidents, Roles of Construction Personnel in Safety, Overview of Accident Causation Theories, Ethics and Safety, Insurance and Safety, Compliance to Safety Standards.
Safety Application on the Job:	Construction Safety & Health Program, Plans and Policies, Components of the Plan, Roles, Safety Rules and Regulations, Example of Safe Work Procedures, Jobsite Inspections, Accident Prevention, Medical and First Aid Facilities and Services, Protection of the General Public, Fire Protection, Substance Abuse, Personal Protective Equipment, Site Safety and Hazard Analysis, Safety Communications, Accident Reporting and Investigation, Recording Injuries and Illnesses, Training, Emergency Response.
Strategic Safety Improvement:	Promoting Safety by Example, Employee Participation in Promoting Safety, Safety Training, Safety Committees, Employee and Management Participation, Incentives, Teamwork Approach to Promoting Safety, Establishing a Safety-First Corporate Culture, Total Safety and its Components, a Brief Discussion of Zero Accident Strategies, Continuous Safety Improvement.

CN-434

TEMPORARY STRUCTURES IN CONSTRUCTION

- Introduction:** Defining Temporary Structures, Why Used?, Where and When to Use?, Loads on Temporary Structures, Design and Building Codes.
- Earth-Retaining Structures:** Methods for Determining Lateral Earth Pressures, including Use of Tables and Charts, Determining the Factors of Safety against Overturning and Sliding, Description and Design Overview of Various Kinds of Earth-Retaining Systems.
- Tower Cranes:** Design of Temporary Reinforced Concrete Foundation for Tower Crane, Load Carrying Capacity of Lift Beams.
- Concrete Formwork:** General objectives in formwork building, Overall Planning for Formwork, Slab Form Design, Beam Form Design, Wall Form Design, Column Form Design, Design Tables, Building and Erecting the Formwork.
- Shoring and Scaffolding:** Design, hardware and installation of shoring and scaffolding.
- Construction Dewatering:** Dewatering as a Temporary Procedure, Choosing the Right System.
- Other Temporary Structures:** Design of Temporary Safety Rails, Design of Temporary Project Signs, Design of Temporary Construction Ramps, etc., Safety Issues.

CN-436

HEAVY CONSTRUCTION EQUIPMENT AND OPERATIONS

General:	Introduction to Heavy Construction Operations, Heavy Construction Divisions.
Introduction to Bulk Excavation Operations:	Preparing for Earthwork, Earthmoving Methods, Protection of Excavations, Protection of Adjacent Structures, Compaction Equipment and Methods, Confined Compaction, Rock moving Methods, Mass Diagrams.
Trenching, Pipe laying and Tunneling Operations:	Trenching Excavation; Pipe laying; Tunneling in Soft Soils; and Tunneling in Hard Rocks.
Concrete and Asphalt Paving Operations:	Paving Operations: Concrete Paving; Asphalt Paving; Rehabilitating Old Pavements.
Placing of Vertical Concrete:	Crane and Bucket, Concrete Pumps, Concrete Conveyors.
Piles and Pile driving:	Introduction to Pile driving Operations; and Pile Operation Economics.
Equipment:	Brief Discussion on Use, Productivity and Economics of Equipment for Heavy Construction Operations, including; Tractors, Dozers, Scrapers, Motor Graders, Power Shovels, Off-Road Haulers, Front-End Loaders, Backhoes, Draglines, Trenchers, Rock Drilling Equipment, Crushers, Conveyors.

Civil Engineering Electives

CE-419

APPLIED HYDRAULICS

Steady Flow through Pressure Conduits:

Overview, Empirical equation for pipe flow-Hazen William etc., Branching Pipes Three reservoir problem, Pipes in series and parallel, Pipe Networks-Hardy Cross Method, manual and computer based problem solution.

Steady Flow in Open channel:

Equation of gradually Varied Flow, Water Surface Profiles and Classification System, Hydraulic jump, phenomena, application and location.

Design of Conveyance Infrastructure:

Canal, outlets, regulating structures, Flumes, Chutes, Siphons, Culverts, Energy Dissipation structures, Canal lining.

Forces on Immersed bodies:

Simple Lift and drag equations and their applications, Introduction to boundary layers, approximate solutions, Lift and drag over a flat plate, Application to simple problems.

Hydrodynamics:

Flow net and its limitations, Different methods of drawing flow net, Viscous Flow, Stress-Deformation Relationships, The Navier-Stokes Equations.

Finite Control Volume Analysis:

Unsteady Flow:

Surges in pipes and open channel.

Impulse-Momentum:

Stationary and moving blades, reducers and bends, Torques in rotating machines, Applications.

CE-422

STRUCTURAL DESIGN & DRAWING

**Design of Buildings for
Wind & Earth Quake:**

Analysis and design of reinforced concrete and steel, industrial and commercial type of buildings including affects of wind and earthquake.

Tanks & Reservoirs:

Analysis and design of underground, overhead tanks and reservoirs. Analysis and design of cantilever and counter fort retaining walls

Shell, Plates and Bridges:

Introduction to analysis and design of thin shell, and folded plate structures, steel and RCC bridges.

CE-423

MASONRY STRUCTURES

Loadbearing masonry Buildings:

Advantages and development of loadbearing masonry, basic design considerations, Structural safety; limit state design, foundations, unreinforced, reinforced and prestressed masonry, design methods, load combinations

Bricks, blocks and mortars:

Bricks and blocks, mortar, lime, sand, water, plasticized Portland cement mortar, use of pigments, frost inhibitors, proportioning and strength, choice of unit and mortar, wall ties, concrete infill and grout; reinforcing and prestressing steel.

Masonry Properties:

Compressive strength, strength of masonry in combined compression and shear, tensile strength of masonry, stress-strain properties of masonry, modulus of elasticity, effects of workmanship on masonry strength, thermal effects, creep, shrinkage.

Design for vertical and Lateral loading:

Wall and column behaviour under axial load, Wall and column behaviour under eccentric load, slenderness ratio, calculation of eccentricity, vertical load resistance, modification factors, distribution and analysis for lateral forces.

Cavity Walls:

One wythe loaded axially, effects of ties, two wythe loaded axially

Reinforced masonry:

Flexural strength, shear strength of reinforced masonry, deflection of reinforced masonry beams, reinforced masonry columns

Prestressed masonry:

Methods of prestressing, basic theory, general flexural theory, shear stress, deflections, loss of prestress

Construction Aspects:

Placement of steel reinforcement, grouting, control of cracking and movement joints, quality assurance, flashing for masonry construction

Anchorage to Masonry:

Type of anchor bolts, placement and embedment of anchor bolts in masonry grout, nominal strength of anchor bolts, nominal axial strength of anchor bolts loaded in tension and in combined, tension and shear, nominal shear strength of headed and bent-bar anchor bolts in shear; headed and bent-bar anchor bolts in combined axial tension and shear, structural walls and their anchorage requirements.

CE-429

GEOSYNTHETICS AND THEIR APPLICATIONS

Fundamentals of Geosynthetics

Introduction, definitions and classification, historical development, Raw materials and manufacturing processes, Properties and test methods and application areas

Geosynthetics functions and Mechanisms

Separation, filtration, reinforcement, drainage, containment, combined Functions.

Soil–Geosynthetic interaction

Introduction, Granular soil behavior, Soil– geosynthetic interaction mechanisms, Soil– geosynthetic interface resistance, Factors influencing soil–geosynthetic interaction, Laboratory tests for quantification of soil–geosynthetic interface resistance.

Engineering applications techniques

Filters and drains, soil subgrades, landfills, retaining walls, embankments, canals and reservoirs, pavements, slope stabilization, erosion control.

CE-431

GEO-INFORMATICS APPLICATIONS

Map Projections:	Concepts of Projections and Transformations, Coordinate Systems, Field Coordinates and Global Coordinate Syncing. Locating Datum, Introduction of Global Horizontal Control Systems.
Vertical Control:	Understanding Vertical Controls, World Geodimetric System of Vertical Control, Earth's Gravitational Model, Establishing Local Vertical Control, Synchronization of Local and Global Vertical Control Points.
GIS:	Fundamentals of GIS Data Handling, Standards of Data Files, Introduction to spatial analysis. Hands-on with software
Data Files:	Standard Database Formats, Understanding GIS data. Vector and Raster Formats, Spatial Statistics.
Instrumentations:	Navigational Satellites, Positioning Systems (GLONASS, GPS & Galileo), Fundamentals and Elements of GPS, System Operation & Characteristics, Errors and Atmospheric effects. Differential GPS (DGPS).
Remote Sensing:	Physicals basis of Remote Sensing, Satellite System, Aerial and Satellite photogrammetry, Sensors, Types of Resolutions, Geo-referencing, Image Processing Techniques, Classification. Acquisition of Global Datasets, Understanding Digital Elevation Model, Digital Surface Model, and Limitations of Satellite acquired data. Other Spatial Data Acquisition Technologies: Use of Drone Technology in Geoinformatics, Data Transformation, Application.
Practical Work:	GNSS and Surveying. Image processing software and GIS based exercises. Applied exercises of GIS and RS in Civil Engineering.
Legal implication Pakistan:	Ethical and National responsibilities during the development & sharing of spatial database, of GIS in Mapping & Surveying Act 2014

CE-433

COASTAL AND HARBOUR ENGINEERING

Wave Statistics:	Short and long-term wave statistics; irregular waves; Rayleigh distribution, Wave generation – wind; Simple wave hindcasting models.
Tides and Water level:	Physics of Tides, prediction of tidal variations and appreciate the impact of tides in the coastal environment; tidal power;
Coastal Processes:	Surf zone processes: cross shore and longshore currents; sediment transport; beach response and profiles; shoreline erosion/ Bluff erosion.
Introduction to Coastal Management: Coastal management strategies,	Management of coastal lands and water: ground water, waste water and other forms of pollution; Principles of coastal defence and techniques: artificial headlands, breakwater and rip-rap, groynes, beach nourishment, sea walls, managed retreat; wave-coastal structure interaction.
Harbour Engineering:	Design principles and requirements of harbours, effects of waves and tides on design, Wharves and jetties, Channel regulation and demarcation, Classification of docks and their construction, Transit Sheds and warehouses.

CE-438

HYDRAULICS AND WATER RESOURCE ENGINEERING II

Hydrology:	Weather Systems, Precipitation Analysis, Intensity-Duration-Frequency curve, Stream flow, Unit and Synthetic Hydrograph Analysis
Sediment Engineering:	Weathering, Erosion and Sediment Processes, Factors Affecting Erosion, Sediment Yield e.g., RUSLE, Sediment Transport processes, Erosion and Pollution, Vegetate Waterways
Irrigation & Drainage:	Crop Water Requirement/Soil-Water-Plant Relationship; Irrigation Strategies, Irrigation System Designs Subsurface Drainage Design; Occurrence of Groundwater, Well Hydraulics (Theim and Theis Equations)
Hydrological Analyses:	Probability concept, Annual Maxima, Flow Duration Curve, Risk and Reliability
Hydrologic Simulation Models:	Introduction and steps to Watershed Modelling, Application of Hydrologic Models
Water Quality and Lake Dynamics:	Water quality background, Important Concepts, Best Management Practices, Biological Impaired Water.

CN-424

ENVIRONMENTAL ISSUES IN CONSTRUCTION

Environment:	Definition, Climatic factors, soil-air-water relationship.
Environmental Pollution:	Sources, Pollutants, Effects and remediation of air, water, land, noise and radiation pollution, Toxic/hazardous wastes, Wastes related to construction activities.
Environmental Impact Assessment:	Requirement, Implication and significance, International; Federal and Provincial EPA Standards, Bye-laws and legislation, EIA of big and small projects as per National and International guidelines.
Water Demand & Supply:	Population forecast, Water uses & consumption, Types & variations in demand, Maximum demand & fire demand, Urban & rural water supply, Technology.
Water Quality and Treatment:	Water impurities & their health significance, Water quality standards, (U.S. & WHO, Pakistan etc.), Water quality monitoring, Various methods of treatment of surface & ground waters including screening, sedimentation, coagulation, filtration, disinfection and water softening methods, Emergency treatment methods.
Sewage and Sewerage Systems:	Wastewater types, Separate and combined sewer systems, Types, sizes and materials of sewers, Sewer appurtenances, pipe strength and tests.
Building Water Supply and Drainage:	Layout of water supply arrangement, Fixtures and their installation, Tapping of water mains, Requirements and arrangement of building drainage, Soil pipes, Antisyphon pipes and waste water pipes, Sanitary fixtures and traps.
Construction Waste Disposal:	Types, characteristics and sources of construction wastes, Collection disposal and recycling.
Energy Conservation:	Effective utilization and management of energy services in construction activities, Green building concepts.

CN-430

DISASTER AND RECONSTRUCTION MANAGEMENT

- Foundations of Sustainability:** Defining Sustainable Construction, Whole Systems Thinking, Collaboration as Sustainability in Action, Key Features of Sustainable Construction, The Green Construction Movement, Emerging Directions.
- Material Technologies:** Recycling of Conventional Construction Materials, Overview of Emerging Construction Materials and Products with Specific Reference to their Effectiveness towards Sustainable Construction.
- Construction Technologies:** Overview of Latest Developments in Construction Technology, such as Trenching e.g. Trench-less Technology; Specialized Formworks; Technologies for Building Deep Waterproof Basements; Mechanized Construction Methods & Equipment, Slip Forms, Effectiveness of Technologies towards Sustainable Construction.
- Disaster Management:** Monitoring of Infrastructure facilities; strategies for protection against possible damages; maintenance for different infrastructure facilities. Rehabilitation and repair strategies for reinforced concrete, repair and rehabilitation of pipe networks; sewers; roads and drainage facilities, Predictions and preparedness strategies for natural disasters such as Earthquakes etc; Emergency management; Awareness Programs; Follow-on Disasters; Recovery plans; Strategies for protection; Loss estimation; Risk and Vulnerability Analysis; Disaster Mitigation.

CE-409

CIVIL ENGINEERING PROJECT