

Scheme of Studies of BE Civil (Specialization in Urban) for the Batch 2020 & 2021

FIRST YEAR									
Fall Semester					Spring Semester				
Course Code	Course Title	Credit Hours			Course Code	Course Title	Credit Hours		
		Th.	Pr.	Total			Th.	Pr.	Total
UE-151/CE-107	Engineering Drawing-I	1	2	3	UE-153/CE-109	Engineering Surveying-I	2	1	3
UE-102/CE-102	Statics and Dynamics	3	1	4	UE-154/CE-110	Chemistry for Civil Engineers	1	1	2
EE-123	Basic Electrical Engg	2	0	2	UE-155/CE-111	Intro to Computing for Civil Engg	1	2	3
UE-152/CE-108	Engineering Materials	2	1	3	ME-110	Basic Mechanical Engineering	2	0	2
MT-114	Calculus	3	0	3	HS-111	Functional English	2	0	2
HS-106 / HS-127	Pakistan Studies/ Pakistan Studies (for Foreigners)	1	0	1	MT-221	Linear Algebra & Ordinary Differential Equations	3	0	3
	Total Credits	12	4	16	HSK-1	Chinese Language	NC		
						Total Credits	11	4	15
SECOND YEAR									
Fall Semester					Spring Semester				
Course Code	course Title	Credit Hours			Course Code	Course Title	Credit Hours		
		Th.	Pr.	Total			Th.	Pr.	Total
UE-201/CE-201	Engineering Surveying - II	3	1	4	UE-253/CE-222	Engineering Drawing -II	1	2	3
UE-251/CE-205	Mechanics of Solids -I	3	1	4	UE-254/CE-219	Fluid Mechanics-I	3	1	4
UE-252/CE-220	Geology for Engineers	2	1	3	UE-255/CE-221	Structure Analysis -I	3	0	3
HS-218	Business Communication	2	1	3	HS-219	Professional Ethics	2	0	2
HS-205/ HS-209	Islamic Studies OR Ethical Behaviour (for Non-Muslims)	2	0	2	MT-331	Probability & Statistics	3	0	3
HSK-2	Chinese Language				CF-303	Applied Economics for Engineers	3	0	3
	Total Credits	12	4	16		Total Credits	15	3	18
THIRD YEAR									
Fall Semester					Spring Semester				
Course Code	Course Title	Credit Hours			Course Code	Course Title	Credit Hours		
		Th.	Pr.	Total			Th.	Pr.	Total
UE-351/CE-320	Reinforced Concrete Design-I	3	0	3	AR-309	Architecture and Town Planning	3	0	3
UE-352/CE-321	Construction Engineering	3	0	3	UE-305/CE-305	Soil Mechanics-I	3	1	4
UE-353/CE-323	Quantity & Cost Estimations	3	0	3	UE-356	Traffic Engineering and Management	3	0	3
UE-455	Municipal Engineering and Urban Management	2	0	2	UE-218	Law and Regulatory Control Studies	2	0	2
MT-443	Numerical Analysis	3	0	3	UE-355/CE-424	Essential in Construction Project Management	3	0	3
UE-361	Planning & Design of Transportation System	3	1	4	UE-453/CE-453	Reinforced Concrete Design- II	3	0	3
	Total Credits	17	1	18		Total Credits	17	1	18
FINAL YEAR									
Fall Semester					Spring Semester				
Course Code	Course Title	Credit Hours			Course Code	Course Title	Credit Hours		
		Th.	Pr.	Total			Th.	Pr.	Total
UE-403/CE-403	Soil Mechanics-II	3	1	4	XX-###	Engineering Electives (3+0 OR 2+1 OR 1+2)	3	0	3
UE-452	Urban Mass Transportation	2	0	2	UE-435	Financial Resource Management	2	0	2
UE-451/CE-418	Hydraulic Engineering and Water Resources Engg-I	3	1	4	UE-460	Geoinformatics	1	1	2
UE-359	Structural Analysis-II	2	0	2	UE-454/CE-421	Design of Steel Structures	3	0	3
EN-301	Environmental Engineering-I	2	1	3	EN-401	Environmental Engineering-II	2	1	3
UE-415	Urban Engineering Project	0	3	3	UE-360	Mechanics of Solid-II	2	0	2
	Total Credits	1	6	18	UE-415	Urban Engineering Project	0	3	3
	Total Fall semesters			68		Total Credits	13	5	18
						Total Spring semesters			69
Grand Total- 137									

Bold fonts, Italics and thick border are courses, that have been introduced in the scheme as per desire of PEC (EAB-100)

List of Engineering Electives (3+0 OR 2+1 OR 1+2)

COURSE CODE	COURSE TITLE
CE-419	Applied Hydraulics
CE-423	Masonry Structures
CE-426	Building Information Modeling
CE-429	Geo-synthetics and their applications
CE-438	Hydraulics and Water Resources Engineering-II
CN-424	Environmental Issues in construction
CN-430	Disaster and Reconstruction Management
UE-422	Traffic Impact Assessment
UE-423	Highway and Airfield Pavement Design
EN-403	Environmental Impact Assesment
UE-421	Modern Aspects of Construction Project Management
UE-436	Urban Sociology

Syllabus (Batch 2020 & 2021)

Contents of Courses

FIRST YEAR (Fall Semester)

UE-151/CE-107: ENGINEERING DRAWING-1

UE-151/ CE-107	ENGINEERING DRAWING-1
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.

UE-102/CE-102: STATICS AND DYNAMICS

UE-102/ CE-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; 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

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, Equalising Connections and Dummy Coils, Elementary concept of Armature Reaction and Commutation, Cross and Demagnetising 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.

UE-152/CE-108: ENGINEERING MATERIALS

UE-152/CE-108	ENGINEERING MATERIALS
Materials and their Properties	Introduction of materials, Construction materials, Physical, mechanical and chemical properties, Electrical and thermal properties.
Binding Materials	Introduction and manufacture of Ordinary Portland Cement, Constituents of cement, Types of cement and their use, Properties and field tests of cement, Special cements, Introduction and preparation of lime, Setting and hardening of lime, Applications of lime, Comparison (cost and characteristics) of lime and cement.
Fine & Coarse Aggregates and Stones	Definition and introduction of aggregates, Mechanical and physical properties of aggregates, Importance and methods of grading of aggregates, Introduction, types, applications, characteristics of good building stones, Artificial stones.
Cementitious materials	Introduction and methods of preparation of paste, Properties and application of paste, Introduction and methods of preparation of mortars, Properties and application of mortars, Introduction about concrete Components and manufacture of concrete, properties of concrete, Types of concrete.
Metals (Steel and Aluminium)	Introduction to steel, Mechanical and physical properties of steel, Application of steel in civil engineering projects, Introduction to aluminium, Mechanical and physical properties of aluminium, Application of aluminium in civil engineering projects.
Ceramics, Bricks and Blocks	History and evolution of ceramics, Manufacture of ceramics, Properties and applications of ceramics in buildings, History and evolution of bricks, Properties and applications of bricks, Dimensions, manufacture and classification of bricks, History and evolution of blocks, Properties and applications of blocks, Dimensions, manufacture and classification of blocks.
Glass and Wood	Constituents of glass and methods of manufacture, Types, use and significance of glass in civil engineering, Advantages and drawbacks of glass, Structure of tree and general characteristics, Types, seasoning and preservation of wood, Lamination of wood.
Pavement Materials	Bitumen, Asphalt, Road Metal,

Miscellaneous Construction Materials	Asbestos, Plaster of Paris, Abrasives, Rubber, Cork, Plastics, Paint, Thermometry and acoustics, Bamboo, Natural, artificial and steel fibres, Modern Materials, (Fibre reinforced polymer etc.).
---	---

MT-114: CALCULUS

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, DeMorgan'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/HS-127: PAKISTAN STUDIES/ PAKISTAN STUDIES FOR FOREIGNERS

HS-106	PAKISTAN STUDIES
Historical and ideological	Two Nation Theory: Claim of Muslims of being a separate nation from Hindus, based upon cultural diversity. Cultural diversity and interests as

perspective of Pakistan Movement	bases for the demand of Pakistan – Lahore resolution. Creation of Pakistan: Factors leading to the creation of Pakistan. Quaid-e-Azam and the demand of Pakistan.
Constitutional Process	Constitutional and Political developments in Pakistan 1947-1973. Salient features of the Constitutions 1956, 1962 and 1973 and amendments.
Land of Pakistan	Geo-physical conditions. Geo-political and strategic importance of Pakistan. Natural resource, viz: mineral, water and power.
Contemporary issues in Pakistan	A brief survey of Pakistan Economy: problems, issues and future prospects. Pakistani Society and Culture-Broad features with emphasis on youth role in the development of Pakistan. Literacy and education in Pakistan: problems and issues. State of Science and Technology in Pakistan: A comparison with other countries with special reference to the Muslim world. Environmental issues in Pakistan: government policies and measures and suggestions for improvement. Pakistan's role in the preservation of nature through international conventions / treaties. Human Rights in Pakistan: Pakistan's response to human rights issues at national & international levels. Pakistan's Foreign Policy Urbanization in Pakistan - problems and issues.
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.

FIRST YEAR (Spring Semester)

UE-153/CE-109: ENGINEERING SURVEYING I

UE-153/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.

UE-154/CE-110: CHEMISTRY FOR CIVIL ENGINEERS

UE-154/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.

UE-155/CE-111: INTRODUCTION TO COMPUTING FOR CIVIL ENGINEERING

UE-155/CE-111	INTRO TO COMPUTING FOR CIVIL ENGINEERING
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.

ME-110: BASIC MECHANICAL ENGINEERING

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, and 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 Air-Conditioning and Refrigeration	Heating and Cooling Load and its calculations, Comfort Charts, Outline of A.C. Systems, Consideration for Air – Conditioning in Buildings, Natural Ventilation, Insulating Materials.

HS-111: FUNCTIONAL ENGLISH

HS-111	FUNCTIONAL ENGLISH
Speaking and Listening	Listening actively through the use of skills and sub skills, and in a variety of situations. Speaking: Fluency and confidence building through group discussions, role plays and public speaking.
Vocabulary development	Tips / strategies in vocabulary enhancement Practice in vocabulary development.
Reading	Reading skills, Sub skills Reading strategies Reading practice through variety of reading texts and comprehension exercises Précis writing.
Writing	Note taking: Techniques for taking notes from lectures, from books (integrated with listening & reading) Process of Writing with practice in pre writing strategies, in revising, and in, editing for grammar. Writing well- structured and effective paragraphs, essays and letters (routine communication) using proper writing mechanics. Writing descriptions, narrations, cause and effect, compare and contrast etc.

MT-221: LINEAR ALGEBRA & ORDINARY DIFFERENTIAL EQUATIONS

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, nonsingular,

	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.

Contents of Courses

SECOND YEAR (Fall Semester)

UE-201/CE-201: ENGINEERING SURVEYING – II

UE-201/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.

UE-251/CE-205: MECHANICS OF SOLIDS-I

UE-251/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.

UE-252/CE-220: GEOLOGY FOR ENGINEERS

UE-252/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 landslides.

HS-218: BUSINESS COMMUNICATION

HS-218	BUSINESS COMMUNICATION
Foundations of Business Communication	Definitions: communication, organization, business; understanding the need and scope of business, professional and organizational communication, Conditions, properties, process, tools, modes, levels, types of communication. Principles of Effective Communication & Building goodwill (You-attitude, positive emphasis and unbiased language). Listening, non-verbal communication. Communication dilemmas and problems. Feedback and its types. Audience Analysis.
Oral Communication	Group Discussions and interpersonal skills, Meetings, Interviews, Making presentations.

Business & Technical Writing	Types of messages: Formats (Letter and memorandum). Letter and memorandum elements and formats. Three Types of Business Messages (routine, negative and persuasive communications). Organizational Plans: Direct, Indirect & AIDA approach. Writing business messages (e-mails, inquiries, requests, replies, regrets, declining offers, letters, routine messages, etc.). Meetings: notice, \ agenda and minutes. Job applications and resumes. Research / scientific reports (structure, layout, writing process).
---	--

HS-205: ISLAMIC STUDIES

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 AlRehman 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 BEHAVIOR

HS-209	ETHICAL BEHAVIOR
Nature, Scope and Methods of Ethics	Ethics and Religion, Ethical teachings of World Religions.
Basic Moral Concepts	Right and Wrong, Good and Evil.
Ethical Systems in Philosophy	Hedonism, Utilitarianism, Rationalism & Kant, Self Realization Theories, Intuitionism.
Islamic Moral Theory	Ethics of Quran and its Philosophical basis, Ethical precepts from Quran and Hadith and Promotion of Moral Values in Society.

SECOND YEAR (Spring Semester)

UE-253/CE-222: ENGINEERING DRAWING-II

UE-253/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	<p>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.</p> <p>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.</p> <p>Details of steel roof truss, connection details and fabrication drawings.</p> <p>Plumbing and electrical detailing pertaining to small residential units.</p>
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.

UE-254/CE-219 FLUID MECHANICS-I

UE-254/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	Concept of Energy and head, General equations of energy and Bernoulli's assumption for incompressible fluids, Hydraulic grade line

Steady Flow	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, venture meter, notches & weirs.

UE-255/CE-221: STRUCTURAL ANALYSIS –I

UE-255/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 Principals	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.

HS-219: PROFESSIONAL ETHICS

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	Professional Responsibilities. Risk and Safety as an Ethical Concern for Engineers Workplace Responsibilities and Ethics: Teamwork,

Ethics	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.
---------------	--

MT-331: PROBABILITY & STATISTICS

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.
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.

CF-303: APPLIED ECONOMICS FOR ENGINEERS

CF-303	APPLIED ECONOMICS FOR ENGINEERS
Introduction	Basic Concepts and principles of Economics, Micro-economics theory, the 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.
Elementary Financial Analysis	Basic accounting equation, Development and interpretation of financial statements- Income Statement Balance Sheet and Cash flow, Working capital management.
Break Even Analysis	Revenue/cost terminologies, Behaviour of Costs, Determination of Costs/Revenues, Numerical and graphical presentations, Practical applications, BEA as a management tool for achieving financial/operational efficiency.
Selections Between Alternatives	Time value of money and financial rate of return, Present value, Future value and Annuities, Cost-benefit analysis, Selection amongst materials, techniques, designs etc. investment philosophy, Investment alternatives having identical lives, Alternatives having different lives, Make or buy decisions and replacement decisions.
Value Analysis/ Value Engineering	Value analysis procedures, Value engineering procedures, Value analysis versus value engineering, Advantages and application in different areas, Value analysis in designing and purchasing.
Linear Programming	Mathematical statement of linear programming problems, Graphic solution Simplex procedure, Duality problem
Depreciation and Taxes	Depreciation concept. Economic life, Methods of depreciation, Profit and returns on capital, productivity of capital, Gain (loss) on the disposal of an asset, depreciation as a tax shield.
Business Organization & Industrial Relationship	a) Type of ownership, single ownership, partnerships, corporation, type of stocks and joint stock companies, Banking and specialized credit institutions. b) Labour problems, Labour organizations, Prevention and settlement of disputes.
Capital Financing and Allocation	Capital Budgeting, Allocation of capital among independent projects, financing with debt capital, Financing with equity capital, Trading on equity, Financial leveraging.

Contents of Courses

THIRD YEAR (Fall Semester)

UE-351/CE-320: REINFORCED CONCRETE DESIGN-I

UE-351/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.

UE-352/CE-321: CONSTRUCTION ENGINEERING

UE-352/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.

UE-353/CE-323: QUANTITY & COST ESTIMATIONS

UE-353/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; Site work, 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	

UE-455: MUNICIPAL ENGINEERING AND URBAN MANAGEMENT			
	Cr. Hrs.	Contact Hrs.	Exam Marks
Th.	2	2	100
Pr	-	-	-
<p>General Organization of local government; Role of planners; Municipal Engineer co-ordination with different civic agencies.</p> <p>Sustainable Infrastructure Development Green building Concepts, Sustainable Infrastructure Development such as LEED Systems, Renewable Energy technologies (e.g. wind/solar/Thermal), and construction technologies such as (Trenchless technology)</p> <p>Disaster Management Predictions and preparedness strategies for natural disasters such as Earthquakes, Tsunami and Floods. Emergency management; Follow-on Disasters; Recovery plans; Strategies for protection; Loss estimation; Risk and Vulnerability Analysis; Disaster Mitigation</p> <p>Infrastructure Analysis and Management Infrastructure study design; cohort studies; cross-sectional studies etc. Infrastructure inventory surveys.</p>			
<p>Recommended book(s) for the approved course (Author's name, "Title", edition, publisher, publication year).</p>			
<p>Text book(s)</p> <ol style="list-style-type: none"> 1. Barth Detlef, The Disaster Risk Management Handbook- A learning experience of DRM Model Mansehra, PDMA KP, 2013 2. Ivor H. Seeley, Municipal Engineering Practice, Palgrave, 2014 3. Nitesh Kumar, Textbook of Disaster Management, 1st edition, Satish Serial Publishing House, 2013 			

MT-443: NUMERICAL ANALYSIS

MT-443	NUMERICAL ANALYSIS
Error Analysis	Types of errors (relative, Absolute, inherent, round off, truncation), significant digits and numerical instability, flow chart. Use any computational tools to analysis the numerical solutions.
Finite Difference	Functions of operators, difference operators and the derivative operators, identities. Linear homogeneous and non-homogeneous difference equations. Numerical Differentiation, Forward Difference Method, Backward Difference Method, Central Difference Method.
Solution of Non-linear Equation	Numerical methods for finding the roots of transcendental and polynomial equations (Secant, Newton – Raphson Chebyshev and Graeffe's root squaring methods), rate of convergence and stability of an iterative method. Fixed point Iteration, Bisection Method, Nonlinear systems of equations, application to consolidation,

	settlement and seepage analysis.
Solution of Linear Equation	Numerical methods for finding the solutions of system of linear equations (Gauss- Elimination, Gauss-Jordan Elimination, Triangularization, Cholesky, Jacobi and Gauss – Seidel). Applications to structural analysis and water distribution network problems.
Interpolation & Curve Fitting	Lagrange's, Newton, Hermit, Spline, least squares approximation. (Linear and non-linear curves).
Numerical Integration & Differentiation	Computation of integrals using simple Trapezoidal rule, 1/3th Simpson's rule, 3/8th Simpson's rule. Composite Simpson's and Trapezoidal rules, computation of solutions of differential equations using (Euler method, Euler modified method, Runge Kutta method of order 4).

UE-361: PLANNING & DESIGN OF TRANSPORTATION SYSTEM			
	Cr. Hrs.	Contact Hrs.	Exam Marks
Th.	3	3	100
Pr	1	3	50
<p>Transportation Systems and Planning: Role of Transportation: Classification of Transportation Systems development of various modes in Pakistan; Role of highways within a transport system; Highway classification. Planning needs Goals and Objectives, Types of Plan.</p> <p>Geometric and Pavement design of Highway: Geometric design including cross section element Horizontal alignment Curves; Super elevation and gradient Flexible and rigid pavement design; Highway drainage.</p> <p>Air Transportation: Component of air transportation: Airport activity; Aircraft characteristics affecting airport airside; Airport site Selection; Airside configuration; Navigation aids; Airport lighting and marking; Distribution concepts of terminal buildings; Geometric design of airside; Structural design of airfield pavements.</p> <p>Waterway Transportation: Role of water transportation as a supplementary transportation system. Classification of harbours; Ports and harbours of Pakistan; Design principles and requirement of harbours; Effect of wind, waves and tides on design; wharves and jetties; Breakwater and groins Channel regulation and demarcations; Classification of docks and their construction; Transit sheds and warehouses. Emerging trends in Ports/ container termina.</p>			
<p>Recommended book(s) for the approved course (Author's name, "Title", edition, publisher, publication year).</p>			
<p>Text book:</p> <ol style="list-style-type: none"> 1. Fred L. Mannering, Principles of Highway Engineering and Traffic, Seventh Edition), Scott S. Washburn and Publisher Wiley,2020 2. Jason C. Yu, Transportation Engineering Introduction to Planning, Design and Operations, Elsevier Science Ltd. (June 1982). 3. Horonjeff, R. Planning and Design of Airports, McGraw-Hill Professional; 5th Edition,2010. 4. Gregory P. Tsinker, Port Engineering Planning Construction Maintenance and Security. John Wiley, 2004. 			

THIRD YEAR (Spring Semester)

AR-309: ARCHITECTURE & TOWN PLANNING

AR-309	ARCHITECTURE & TOWN PLANNING
	<u>Architecture</u>
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.
	<u>Town Planning</u>
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.

UE-305/CE-305: SOIL MECHANICS-I

UE-305/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 reconsolidation pressure, swelling clays and clay-shale.
Soil Compaction	Requirements, principle and methods including standard and modified AASHTO tests.

UE-356: TRAFFIC ENGINEERING AND MANAGEMENT

UE-356	TRAFFIC ENGINEERING AND MANAGEMENT
Traffic flow characteristics:	Flow characteristics, Interrupted and uninterrupted flows, Traffic bottlenecks Traffic studies; Macroscopic and Microscopic studies, Methods of measuring speed and volume, Relation between speed volume and density. Saturation flow, Traffic delay.
Traffic safety and control	Traffic Lighting; Traffic signals, Signs and markings, Safety and Accident studies, One way and tidal flow systems. Traffic calming, bus priorities, pedestrian facilities and Travel demand management, Road safety audit.
Capacity analysis	Analysis of various highway and traffic facilities including multi-lane highways and signalized intersection.
Intelligent transport systems	Introduction to various components of ITS system needs and application. Discussing and debating solution to urban congestions.
Parking design and control	On street and Off Street Parking, Parking demand and Turnover, Parking Control.

UE-218: LAW & REGULATORY CONTROL STUDIES

UE-218	LAW & REGULATORY CONTROL STUDIES
Law	Definitions of government and law; legal relations; subjects and objects of legal relations; physical and jurisdictional individuals; Local Government Legislation / Act and Licenses requirement and regulation professional ethics. Importance of regulating built environment in urban areas.
Property rights	Forms and types, Possession use and disposal. Transaction; ownership; tenancy and traditional forms of property accesses.

Building plans	Submission of Building applications and drawings including all the procedural requirements enforced by the authority: Site visits, serving of notices; Fines and compounding of violation. Analysis of building proposals: conformity with the development plans, removal of encroachment, land use zoning planning criteria building bylaws, design guidelines, building line / parking requirements, chamfer requirements, construction over cultivators etc.
Coordination and Action between Civic Agencies	Consultation with the neighbors, roads authorities' line departments and allied agencies. Declaration and demolition of dangerous buildings; Litigation involved in building; control.

UE-355/CE-424: ESSENTIAL IN CONSTRUCTION PROJECT MANAGEMENT

UE-355/CE-424	ESSENTIAL IN CONSTRUCTION PROJECT MANAGEMENT
Introduction	The Construction Industry, Nature and Challenges, Key Industry Support Organizations, Public and Private Works, Past; Present; Opportunities; and Threats with Specific Reference to Pakistani Construction Industry.
Project Management in the Engineering & Construction Industry	PM knowledge areas; PM Life Cycle processes; Organizational structure of a construction project; Responsibilities of client, Key PM Skills; Key Roles and Responsibilities of Client, Consultants - including architects, engineers and allied professionals, constructors, PM and CM; Professional construction management; Project Management issues and need for improved organization and management structures and processes with particular reference to local construction industry.
Project Scoping, Bidding and Preconstruction Planning	Determining Relative Priorities of Key Project Objectives; Defining Project Scope, Types of tenders / contracts; Pre-Qualification process, Bidding process, Bid Package, Overview of Preconstruction Planning Aspects Including Area and Site Investigation; Preliminary schedules; Value Engineering; Constructability Analysis; Work packages; Drawings and Specifications review.
Project Planning, and Scheduling by Deterministic Methods	Planning and Scheduling Overview; Planning and Scheduling Process; Work Breakdown Structure; Planning and Scheduling Activities; Bar/ Gant Charts; ADM & PDM Networks; CPM project scheduling using PDM; Time Constrained Scheduling.
Project Planning, by Probabilistic Methods	Uncertainty Sources; Limitations of Deterministic CPM; PERT scheduling; PERT advantages and limitations; PERT today in construction industry.
Resource and Cost Considerations in Project Planning & Scheduling	Resource planning and scheduling; Resource Productivity; Resource levelling; Resource curves and profiles; Direct cost versus indirect cost; ; Contingency and profit; Cost Accrual Patterns; Time cost trade off; Least cost expediting; Project cost accounting; Cash flow and S-Curve;
Project Monitoring	Project Monitoring System, Project Control Process, Time; Cost;

and Control	and Work performance Measurement and Evaluation, Percent Complete, Look Ahead Schedules; Earned Value Cost and Schedule Control System.
Site Organization	Site Layout Planning, Contractor's Site (Team) Organization Chart, Mobilization Plan, Overview of Site Management issues. Project Management Career Paths. Use of Computer Software in Planning and Management for Construction Projects.

UE-453/CE-453: REINFORCED CONCRETE DESIGN- II

UE-453/CE-453	REINFORCED CONCRETE DESIGN- II
Design for Torsion	Torsion in reinforced concrete members. Analysis and design of reinforced concrete members under combined torsion and shear stress.
Flat Slab, Flat Plate & Waffle Slab	Analysis and design of flat plate, flat slabs and waffle slabs, for flexure and shear under gravity loading.
Slender Columns	Analysis and design of slender columns subjected to combined flexure and axial loading, Guidelines for design of shear walls-an over view.
Design of Different Types of Foundations	Analysis and design of eccentric, strap, strip footings and pile caps.
Prestressing Principles & Design Philosophy	Principles of prestressing, properties of high strength materials used in prestressing, Importance of high strength concrete and steel used in prestressing, Behavioral aspects of prestressed beams and comparison with reinforced concrete beams, comparison with reinforced concrete beams, post tensioning and pre- tensioning techniques, comparison and hard-ware requirements.
Prestress Losses	Prestress losses, immediate and time dependent losses, lump sum and detailed estimation of prestress loss.
Analysis and Design	Simply supported prestressed beams for flexure and shear.

Contents of Courses

FINAL YEAR (Fall Semester)

UE-403/CE-403: SOIL MECHANICS-II

UE-403/CE-403	SOIL MECHANICS-II
Sub Soil Investigation	Purpose, Preliminary and detailed investigation, Boring methods, spacing and depth of borings, soil sampling, In situ testings, Standard penetration test, static cone penetration test, Presentation of boring information, Preparation of bore logs.
Settlement Analysis	Settlement by elastic theory, Settlement analysis of a thin stratum of clay from index properties, Thick clay stratum settlement, analysis by strain versus Logarithm of pressure test data, Construction period correction, Secondary consolidation.
Bearing Capacity	Stability of soil masses, Rankine's, Terzaghi's and Meyerhof's analysis, Ultimate and safe bearing capacities for shallow foundations, Plate bearing test, Deep foundations bearing capacity, Static and dynamic load carrying capacity analysis of pile, Pile load test, Group action in piles, Raft foundation.
Lateral Earth Pressure	Types of lateral soil pressure, Rankine's and Coulomb's theories of lateral earth pressures, Soil pressure analysis of earth retaining structures (including retaining wall, sheet piles and excavation supports).
Stability of Slopes	Varieties of failure, Stability analysis of infinite and finite slopes, General method of slices (Swedish Methods), Bishop simplified methods of slices, Friction circle method. Taylor's stability number and stability curves, Effect of pore water and seepage forces on stability
Soil Property Modification	Mechanical and chemical stabilizations of soil, principles & methods.

UE-452: URBAN MASS TRANSPORTATION

UE-452	URBAN MASS TRANSPORTATION
Urban Mass Transit	Need, Types of Mass transit, Mass Transit Planning, Mass Transit Design and operation, Mass Transit Issues, Transportation Demand forecast, System Evaluation.
Rail transit	Rail systems; Railway organization; Railway alignment and grades; Cross sectional elements of railway tracks; Pointers and crossings, stations and yards; Railway signal systems; Laying of tracks and maintenance of railway right-of-way; Creep and anti-creep devices; Various types of railway locomotives; Methods of traction; Track resistances; Subways, LRT and MRT.
Design and Feasibility of Public Transport Projects	O-D surveys for public transport users, Analysis of trip patterns using desire lines; Service scheduling and design of new bus services.

UE-451/CE-418: HYDRAULIC ENGINEERING AND WATER RESOURCES ENGINEERING-I

UE-451/CE-418	HYDRAULIC ENGINEERING 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.

UE-359: STRUCTURAL ANALYSIS-II

UE-359	STRUCTURAL ANALYSIS-II
Analysis of Indeterminate Structures Using Force Approach	Compatibility methods for beams and frames with and without support settlement.
Analysis of Indeterminate Structures Using Stiffness Approach	Moment distribution for beams and frames for prismatic and non-prismatic members with and without side-sway and support settlement, Slope deflection method for beams and frames with and without support settlement.
Matrix Methods	Introduction to flexibility method, Determination of flexibility matrix for beams, Introduction to stiffness method, development of member and structure stiffness matrices, Bending moment and shear force diagrams, Application of computer programs.

EN-301: ENVIRONMENTAL ENGINEERING-I

EN-301	ENVIRONMENTAL ENGINEERING-I
Communicable Disease	Water borne, foodborne and vector borne diseases, Water supply and sanitation.

Control	
Environmental Pollution	Sources, Pollutants, Effects and remediation of air, water, land and noise pollution, Toxic/hazardous wastes.
Water Demand & Supply	Population forecast, Water uses & consumption, Types and variations In demand, Maximum & firefighting 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).

FINAL YEAR (Spring Semester)

UE-435: FINANCIAL RESOURCE MANAGEMENT

UE-435	FINANCIAL RESOURCE MANAGEMENT
Resource Management	Meaning; Nature; Aims; Characteristics; Elements; Functions and Objectives of management.
Capital financing and Allocation	Difference between sources of capital; Equity and borrowed capital; Financing with debt capital- cost of debt capital; Financing with bonds- cost of equity capital; Financing through retained profit; Leasing as a source of capital; Capital Allocation; An overview of a typical corporate capital budgeting Process.
Banking and specialized Credit Institution	Functions of Bank and Credit Institution; Documentation related to International and Domestic Banks, Financial and funding Institutions.
Business and Consumer Loans	Open-End Credit and charge cards; Installments loans; Early payoffs of loans; Personal property loans; Real estate loans.
Taxation	Basics of taxation; Tax formulas and computation; Tax laws for capital gains.
Price Changes and Exchange Rate	Terminology and basic concepts; Differential price inflation or deflation; Application strategy; Foreign Exchange rates and purchasing power.
Home ownership and Mortgage financing	Mortgage financing for home ownership; Mortgage the investment market in the investment market; Comparing mortgages and different interest rates; Effects of different interest rates; Effects of different

(Owning v/s Renting)	mortgages lives..
Investment Property	Land inventory; Features of investment real estate; Investment return; Determination of project feasibility.

UE-460: GEOINFORMATICS			
	Cr. Hrs.	Contact Hrs.	Exam Marks
Th.	1	1	100
Pr	1	3	50
<p>Introduction to Geo informatics Resources of information: Photogrammetric surveying, Satellite System, Aerial and Satellite photogrammetry.</p> <p>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.</p> <p>Remote Sensing (RS): Basic Concepts. Physicals basis of Remote Sensing, Earth Resources Satellites/ Platforms, Sensors, Types of Resolutions, Georeferencing, Image Processing Techniques. Classification.</p> <p>Global Positioning System (GPS): Navigational Satellites, Positioning Systems (GLONASS, GPS & Galileo). Fundamentals and Elements of GPS, System Operation & Characteristics, Errors and Atmospheric effects. Differential GPS (DGPS).</p> <p>Field and Laboratory Work: Training on GPS instruments-based surveys, Integration GPS data in GIS. Exercises on Image processing software and recent GIS software. Demonstration on RS/GIS applications in engineering disciplines</p>			
<p>Recommended book(s) for the approved course (Author's name, "Title", edition, publisher, publication year).</p>			
<p>Text book:</p> <ol style="list-style-type: none"> 1. Michael Kennedy, The Global Positioning System and Arc GIS System, 3rd Edition, Taylor & Frances, New York, , 2017 2. Thomas, M. Lillesand & Ralph W. Kiefer, Remote Sensing and Image Interpretation, 7th edition, John Wiley & Sons, Inc. 2015, 3. Clarke, K. Getting Started with Geographic Information System, Prentices Hall, New York 3rd Edition, 2010, ISBN-1879102897 4. Chang, K. T., Introduction to Geographic Information Systems, 9th Ed. McGraw-Hill Higher Education, 2019 			

UE-454/CE-421: DESIGN OF STEEL STRUCTURES

UE-454/CE-421	DESIGN OF STEEL STRUCTURES
Introduction	Steel properties, design load and load factors, Types and shapes of structural steel members, Specifications and design codes, Safety factors.
Tension Members	Design of threaded, riveted and welded tension members.
Flexural Members	Design of laterally supported and unsupported beams, Deflection, Design of beams for heavy concentrated loads, Bearing plates, Design of purlins, Design of beams with unsymmetrical cross-section and unsymmetrical bending, Design of builtup beams, gentry girder and plate girder.
Compression Members	Design & analysis of axially loaded columns, Design of laced columns, Analysis and design of eccentrically loaded columns, Length effects and evaluation of effective length factor for columns in braced and unbraced frames.
Connections	Types of high strength bolts and rivets, Friction & bearing type connections, Fasteners subjected to eccentric loads, Design of seated beam connection, Continuous beam-to-beam and beam to-column connection.
Framing System & Design	Design of industrial frame works, crane and gantry girder-setting of geometry, different load conditions and lateral bracing, Design of frames using plastic analysis.
New Design Codes	Introduction of LRFD.

EN-401: ENVIRONMENTAL ENGINEERING- II

EN-401	ENVIRONMENTAL ENGINEERING- II
Storm Flow & Sewage Flow Estimates	Rainfall intensity formulas, hydrograph & dry weather flow, sewage quantities; Variations and rates of flows; Velocity gradient & limiting velocities.
Types of Sewerage Systems	Separate & combined systems; Types shapes, sizes and materials of sewers; Sewer appurtenances, pipe strengths and tests.
Principles of Design	Construction & maintenance of sewers; Sewer, system analyses; Diameter and gradient, sewer joints, grading, laying, Jointing and testing of sewers.
Characteristics of Sewage	Municipal and industrial wastes; Water pollution, causes and control parameters; Effluent disposal guideline and standards.
Sewage Treatment	Primary, secondary & tertiary treatment; Screening grit chamber, skimming tanks & sedimentation tanks; Activated sludge treatment, trickling filters, oxidation ponds, etc.
Sewage Disposal Method	Receiving body, assimilation capacity; Stream pollution and self recovery, sludge handling & disposal; Effluent Reuse. Control and management of industrial wastewaters.
Building Drainage	Requirements and arrangement of building drainage; Soil pipes, antisiphon pipes and waste water pipes; Sanitary fixtures and traps; House connection and testing of house drainage; Cross connection and back syphonage control.
Solid Waste Disposal	Types, characteristics, sources and quantities of solid wastes; Collection disposal and recycling.
Laboratory Work	Related to the above, sampling techniques and examination of wastewater (Physical, chemical and microbiological parameters).

UE-360: MECHANICS OF SOLIDS-II

UE-360	MECHANICS OF SOLIDS-II
Enhanced Topics Related to Beam Bending and Shear	Unsymmetrical bending, shear flow, shear center, Analysis of curved beams and beams on elastic foundations.
Theory of Elasticity	Analysis of stresses and strains due to combined effect of axial, bending and twisting forces/moments, Elementary theory of elasticity, equilibrium and compatibility equations, stress and deformation relationships, Stress transformation, polar co-ordinates, Theories of failure.
Torsion of Thin Tubes and Open Sections	Torsion of non-circular shafts, membrane analogy, Torsion in thin tubes and open sections.
Stability	Struts and columns, Euler, Rankine and other formulas for buckling load of columns, Stability analysis of columns under eccentric loading.
Theory of Plasticity	Elementary theory of plasticity, plastic hinges, shape factor and failure mechanism.

Contents of Electives Courses

CE-419: APPLIED HYDRAULICS

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-423: MASONRY STRUCTURES

CE-423	MASONRY STRUCTURES
Load bearing 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 share, 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 ration, 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: GEO-SYNTHETICS AND THEIR APPLICATIONS

CE-429	GEO-SYNTHETICS 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	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-426: BUILDING INFORMATION MODELING

CE-426	BUILDING INFORMATION MODELING
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 Technology on a Real Time Project of Challenging Scope	Developing an Architectural Model; Walls; Slabs; Roofs; Ceilings; Floor Coverings and Wall Coverings; Doors and Windows; Specialty Items, 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 using Real Time Project	Stakeholder and Site Coordination, Sustainable Design and Construction, 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.

CE-431: GEO-INFORMATICS APPLICATIONS

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	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-438: HYDRAULICS AND WATER RESOURCES ENGINEERING-II

CE-438	HYDRAULICS AND WATER RESOURCES 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-425: ENVIRONMENTAL ISSUES IN CONSTRUCTION

CN-425	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 projects as per EPA Standards, Bye-laws and legislation, EIA of big and small 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

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, Predications 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.

UE-422: TRAFFIC IMPACT ASSESSMENT

UE-422	TRAFFIC IMPACT ASSESSMENT
Fundamentals of Traffic Impact Assessment	The Traffic Impact Assessment Report: Familiarization with the Components.
Traffic Impact and Transport Planning	Trip Generation and Distribution, Mode Split and Route Assignment.
Traffic impact and Traffic Engineering Analysis	Determination of Level of Service (LOS).
Transport and Traffic Survey for Traffic Impact Assessment	Methods of collecting, processing, analyzing and managing various, transport and traffic data necessary for a TIA study.
Transport Systems Management (TSM) and Travel Demand Management (TDM)	Concepts, models, and practice.

EN-403: ENVIRONMENTAL IMPACT ASSESSMENT

EN-403	ENVIRONMENTAL IMPACT ASSESSMENT
Introduction	Environmental Impact Assessment requirement, its implication and significance International, Federal and Provincial, Environmental Protection Agency Standards. Environmental assessment bye-laws and legislation. EIA analysis of big and small projects as per National and International guidelines.
Pollutants and their Impacts	Air, Water, Land and Noise pollution assessment; Impact of pollutants on Atmosphere, on land, on water and on marine life; controlling agencies monitoring EIA.
Evaluation Method	Performa and conclusion keeping in consideration of socioeconomic and Environmental effect on natural areas such as human, Animal and Plant life.

UE-421: MODERN ASPECTS OF CONSTRUCTION PROJECT MANAGEMENT

UE-421	MODERN ASPECTS OF CONSTRUCTION PROJECT MANAGEMENT
Organizing for Construction Project Management	Trends in Modern Management, Strategic Planning and Project Programming, Organization of Project Participants, Stake holders in a Project – Client, Consultant, Contractor, Interpersonal Behavior in Project Organizations, Perceptions of individual stake holders.
Project delivery Methods	Traditional and alternative delivery methods, organization of stakeholders, parties' contracts. Relational and Lean Project delivery systems. FIDIC, JCT, RICS etc.
Construction Contracts	Definition of contract, major requirement of contracts, Contracts by delivery methods, Contracts by Payment Schemes. Types of Contracts – Lump Sum, Unit Rate, Cost Plus, Turn Key, EMC,
Resource Management and Planning	Kinds of Resource Constraint, Resource-constrained scheduling. Resource Allocation Methods. Histograms.
Quality Management	Quality Planning, Perform Quality Assurance, Perform Quality Control. Tools for QAQC Management.
Risk Management	Risk Management Planning, Risk Identification, Qualitative Risk Analysis, Quantitative Risk Analysis, Risk Response Planning, Risk Register, Risk Monitoring and Control. Effects of Project Risks on Organization.

UE-436 URBAN SOCIOLOGY

UE-436	URBAN SOCIOLOGY
Concepts and Terminology	Introduction types and formats of social relationship: Urban communities; space and its types (physical, social and economic); social infrastructure; sociology and development; social and psychological characteristics
Urban Communities	Types and characteristics; communities in relation to build environment; issues related to urban communities; case studies

Issues in Urban sociology	Population; urbanization; human values; culture, traditions and norms; distribution and utilization pattern of resources gender and space; social justice
----------------------------------	---

UE-423: HIGHWAY AND AIRFIELD PAVEMENT DESIGN

UE-423	HIGHWAY AND AIRFIELD PAVEMENT DESIGN
Basic Concepts:	Principles relative to the design, construction and rehabilitation of highway and airfield pavement systems.
Elastic Slab Theory:	Introduction to multi-layered elastic and slab theories, properties of pavement materials and methods of characterization, stochastic treatment of design variables.
Advanced Topics in Pavement Design	Review of existing rigid and flexible design methods as well as major fundamentals relative to the rehabilitation of existing pavement system. Familiarization to relevant software.