

1.5.2 Master's Program

1.5.2.1 Structural Engineering

SI 6001 Advanced Numerical Methods (Mandatory, 3 credits)

Course Description

Provides a deeper understanding of numerical methods and introduces numerical methods application for civil engineering problems. This course concentrates on methods required for finite element method application. The study focuses on understanding of efficiency and accuracy methods. Topics: computer arithmetics and error, linear equation systems (advanced), nonlinear equation systems, eigen systems.

Related Courses

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References

1. Golub, G.H. and van Loan, C.F., "Matrix Computations", The Johns Hopkins University Press
2. Al-Khafaji, A.W. and Tooley, J.R., "Numerical Methods in Engineering Practice", Holt, Rinehart & Winston, Inc
3. Kahaner, D., Moler C. and Nash, S., "Numerical Method and Software", Prentice Hall

SI 6101 Engineering Analysis I (Mandatory, 3 credits)

Course Description

Generalized vector algebra; dot product and orthogonality; convergency; n-dimension space; Fourier transform; orthogonal projection as an approach; calculus of real variable functions; vector function with vector variables: differentiation and partial differentiation, gradient, divergence and rotation; double integral (surface and volume), Green, Gauss and Stokes theorem.

Related Courses

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References

1. Kreyzig, E., "Advanced Engineering Mathematics, 8th ed.", John Wiley & Sons

SI 6111 Advanced Mechanics of Materials (Mandatory, 3 credits)

Course Description

Definition and formulation of stress, strain and deformation; equilibrium and compatibility requirements; elasticity in Cartesian and polar coordinates; plastic deformation; theory of fractures; stress concentration; unsymmetric bending; curved beams; thick-walled cylinder; energy methods: first and second Castigliano principles.

Related Courses

SI2211 Mechanics of Materials, Prerequisites

References

1. Cook, R.D., and Young, W., "Advanced Mechanics of Materials", Macmillan
2. Timoshenko and Goodier, "Theory of Elasticity", MacGraw-Hill
3. Popov, E., "Advanced Solid Mechanics", McGrawHill

SI 6201 Engineering Analysis II (Mandatory, 3 credits)

Course Description

Ordinary differential equation, linear differential equation with inconstant coefficient with power methods, approaching to several special functions (Legendre dan Basell). Boundary value problems of two points (Sturm-Liouville problems), orthogonality of eigen functions. Partial differensial equations in homogeneous and non-homogeneous canonic forms, with homogeneous and non-homogeneous boundary conditions; Green function.

Related Courses

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References

1. Kreyzig, E., "Advanced Engineering Mathematics", 8th edition, John Wiley & Sons

SI 6211 Finite Element Methods (Elective, 3 credits)

Course Description

Introduction, comprehension, and application of finite element methods including computer programming. The FEM based on displacement; isoparametric element; application in various structural mechanics problems: beams, plates, plane-stress, plane-strain, solid; modeling and numerical aspects; weight residual methods; material and geometry non-linearity problems; application in dynamics.

Related Courses

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References

1. Cook, R.D. et al, "Concept and Applications of Finite Element Analysis", 3rd edition, John-Wiley & Sons
2. Bathe, K.J., "Finite Element Procedures in Engineering Analysis", Prentice Hall
3. Zienkiewics, O.C., "The Finite Element Method, Vol. I & II", McGraw-Hill

SI 6212 Experimental Stress Analysis (Mandatory, 3 credits)

Course Description

This course offers a comprehensive knowledge of various methods of experimental stress analysis frequently used in Structural Engineering.

Related Courses

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References

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SI 70Z1 Research and Thesis (Mandatory, 6 credits)

Course Description

Improve academic abilities, supplies the students with analysis and synthesis capability, as well as directing and supplying the students to be independent in performing activity research and technical report writings.

Related Courses

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References

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SI 7211 Earthquake Engineering (Mandatory, 3 credits)

Course Description

Related Courses

References

SI 6112 Advanced Concrete Technology (Elective, 3 credits)

Course Description

Physical, mechanical and chemical properties of concrete and its materials including material, correlation of concrete composition and its performance, admixtures, high strength concrete, repair and rehabilitation of components of concrete structures.

Related Courses

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References

1. Neville, A.M., "Concrete Technology",
2. Kevin L. Rens, "Forensic Engineering"
3. Ted Kay, "Assessment & Renovation of Concrete Structure."

SI 6213 Behavior of Steel Structures (Elective, 3 credits)

Course Description

Ultimate behavior of elements of steel structures, emphasized on buckling and stability problems of elements and frames, torsion of beams, lateral torsional buckling, and curved beams with stresses on problems related to design criteria, post-buckling strength of plates, post buckling behavior of columns.

Related Courses

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References

1. Salmon, C.G., and Johnson, J.E., "Steel Structures, Design and Behavior", 3rd edition, Harper Collins.
2. McGuire, W., "Steel Structures", Prentice Hall.

SI 7111 Theory of Plates and Shells (Elective, 3 credits)

Course Description

This course offers various analytical methods of plates and shells, including finite difference and finite element methods. Materials covered including stability of plates, formulation and solution; geometry of shells; various shell analysis, etc.

Related Courses

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References

1. Timoshenko, S. & Woinowsky, Krilger, "Theory of Plates & Shells", McGraw-Hill
2. Flugge, W., "Stress in Shells"

SI 7212 Theory of Plasticity (Elective, 3 credits)

Course Description

This course offers mathematical study of stress and strain of a solid body undergone a deformation, developing plastic stress-strain relationship, and analyzing its distribution.

Related Courses

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References

1. Beedle, L.S., "Plastic Design of Steel Frames", John Wiley & Sons, Inc
2. Chen, W.F., Zhang, H., "Structural Plasticity: Theory, Problems, and CAE Software", Springer-Verlag

SI 6113 Behavior of Concrete Structures (Elective, 3 credits)

Course Description

This course offers advanced materials on behavior of reinforced concrete structures and elements. Subjects covered include behavior of reinforced concrete materials, element, and structures under various loading conditions. Precast concretes which recently gaining popularity in and several analytical tools such as limit analysis and strut & tie will be covered in this course.

Related Courses

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References

1. Dept. Kimpraswil, "Tata Cara Perencanaan Struktur Beton untuk Bangunan Gedung",
2. Wang, C.K. and Salmon, C.G., "Reinforced Concrete Design, 4th edition", Harper & Row, New York.
3. McGregor, J.G, "Reinforced Concrete: Mechanics and Design", Prentice Hall

SI 7112 Theory of Stability (Elective, 3 credits)

Course Description

Materials covered includes concepts and types of stability, rigid body model, column, beam-column, rigid frame, bema, plate and cylinder, exact methods, energy and numerical methods.

Related Courses

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References

1. Chayes, A., "Principles of Structural Stability Theory", Prentice Hall
2. Timoshenko and Gere, "Theory of Elastic Stability"

SI 7213 Structural Optimization (Elective, 3 credits)

Course Description

Materials covered includes design process in structures, problem description in structural optimization, volume of structures, application of mathematical programs in structural system optimization.

Related Courses

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References

1. Gallagher, R.H., "Structural Optimization",
2. Arora, J.S., Arora, J.S., "Introduction Optimum Design", McGraw Hill
3. Haftka, R.T., Gurdal, Z., "Elements of Structural Optimization", Kluwer Academic Publishers.

SI 7113 Advanced Structural Dynamics (Elective, 3 credits)

Course Description

Subjects covered include: Analysis of behavior and response of linear and nonlinear SDOF and MDOF (2D dan 3D) structures with various dynamic loading, analysis with viscous and hysteretic dampers. Application of matrix methods with lump mass and consistent mass systems using softwares. Solution with modal superposition and step by step integration analyses. Relationship of dynamic analysis and static equivalent analysis. Various methods for solving eigen properties.

Related Courses

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References

1. Bathe, K.J., "Finite Element Procedures in Engineering Analysis", Prentice Hall
2. Anil K. Chopra, "Dynamics of Structures", Prentice Hall
3. Mario Paz, "Structural Dynamics", Van Nostrand Reinhold.

SI 7214 Continuum Mechanics (Elective, 3 credits)

Course Description

Tensor analysis, stress analysis, strain and stress rate, constitutive equation, fields equation for fluid mechanics and elasticity, energy balance, inequality theorem, thermodynamics on continuum media.

Related Courses

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References

1. Eringen, A.C., "Mechanics of Continua", John Wiley & Sons, Inc
2. Timoshenko, S., and Goodier, J.N., "Theory of Elasticity, 2nd ed.", McGraw-Hill Book Company, New York
3. Frederick, D., and Chang, T.S., "Continuum Mechanics", Allyn and Bacon, Inc., Boston

SI 7011 Special Topics in Structural Engineering (Elective, 3 credits)

Course Description

Related Courses

References

SI 7114 Probability and Reliability in Structural Engineering (Elective, 3 credits)

Course Description

This course is intended that students can understand structural safety from the aspect of probability.

Related Courses

1. SI2102 Statistics and Probability,
2. SI2111 Statics

References

1. Ang, A.H.S., & Tang, W.H.,” Probability Concepts in Engineering Planning and Design”, Vol-II, McGraw-Hill
2. Augusti, G., Baratte, A., and Casciati, F.,” Probabilistic Methods in Structural Engineering”, Chapman and Hill
3. Melchers, R.E.,” Structural Reliability Analysis and Prediction”, Wiley.

1.5.2.2 Geotechnical Engineering

SI 6101 Engineering Analysis I (Mandatory, 3 credits)

Course Description

Generalized vector algebra; dot product and orthogonality; convergency; n-dimension space; Fourier transform; orthogonal projection as an approach; calculus of real variable functions; vector function with vector variables: differentiation and partial differentiation, gradient, divergence and rotation; double integral (surface and volume), Green, Gauss and Stokes theorem.

Related Courses

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References

1. Kreyzig, E., "Advanced Engineering Mathematics, 8th ed.", John Wiley & Sons

SI 6121 Advance Soil Mechanics (Mandatory, 3 credits)

Course Description

Index properties of soils, soils classification, compaction, volume change of compacted soils, behaviors and structure of compacted cohesive soils, 1-D, 2-D, and 3-D consolidation, time rate consolidation, soil stress-displacement relationship, parameters from consolidation tests, critical state of soil, Mohr-Coulomb shear criteria, Tresca and Von Mises failure criteria, stress path, stress-displacement and shear strength of sands and clays, UU, CU, and CD triaxial tests, excess pore water pressure, undrained and drained conditions, insitu subsurface exploration.

Related Courses

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References

1. Mitchell, J. K., "Fundamentals of Soil Behavior" 3rd edition, John Wiley & Sons, New York, 2005
2. Lambe, T. W. and Whitman, R. V., "Soil Mechanics, SI Version" John Wiley & Sons, 1979
3. Zeevaert, L., "Foundation Engineering for Difficult Subsoil Conditions" 2nd edition, Litton Educational Publishing, 1983
4. Holtz, R. D. and Kovacs, W. D., "An Introduction to Geotechnical Engineering, Prentice Hall, 1981

SI 6122 Field and Laboratory Soil Investigation (Mandatory, 2 credits)

Course Description

Field works: Insitu soil exploration methods, devices, procedures, data reducing, and interpretation. Types of soil exploration include: deep borings, SPT, CPT, pressuremeter, vane shear tests. Laboratory works: index properties of soils, triaxial tests: CU, CD, UU, unconfined, saturation by vacuum, backpressure, swelling test. Pile driving recording, static and dynamic load tests of pile and bored pile.

Related Courses

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References

1. Bowles, J. E. "Foundation Analysis and Design" 5th edition, McGraw Hill Book Company, New York, N.Y., 1996
2. Campanella, R. B., "The Cone Penetration Test", 1994

SI 5221 Advance Foundation Engineering (Mandatory, 3 credits)

Course Description

Soil Mechanics review, insitu soil characterization, soil laboratory tests, soil shear strength, reliability and risk analysis, shallow foundations, bearing capacity theories: Terzaghi, Meyerhoff, Brinch Hansen, Vesic, API, bearing capacity by cone penetration test (CPT) data, reduced bearing capacity, safety factor, stress distribution, elastic (immediate) settlement, Terzaghi's consolidation theory, creep, deep foundations, deep foundation capacity, deep foundation capacity by SPT, deep foundation capacity by CPT, pile capacity by dynamic method (PDA), axial and uplift tests, lateral capacity of deep foundations, lateral test, axial and lateral deformation of deep foundation, t-z method, q-z method, and p-y method, analysis of pile groups, behaviors piles during earthquake, design aspects and construction of deep foundation.

Related Courses

1. SI 2102 Statistics and Probablistics, Prerequisited
2. SI 2221 Soil Mechanics I, Prerequisited
3. SI 3101 Numerical Method, Prerequisited
4. SI 3121 Soil Mechanics II, Prerequisited
5. SI 3221 Foundation Engineering, Prerequisited
6. SI 6221 Soil Improvement, Prerequisited

References

1. Canadian Geotechnical Society, "Canadian Foundation Engineering Manual", 2rd Edition, The Canadian Geotechnical Society, 1985
2. Terzaghi, K., Peck, R. B., and Mesri, G., "Soil Mechanics in Engineering Practice" 3rd Edition, John Wiley & Sons, 1996
3. Flemming, W. G. K., Weltman, A. J., Randolph, M.F., "Piling Engineering" Blackie Academic & Professional, 1992

SI 5222 Stability in Geotechnical Engineering (Mandatory, 3 credits)

Course Description

Stress conditions in soil – “at rest”, active, and passive, Rankine theory of earth pressure, coulomb theory, critical height of vertical unsupported cuts, retaining wall stability, influence of distributed and line loads on backfill, influence of water on lateral loads, passive earth pressure estimate, braced excavation, breast walls, planted walls, reinforced earth – types and mechanics of reinforcement, retaining wall design requirements, reinforced earth wall – metal strips, reinforced earth wall – geogrids, corrosion considerations, causes and classifications of slope, failures of slope stability, infinite slope, stability of finite slope, methods of slices, sliding wedge analysis, circular arc analysis, prevention and control of slope failures

Related Courses

1. SI 2221 Soil Mechanics I, Prerequisites
2. SI 3121 Soil Mechanics II, Prerequisites
3. SI 3221 Foundation Engineering, Prerequisites

References

1. Edil, T. B. () “Seepage slopes and embankments” lecture notes, University of Wisconsin, Madison, USA.
2. Leroueil, S, et al., “Embankments on soft clays” Ellis Horwood, NY, 1990
3. Perloff, W. H. and Baron W., “Soil Mechanics Principles and Applications” John Wiley & Sons, New York, NY, 1986

SI 7121 Soil Behavior (Mandatory, 3 credits)

Course Description

Soil origin and composition, clay-water system, clay mineralogy, colloidal properties and behaviors, soil inter-particle forces, ion exchange, ionic influences, dispersive clays, shrink-swell behaviors of clays, swelling models and prediction, stress-strain behaviors of swelling soils, effects of void ratio and confining pressure to volume change, chemical stabilization, behaviors of stabilized soils, shear strength of sand, liquefaction, volume change of sand due to cyclic loads; peat, rheological model, volume change of peat, consolidation of peat; particle contact theory by Hertz.

Related Courses

1. SI 5222 Stability in Geotechnical Engineering, Prerequisites
2. SI 6121 Advance Soil Mechanics, Prerequisites
3. SI 6122 Field and Laboratory Soil Investigation, Prerequisites

References

1. Mitchell, J. K., “Fundamentals of Soil Behavior” 3rd edition, John Wiley & Sons, New York, 2005
2. Lambe, T. W. and Whitman, R. V., “Soil Mechanics, SI Version” John Wiley & Sons, 1979
3. Holtz, R. D. and Kovacs, W. D., “An Introduction to Geotechnical Engineering, Prentice Hall, 1981

SI 7122 Soil Dynamics and Earthquake Engineering (Mandatory, 3 credits)

Course Description

Wave propagation in elastic medium, seismic wave due to earthquake, plate tectonics, seismic design parameters, earthquake attenuation, response spectra, maximum ground acceleration, local characteristic, dynamic behaviors of clay and sand, soil behaviors during earthquake, soil shear modulus, soil shear wave velocity, damping, wave propagation through stratified soils, SHAKE, zonation and microzonation; equivalent number of uniform stress cycles, empirical and analytical liquefaction prediction; foundation stability during earthquake, lateral earth pressure during earthquake.

Related Courses

1. SI 5221 Advance Foundation Engineering, Prerequisites
2. SI 6121 Advance Soil Mechanics, Prerequisites

References

1. Richart, F. E., Hall, J.R., Woods, R. D., "Vibrations of Soils and Foundations" Prentice-Hall, Inc., Englewood Cliffs, New Jersey, NY, 1970
2. Das, B. M., "Fundamentals of Soil Dynamics", Elsevier, N.Y., 1983
3. Prakash, S., Puri, V. K., "Foundations for Machines: Analysis and Design" John Wiley & Sons, N.Y., 1988
4. Kramer, S. L., "Geotechnical Earthquake Engineering", Prentice Hall, Inc., Upper Saddle River, NJ, USA, 1996

SI 70Z1 Research and Thesis (Mandatory, 6 credits)

Course Description

Improve academic abilities, supplies the students with analysis and synthesis capability, as well as directing and supplying the students to be independent in performing activity research and technical report writings.

Related Courses

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References

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SI 5121 Retaining Structures (Elective, 3 credits)

Course Description

Approach to design and analysis, stress conditions in soils – “at rest”, active, and passive, Rankine theory of earth pressure, Coulomb theory of earth pressure; lateral earth pressure during earthquake; dewatering; local and global stability; rigid and flexible reinforced earth walls; analyses and designs of sheet pile, anchored sheet pile, anchored bulkheads, braced-cuts, tie back cuts, slurry trench walls, diaphragm, reinforced earth, and cofferdam.

Related Courses

1. SI 2221 Soil Mechanics I, Prerequisites
2. SI 3121 Soil Mechanics II, Prerequisites
3. SI 3221 Foundation Engineering, Prerequisites

References

1. Bowles, J. E., “Foundation Analysis and Design” 5th edition, McGraw Hill Book Company, New York, N.Y., 1996
2. Das, B. M., “Principles of Foundation Engineering”, 5th edition, PWS Publishing, Boston, USA, 2001

SI 6211 Finite Element Method (Elective, 3 credits)

Course Description

Introduction to the finite element method, direct stiffness method (review), Strong vs weak formulations, approximate solutions to analysis problems; improving the approximate solutions: Rayleigh-Ritz, rod element, review of linear elastic mechanics, energy theorem for elastic structures, principle of virtual displacement, properties of the finite element solution: strong vs. weak formulations, beam element, plane stress, plane strain, finite element analysis with PLAXIS, shape function for C^0 and C^1 elements, four-node quadrilateral element, equivalent nodal forces for isoparametric elements, convergence requirements, numerical integration, the patch test, axisymmetric elements, general three dimensional solids, dynamic problems.

Related Courses

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References

1. Cook, R. D., Malkus, D. S., Plesha, M. B., “Concepts and Application of Finite Element Analysis” 3th edition, John Wiley & Sons, 1989
2. Bathe, J. K., “Finite Element Procedures in Engineering Analysis”, Prentice Hall, 1996
3. Zienkiewics, O. C., “The Finite Element Method, Vol I & II” McGraw-Hill, 1997

SI 7021 Special Topics in Geotechnical Engineering (Elective, 3 credits)

Course Description

Sokolovskii's theory for bearing capacity calculations; axial capacity based insitu tests, pile group analysis, dynamic analysis for axial capacity of deep foundation, wave propagation analysis, pile driving record, refusal criteria; construction on soft soils; CU triaxial tests, gain of strength, preloading, vertical drain, and Asoka's method; applications of finite element method: to model stage construction, to model stability and slope failure, to design reinforcement, to design reinforcement of bamboo matras and bamboo piles, behaviors of peat and settlement prediction.

Related Courses

1. SI 5221 Advance Foundation Engineering, Prerequisites
2. SI 6121 Advance Soil Mechanics, Prerequisites

References

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SI 7221 Soil – Structure Interaction (Elective, 3 credits)

Course Description

Static soil – structure interaction: analytical and numerical modeling, p-y analysis, soil – pile interaction, analysis and design of rigid and flexible underground pipes, geotechnical analysis using finite element method.

Dynamic soil – structure interaction: effects of dynamic soil – structure interaction, cinematic and inertia interaction, analytical and numerical modeling of machine foundations, wave propagation, stress wave in bounded elastic medium, soil – structure interaction analysis in frequency domain, soil – structure interaction analysis in time domain analysis, substructure method by dynamic stiffness of soil.

Related Courses

1. SI 5221 Advance Foundation Engineering, Prerequisites
2. SI 6121 Advance Soil Mechanics, Prerequisites
3. SI 7122 Soil Dynamics and Earthquake Engineering, Prerequisites

References

1. Wolf, J. P., "Soil – Structure Interaction Analysis in Time Domain" Prentice Hall, Englewood Cliff, N.J., 1988
2. Sayed, S. M., "Geotechnical Modeling and Applications", Gulf publishing Company, 1987

SI 6001 Advanced Numerical Methods (Elective, 3 credits)

Course Description

Provides a deeper understanding of numerical methods and introduces numerical methods application for civil engineering problems. This course concentrates on methods required for finite element method application. The study focuses on understanding of efficiency and accuracy methods. Topics: computer arithmetics and error, linear equation systems (advanced), nonlinear equation systems, eigen systems.

Related Courses

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References

1. Golub, G.H. and van Loan, C.F., "Matrix Computations", The Johns Hopkins University Press
2. Al-Khafaji, A.W. and Tooley, J.R., "Numerical Methods in Engineering Practice", Holt, Rinehart & Winston, Inc
3. Kahaner, D., Moler C. and Nash, S., "Numerical Method and Software", Prentice Hall

SI 6221 Soil Improvement (Elective, 3 credits)

Course Description

Soil and site problems, soil origin and composition, clay-water system, clay soil behavior, expansive soils and treatment, soil erodibility and soil loss prediction, methods of ground improvement: Mechanics (rollers, compaction, vibration); Supports: shotcrete, anchors; surcharge, vertical drain; chemical stabilization: cement, lime, cement-lime mixture; Biotechnical measures; erosion control principles, methods, and procedures, biotechnical stabilization.

Related Courses

1. SI 2221 Soil Mechanics I, Prerequisites
2. SI 3121 Soil Mechanics II, Prerequisites
3. SI 3221 Foundation Engineering, Prerequisites

References

1. Bell, E. F. G., "Methods of Treatment of Unstable Soils", Balkema, Rotterdam, Netherland, 1975
2. Mitchell, J. K., "Fundamentals of Soil Behavior" 3rd edition, John Wiley & Sons, New York, 2005
3. Lambe, T. W. and Whitman, R. V., "Soil Mechanics, SI Version", John Wiley & Sons, 1979

SI 7123 Machine Foundation (Elective, 2 credits)

Course Description

Review of vibration, elastic half space theory, wave propagation, attenuation of vibration, soil properties for dynamic base design, unbalanced machine forces, foundation impedance functions for axial, lateral, and rocking, coupled rocking and horizontal loads, pile-supported dynamic foundations, stiffness and damping of pile group, pile driving criteria, foundation design due to impact loads, dynamic analysis of retaining structures, active and passive vibration isolation, attenuation of pile driving, general considerations in designing dynamic foundations, allowable vibration criteria.

Related Courses

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References

1. Richart, F. E., Hall, J.R., Woods, R. D., “Vibrations of Soils and Foundations” Prentice-Hall, Inc., Englewood Cliffs, New Jersey, NY, 1970
2. Das, B. M., “Fundamentals of Soil Dynamics”, Elsevier, N.Y., 1983
3. Prakash, S., Puri, V. K., “Foundations for Machines: Analysis and Design” John Wiley and Sons, N.Y., 1988

SI 6123 Offshore Geotechnics (Elective, 3 credits)

Course Description

Introduction to offshore structures, characteristic of offshore subsurface soils, loadings of offshore structures and foundations (wind, current, wave, earthquake), offshore soil investigation, static and dynamic soil mechanics, introduction to loadings in API Code, review of pile foundations, API RP2 bearing capacity of pile foundations, lateral capacity of pile, analysis of pile group, soil – structure interaction of offshore foundation, dynamic analysis of pile capacity and pile drivability, raft foundation, offshore anchors, axial and lateral load tests, non destructive tests, instrumentation, offshore subsurface soil characterization, types of offshore foundations, seafloor stability, stability of offshore pipes.

Related Courses

1. SI 2102 Statistics and Probabilities, Prerequisites
2. SI 3221 Foundation Engineering, Prerequisites
3. SI 5222 Stability in Geotechnical Engineering, Prerequisites
4. SI 6001 Advance Numerical Method, Prerequisites
5. SI 6121 Advance Soil Mechanics, Prerequisites
6. SI 6221 Soil Improvement, Prerequisites

References

1. API RP2A, “Recommended Practice for Planning, Designing, and Constructing Fixed Offshore Platform”, PSD, 1985
2. Poulos, H. G., “Marine Geotechnics” Routledge E & F N Spon, 1996
3. Gerwick, B. Jr., “Construction of Marine and Offshore Structures” 2nd edition, CRC Press LLC, 2000

SI 6124 Rock Mechanics (Elective, 2 credits)

Course Description

Geology classification of igneous, sedimentary, and metamorphic rocks, Index properties of rocks, geomechanics classification system, failure mechanism, lab testing (unconfined compression, triaxial, split cylinder, flexural, ring shear), stress-strain behaviors, failure theories, Mohr-Coulomb theory, Griffith Brittle theory, size, anisotropy, effective strength aspects of strength, insitu stresses, measurement of in-situ stress, structural geology (dip, strike, and thickness), outcrop patterns from field data, folds, faults, stereographic projection, weakness planes in rocks, joint strength testing and modeling, deformability of rock masses, determining rock mass modulus, vector analysis by stereonets, slope stability, slope stability – plane, wedge, toppling, slope stability combined analysis, rock foundations.

Related Courses

1. SI 2221 Soil Mechanics I, Prerequisites
2. SI 3121 Soil Mechanics II, Prerequisites

References

1. Goodman, R. E., "Introduction to Rock Mechanics", 2nd edition, John Wiley & Sons, 1989
2. Jaeger, J. C., "Fundamentals of Rock Mechanics" Methuen & co Ltd., 1979
3. Bieniawski, Z. T., "Engineering Rock Mass Classification" John Wiley & Sons, 1989
4. Herget, G., "Stresses in Rock", A. A. Balkema, 1988
5. Franklin, J. A. and Dusseault, M. B., "Rock Engineering", McGraw Hill, 1989

1.5.2.3 Water Resources Engineering

SI 6001 Advanced Numerical Methods (Mandatory, 3 credits)

Course Description

Provides a deeper understanding of numerical methods and introduces numerical methods application for civil engineering problems. This course concentrates on methods required for finite element method application. The study focuses on understanding of efficiency and accuracy methods. Topics: computer arithmetics and error, linear equation systems (advanced), nonlinear equation systems, eigen systems.

Related Courses

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References

1. Golub, G.H. and van Loan, C.F., "Matrix Computations", The Johns Hopkins University Press
2. Al-Khafaji, A.W. and Tooley, J.R., "Numerical Methods in Engineering Practice", Holt, Rinehart & Winston, Inc
3. Kahaner, D., Moler C. and Nash, S., "Numerical Method and Software", Prentice Hall

SI 6101 Engineering Analysis I (Mandatory, 3 credits)

Course Description

Generalized vector algebra; dot product and orthogonality; convergency; n-dimension space; Fourier transform; orthogonal projection as an approach; calculus of real variable functions; vector function with vector variables: differentiation and partial differentiation, gradient, divergence and rotation; double integral (surface and volume), Green, Gauss and Stokes theorem.

Related Courses

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References

1. Kreyzig, E., "Advanced Engineering Mathematics, 8th ed.", John Wiley & Sons

SI 6131 Advanced Fluid Mechanics (Mandatory, 3 credits)

Course Description

To give deeper understanding and comprehension regarding to type, characteristics, development mechanism of the governing equations which can be used to analyze fluid dynamics. The given material is:

1. Physical characteristics of fluids and their flow dynamics
2. Control volume, fluid static, kinematic, and dimensional analysis
3. Introduction of continuum mechanics
4. Momentum equation (Newton II law) and continuity
5. Navier-Stokes Equation
6. Turbulent characteristics and boundary layer concept
7. Motion equation, averaging and fluctuation of fluid flow
8. Motion equation, Reynolds stress and turbulence kinetic energy
9. Application of boundary layer concept in the derivation of governing equation of flow
10. Application of Navier Stoke Equation in the derivation of Euler and Bernoulli Equation
11. Governing equation of shallow water flow
12. Governing equation for long wave unsteady flow
13. Turbulent Equation

Related Subjects

1. SI2111 Static, Prerequisites
2. SI2131 Fluid Mechanics and Hydraulics, Prerequisites
3. TL2105 Engineering Mathematics, Prerequisites

References

1. Leo Van Rijn, " Principles of Fluid Flow and Surface Waves in Rivers, Estuaries, Seas and Ocean"

SI 5231 River Engineering (Elective, 3 credits)

Course Description

Hydraulic characters of rivers, morphology and stability, stability and river protection. Character of rivers network, basic river classification, river hydraulic, dynamic in the change of morphology, meandering process, protection on river environment, river normalization, river functions (transportation, flood control, etc.), control structure and benefits of river

Related Courses

1. SI2131 Fluid Mechanics and Hydraulics, Prerequisites
2. SI7232 Erosion and Sediment Trnsport, Co-requisites

References:

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SI 5232 Advanced Hydraulics (Mandatory, 3 credits)

Course Description

To give understanding and basic concept of nearly horizontal flow and the laws of conservation and the numerical techniques used to solve flow equation. Mathematical models of 1-D, 2-D and 3-D flows. Turbulent model, characteristic method; Applied numerical methods to solve the flow equation: finite difference (explicit and implicit scheme). Numerical schemes to solve flow equation 1-D, 2-D and 3-D flows, e.g.: Lax-Wendroff scheme, MacCormack, Abbott-Ionescu, Preissmann, UNO and TVD. Splitting techniques: ADI, optimal splitting, strang, etc.

Related Courses

1. SI2131 Fluid Mechanics and Hydraulics, Prerequisites
2. SI6001 Advanced Numerical Method, Prerequisites
3. SI6131 Advanced Fluid Mechanics, Prerequisites

SI 6231 Advanced Hydrology Engineering (Mandatory, 3 credits)

Course Description

Theory and hydrograph application for design, rainfall analysis and runoff; flood routing: reservoir routing and river routing; advance hydrology design; design storm; hydrology analysis for reservoir design, flood control; stochastic hydrology.

Related Subject

1. SI2102 Statistic Analysis and Probability, Prerequisites

Reference

1. Chow, V.T., Maidment, D., and Mays, L.W., "Applied Hydrology",
2. Eagleson, P.S., "Dynamic Hydrology", McGraw-Hill
3. Bras, R.L., Wesley, A., "Hydrology, an Introduction to Hydrologic Science"

SI 70Z1 Research and Thesis (Mandatory, 6 credits)

Course Description

Improve academic abilities, supplies the students with analysis and synthesis capability, as well as directing and supplying the students to be independent in performing activity research and technical report writings.

Related Courses

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References

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SI 5131 Dams and Water Power (Elective, 3 credits)

Course Description

Civil engineering aspect in the design of dam: type, function and capacity of dam; measurement method and data analysis; site determination, planning and hydraulic design of primary structure and supporting structure, operational and safety aspects.

Related Courses

1. SI2131 Fluid Mechanics and Hydraulics, Prerequisites

References

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SI 7131 Physical Hydraulic Model (Elective, 3 credits)

Course Description

Introduction, idea and principal of similarity, dimensional analysis, purpose of physical scale model and its classification. Distorted and undistorted model, determination of scale, bed type: movable and fixed bed model. Models: Weir, flushing outlet, spillway and river.

Related Course

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References

1. Barr, D.I.H., " A Survey Procedures for Dimensional Analysis", Inst. Jurnal Mechanical Engineering Education, 11 (3), 1
2. Sharp, J.J., " Hydraulic Modelling", Butterworths, London
3. Novak, P., & Cabelka, " Model in Hydraulic Engineering", Pitman, London

SI 7231 Finite Element & Vol. Method (Elective, 6 credits)

Course Description

Basic of finite element and volume difference and their application in structural analysis and fluid dynamic.

Related Course

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References

1. Segerlind, L.J., " Applied Finite Element Analysis", Wiley, New York
2. Chung, T.H., " The Finite Element Method in Fluid Mechanic", McGraw-Hill, New York
3. Zienkiewicz, O.C., and Morgan, K., " Finite Element and Approximations", Wiley, New York

SI 5132 Coastal and Swamp Engineering (Elective, 3 credits)

Course Description

Definition of coast and lowland, coastal hydraulics, wave mechanics, tide, wave transformation, coast protection system, low land formation process, lowland hydrology and hydrometry, water and soil quality, design of infrastructure construction, lowland development

Related Courses

1. SI2131 Fluid Mechanics and Hydraulics, Prerequisited

References:

1. Hang Tuah, "Rekayasa Rawa dan Pantai", Diktat Kuliah
2. Herbich, J.B., "Handbook of Coastal Engineering", McGraw-Hill Pub. Co
3. Lobbrecht, et al, "Swampland Development in Indonesia", Dept. Civil of Eng. Univ. TU Delft

SI 7132 Water Wuality Engineering (Elective, 3 credits)

Course Description

Basic concepts in the modeling of physical, chemical and biological processes in water bodies: river, estuary, coastal, lake and reservoir. Development of numerical model of water quality: derivation of transport equation, analytical and numerical solution of the transport equation, calibration and verification.

Related Course

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References

1. Cahyono, "Pemodelan Kualitas Air di Sungai, Muara, Pantai, Danau dan Waduk", Diktat Kuliah.
2. Olausson, E. and Cato, I, "Chemistry and Biogeochemistry of Estuaries", John Wiley & Sons.
3. Chapra, S.C, "Surface Water-Quality Modelling", McGraw-Hill International

SI 7232 Erosion and Sediment Transport (Elective, 3 credits)

Course Description

Characteristics and behavior of cohesive and non-cohesive sediments: grain size, settling velocity, relationship of concentration and salinity, incipient motion, bed load transport, bed form and its effect on the roughness, suspended sediment transport. Wave induced sediment transport. Movable bed model, erosion and deposition, dynamic balance of the channel. Land erosion. Numerical model on sediment transport..

Related Course

1. SI6131 Mekanika Fluida Lanjut, Co-requisited

References

1. Julien, Y.P, "Erosion and Sedimentation", Cambridge Univ. Press
2. Cahyono, "Teori Angkutan Sedimen dan Rekayasa Sungai", Diktat Kuliah.
3. van Rijn, L.C., "Principles of Sediment Transport in Rivers, Estuaries & Coastal Seas", Aqua Publication

SI 7133 Ground Water: Theory and Modelling (Elective, 3 credits)

Course Description

Groundwater hydraulic, Darcy's Law, ground water head equation, aquifer types, (un-confined, confined, semi confined aquifer). Exploration, exploitation techniques and groundwater management, aquifer parameter, transient and steady flow. Numerical solution of ground water model.

Related Course

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References

1. Verruijt, A, " Grounwater Flow", MacMillan Press
2. Kahef, " Groundwater Engineering", McGraw Hill

SI 7233 Transien Flow in Pipes (Elective, 3 credits)

Course Description

Unsteady flow and water hammer phenomenon in pipe.

Related Course

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References

SI 7134 Analysis of Water Resource System (Elective, 3 credits)

Course Description

System analysis using simulation and optimization technique: linier, non-linier and dynamic programming in planning and management. Stochastic and deterministic model. Application of risk analysis and system reliability in water resources system.

Related Course

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References

1. Hall, W., and Dracup, J.A., " Water Resources Systems Engineering", McGraw-Hill Book Company
2. Cooper, L., and Cooper, M.W., " Introduction to Dynamic Programming", Pergamon Press
3. Smith, G.N., " Probability and Statistic in Civil Engineering", Collins

SI 7234 Lake Hydrodynamic (Elective, 3 credits)

Course Description

Physical character and flow dynamic in a lake/reservoir. Important parameters in flow dynamic, flow dynamic caused by climate parameters, inflow and outflow.

Related Course

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References

1. Walter H. Graf, and Clifford H. M., "Hydrodynamics of Lakes", Elsevier Scientific Publishing Company
2. Hugo B. F. et al, "Mixing in Inland and Coastal Waters", Academic Press

SI 7235 Water Resource Management Planning (Elective, 3 credits)

Course Description

Planning concept application, budget and economical aspect analysis, multi purpose planning, multi sectors planning, policy and regulation of exploitation and management of water resource. Relationship of technology and society in the procedure of alternatives evaluation towards development in the planning of water resource management.

Related Course

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References

1. Grigg, N.S., "Water Resources Management: Principles, Regulations, and Cases", McGraw-Hill
2. Savenije, H.H.G., "Water Resources Management Concept and Tool", IHE-Delft
3. Grigg, N.S., "Infrastructure Engineering and Management", John Wiley & Sons

SI 7236 Water Resources Decision Support System (Elective, 3 credits)

Course Description

Application of decision support system using scoring, outranking (electre I and II, promethe I and II, analytic hierarchy process, goal programming, expert system, fuzzy based rule, genetic algorithm dan simulated annealing method, artificial neural network in the planning of water resources management.

Related Course

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References

1. Mollaghasemi, M., and Pet-Edwards, J., "Making Multi-Objective Decisions", IEEE Computer Soc. Press
2. Rojas, R., "Neural Network", Spriger
3. Tsoukalas, L.H., and Uhrig, E.R., "Fuzzy and Neural Approaches in Engineering", John Wiley & Sons, Inc.

1.5.2.4 Transportation Engineering

SI 5141 Transport Planning and Modeling (Mandatory, 3 credits)

Course Description

Concerns with transportation planning concept, land use and transportation interaction concept, accessibility and mobility concept, system modeling concept, trip generation/attraction, trip distribution, modal split, trip assignment, transportation demand model based on traffic flow and introduction to transportation modeling software.

Students know about transportation planning concept and system modeling in general and the 4 stages transportation planning model in details. Students have the ability to model the trip demand in the future by using the 4 stages transportation planning model. Students are able to carry out the simulation (using a transportation model software) for predicting the traffic flow movement if some changes occur in the transportation system

Related Courses

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Reference

1. Hay, "An Introduction to Transportation Engineering", John Wiley and Sons, 1977
2. Tamin, O.Z., "Perencanaan dan Pemodelan Transportasi", Edisi ke-1st, Penerbit ITB, 1997
3. Ortuzar & Willumsen, "Modelling Transport", John Wiley, 1990

SI 6141 Analysis of Transportation Engineering (Mandatory, 3 credits)

Course Description

Provides basic understanding in statistics in transportation engineering application, probability theory, statistics parameters, analysis of average value, discrete distribution, continual distribution, hypothesis test, regression analysis, goodness of fit, non parametric statistics, variant analysis, linier programming, convergence algorithm, matrix analysis.

Related Courses

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Reference

1. Kennedy, J.B., Neville, A.M, "Basis Statistical Methods for Engineers and Scientist, (second Edition)", Harper & Row Publishers, New York
2. R. E. Walpote, R. H. Myers, "Probability and Statistics for Engineers and Scientist", Mac Millan Publishing Company, New York
3. Greenshields, B.D., Weida., F.M., "Statistics with Applications to Highway Traffic Analysis Connecticut, Eno Foundation for Transportation.

SI 6142 Computer Programming & Simulation Techniques (Mandatory, 3 credits)

Course Description

Teaches how to develop an algorithm, theory of programming, program architecture design, flow chart, structure of the program, basic theory of simulation, programming simulation, application of simulation in transportation, database understanding, developing database and samples of application program.

Related Courses

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Reference

1. Amrinsyah Nasution, "FORTRAN: Pengenalan Program dan Terapannya", Erlangga, Jakarta
2. Amrinsyah Nasution, Hasan Iskandar, "TURBO PASCAL", Penerbit Erlangga, Jakarta
3. Budi Sutejo, Michael A.N., "Algoritma & Teknik Pemrograman", Penerbit ANDI Yogyakarta

SI 6241 Roadway Engineering (Mandatory, 3 credits)

Course Description

This course consists of 3 parts: road designs, railway design and airway design.

1. Roadway design includes the determination of route and road geometry in the straight and curve part, manual and standard design.
2. Railway design includes loading concept, characteristics of rail mode, Theory of stress on ballast, vehicle aspect, traffic control instruments, railway planning.
3. Airway design includes airway geometric, runway geometric and pavement design.

Related Courses

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Reference

1. Departemen Pekerjaan Umum, Direktorat Jendral Bina Marga, "Tatacara Perencanaan Jalan Antar Kota", Jalan No. 038/T/BM/1997, September 1997
2. Paquette, Ashford, Wright, "Transportation Engineering, Planning and Design", John Willey & Sons
3. AASHTO, "American Association of State Highway and Transportation Officials, 2001, A Policy on Geometric Design", AASHTO

SI 6242 Traffic Engineering (Mandatory, 3 credits)

Course Description

The course is concerned with traffic flow theory, capacity concept and level of service, survey methods, road equipments and environmental aspect.

Related Courses

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Reference

1. Webster, F.V. and Cobbe, B.M., "Traffic Signals, Road Research Technical Paper No.56", Her Majesty's Stationery Office, London
2. Transportation Research Board, "Highway Capacity Manual", Washington, DC. TRB, Highway Capacity Manual. Spec
3. McShane, W.R. and Roess, R.P., "Traffic Engineering", Prentice Hall, New Jersey

SI 6243 Transport Economics (Mandatory, 3 credits)

Course Description

Covers the definition and the meaning of investment, plan, program, project, distinction between economics and financial analysis, demand/supply curve, cost concept, unit cost, development cost, maintenance cost, operation cost, type of investment benefit, benefit measuring approach, benefit conversion, producer surplus concept, consumer surplus, vehicle operation cost, money value, interest, discount rate, time value, investment criteria, cost-benefit analysis, net present value, internal rate of return, break event, ranking and priority, introduction to multi-criteria analysis and case examples.

Related Courses

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Reference

1. Button, K.J, "Transport Economics", Heineimann, London, Edisi Pertama
2. Bannister, D, "Transport Appraisal"

SI 7141 Group Project (Mandatory, 3 credits)

Course Description

1. This course is an activity of using the knowledge that has been obtained in course and then applies to a real project.
2. This course trained the students to have the activity start from the beginning of a work, data gathering, data analysis and designing, evaluation and conclusion and suggestion to the work that has been done.
3. Students are obliged to create report which consists of introduction report, data report and its gathering, data analysis report and the solution to work problem and conclusion and suggestion.
4. Students ought to present each report.

Related Courses

1. SI6241 Roadway Engineering, Prerequisites
2. SI6242 Traffic Engineering, Prerequisites
3. SI6243 Transport Economics, Prerequisites

Reference

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SI 70Z1 Research and Thesis (Mandatory, 6 credits)

Course Description

Improve academic abilities, supplies the students with analysis and synthesis capability, as well as directing and supplying the students to be independent in performing activity research and technical report writings.

Related Courses

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References

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SI 5241 Structure and Pavement Material Engineering (Elective, 3 credits)

Course Description

Teaches the analysis of stress and strain in pavement structure, analytical method in pavement structure design, analysis of traffic load and its influence to pavement structure, advanced pavement material and its analysis method, introduction to computer software for pavement structure evaluation.

Students have the knowledge and comprehension concerning various alternative methods pavement design, element and material which are used for the construction of road transportation infrastructure together with its supporting equipment.

Related Courses

1. SI3141 Transportation Engineering I, Prerequisites
2. SI3241 Transportation Engineering II, Prerequisites

Reference

1. Collis, L., and Fox, R.A., "Aggregate: Sand, Gravel, and Crushed Rock Aggregate for Construction Purposes", The Geological Society, London, 1985
2. Hwang, Y.H., "Pavement Analysis and Design", The 2nd edition, Prentice Hall, USA, 2004
3. Shell Bitumen, "The Shell Bitumen Handbook", National Research Council, Washington D.C., USA, 1990,

SI 6143 Network Theory and Analysis (Elective, 3 credits)

Course Description

Introduces the definition of graph, notation and the using of graph, node, link and arch, degree, isomorphism, types of graph, subgraph, complement, trajectory and circuit. Euler's and Hamilton's trajectory and circuit, Traveling Salesman Problem. Tree, directed tree, m-ary tree, binary-seeking tree, prefix code, stretch-out tree, minimum stretch-out tree. Minimum stretch-out tree algorithm: Prim, Kruskal and Fusi. Algorithm in the shortest trajectory between knots (Alg. Dijkstra), network analysis, system optimal and user equilibrium concept, mathematics formulation of user equilibrium concept and system optimal. Network control theory, marginal cost concept. Algorithm in seeking user equilibrium solution (Alg. Frank-Wolfe) and transportation network computer software.

Related Courses

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Reference

1. Narsingh Deo, "Graph Theory with Applications to Engineering and Computer Science", Prentice Hall
2. Sheffi, Y., "Transportation Network Equilibrium", Wiley

SI 7142 Transportation Infrastructure Management System (Elective, 3 credits)

Course Description

Provides the comprehension regarding transportation problems, alternative of traffic management techniques, traffic infrastructure management for various modes and strategy evaluation.

Related Courses

1. SI6141 Transportation Engineering Analysis, Prerequisites
2. SI6143 Link Theory and Analysis, Prerequisites
3. SI6241 Linkway Engineering, Prerequisites
4. SI6242 Traffic Engineering, Prerequisites

Reference

1. Hay, "An Introduction to Transportation Engineering", John Wiley & Sons,
2. Robinson, R., Danielson, U., Snaith, M, "Road Maintenance Management Concept and System", Mac Millan Press Ltd., London
3. Underwood, R.T, "Traffic Management", Hargreen, Melbourne

SI 6244 Transportation Planning and Policy (Elective, 3 credits)

Course Description

Introduces the scope and boundaries of transport planning and policy, determination of transportation cost, funding and fare.

Related Courses

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Reference

1. Kanafani, A., "Transport Demand Analysis", McGraw-Hill
2. Manheim, M.L, "Fundamentals of Transportation System Analysis, Vol. 1: Basic Concept", MIT Press
3. Meyer, M.D., Miller, E.S., "Urban Transportation Planning: a Decision Oriented Approach", McGraw-Hill

SI 7143 Public Transportation System (Elective, 3 credits)

Course Description

Covers the general description regarding public transportation system, including the classification of means and infrastructure as well as determining the demand, network planning, bus stops, terminals and operation system, economic analysis, financial and determination of public transportation system method, institutional aspect, system development and performance aspect.

Related Courses

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References

1. Vuchic, "Urban Public Transportation", Prentice Hall
2. White, "Public Transport", UCL Pers
3. Gray & Hoel, " Public Transportation", Prentice Hall

SI 6245 Terminal Engineering (Elective, 3 credits)

Course Description

Introduces the types and function of terminal, function of terminal element, properties of pedestrian flow, pedestrian speed and density, level of service, passenger queue, waiting room capacity, entrance escalator and all the entries inside the terminal; ticketing system; general description, ticketing system, ticket-window system, token, service time; parking definition, parking pattern, parking characteristics, parking area capacity, shuttle service, parking building, various types of bus terminal in the city, infrastructures for bus terminal in the city, infrastructures for terminal, terminal layout system, operation system and flow control (vehicle, people and goods) in the terminal, regulation of in/out terminal flow with the surroundings, terminal capacity, bus bay capacity, queue, rail train terminal: characteristics of train in the urban and inter-urban, infrastructure for rail terminal, rail terminal lay out system, mode change system, operation system from terminal control, organizing the flow of people and goods, queue, evacuation system, park and ride, truck terminal, ship terminal, air terminal.

Related Courses

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Reference

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SI 7144 Transportation Infrastructure Construction Method (Elective, 3 credits)

Course Description

Introduces the stages, principles and the execution method of transportation infrastructure development, which includes highway, harbor, airport and railway. The stages are: contracting, equipment and work force mobilization, preparation; staking out, site cleaning and demolition, earth works, cover dam construction, digging and reclamation, dock construction, highway pavement construction, airport runway construction, dock and piling field; and railway construction.

Related Courses

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Reference

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SI 6246 Geotechnics (Elective, 3 credits)

Course Description

Reviews the engineering properties of soil, includes soil mechanics science in general, type of soil, soil classification, tropical soil, clay, soft soil, permeability, surface drainage and sub-surface drainage, compaction, CBR, UCS and slope stability, foundation and stability.

Related Courses

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Reference

1. AASHTO, "Standard Specifications for Transport Material and Method of Sampling and Testing", Washington D. C.
2. Krebs, R. D. and Walker, R. D., "Highway Material", McGraw-Hill Book Company, New York
3. Bowles, J.E., "Physical and Geotechnical Properties of Soil", McGraw-Hill Book Company, New York.

SI 7145 Environmental Impact and Safety Analysis (Elective, 3 credits)

Course Description

Provides basic understanding concerning environmental parameters, noise, vibration, air-pollution by transportation, impact of traffic load, impact of slope-cutting, expansion of quarry; blasting impact, impact which is related with air, social and culture, attempts to reduce pollution, reviews of existing or proposed laws, which influence the project development and construction, land acquisition, safety and traffic impact in transportation engineering, accident analysis and determination of environmental impact boundaries.

Related Courses

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References

1. Peraturan Pemerintah RI. No. 29 tahun 1986, " Analisis Mengenai Dampak Lingkungan", Kantor Menteri Negara Kependudukan dan Lingkungan
2. TRRL, "Towards Safer Roads in Developing Countries, A Guide for Planners and Engineers", Transport and Road Research Laboratory & Overseas
3. Undang-undang RI No. tahun 1982, "Ketentuan-ketentuan Pokok Pengelolaan Lingkungan Hidup", Kantor Menteri Negara Kependudukan dan Lingkungan

1.5.2.5 Construction Management and Engineering

SI 5151 Construction Cost Estimation (Elective, 3 credits)

Course Description

This course covers cost estimation methods in various stages of construction work planning/design. These estimation methods include: conceptual, parametric, detailed, bid, and range estimating. Computer applications for cost estimation utilizing commercial software are also introduced. Through this course the students are expected to acquire the basic knowledge in cost estimation for design and construction purposes, and the skill to estimate the cost of construction work for bidding and cost control purposes.

Related Courses:

SI4151 Method and Construction Equipment, Prerequisites
S14251 Engineering Economic, Co-requisites

References

1. Peurifoy and Oberlender, "Estimating Construction Cost", Edisi ke 2-th, McGraw Hill, 2002
2. Cobb and Elliot, ed., "Cost Estimating: Concepts and Approaches", AACE, 1989
3. Ostwald, P.F., "Engineering Cost Estimating", Edisi ke-3rd, Prentice Hall, 1992

SI 5152 Project Planning and Control System (Elective, 3 credits)

Course Description

This course covers construction project planning and control aspects which include work budgeting, scheduling and progress measurement. The materials consist of project planning in various stages by applying several planning methods (strategic planning, SWOT analysis) and scheduling methods (bar chart, AOA, AON, linear scheduling, PERT), resources scheduling, and schedule – cost integration (CSCS/C), and computer applications in construction project management.

The objective of this course is that students will have the basic capability to analyze and plan construction project control system which include cost and schedule aspects in an integrated manner.

Related Courses:

1. SI3251 Construction Management, Prerequisites

References

1. Ahuja, Dozzi, and Abourizk, "Project Management: Techniques in Planning and Controlling Construction Projects, 2nd Ed", Edisi ke 2-nd, John Wiley, 1994
2. G. Oberlender, "Project Management for Engineering and Construction", Edisi ke-2nd, McGraw Hill, 2000
3. Callahan, Quackenbush & Rowing, "Construction Project Scheduling", McGraw Hill, 1992

SI 6151 Construction Business Management (Mandatory, 3 credits)

Course Description

This course covers the basic concept of construction business preparation, management, and development which includes various aspects of business management (business target, organization, human resources, capital and finance, marketing, business world regulations and policy, business climate, business collaboration) in various types of construction business (contractors, consultants).

Related Courses

1. SI3251 Construction Management, Prerequisites

References

1. Volpe and Volpe, "Construction Business Management", John Wiley, 1992
2. Lavender, S., "Management for the Construction Industry", Longman.
3. Stewart and Stewart, "Proposal Preparation, 2nd Ed", John Wiley

SI 5251 Legal Aspects and Contract Management (Elective, 3 credits)

Course Description

This course covers legal and contractual concept and aspects for construction projects. The materials consist of various direct and indirect legal and contractual aspects on the practices of procurement and contract management as well as contract development and management strategy (contract planning, contract formation, contract administration and contract auditing) for construction projects. Through this course students are expected to know and be able to develop legal and contractual aspects concept in contract development and management strategy for construction and infrastructure projects on all stages.

Related Courses:

1. SI3251 Construction Management, Prerequisites
2. SI6251 Management Financial Construction, Co-requisite

References

1. Hinze, "Construction Contracts.", Mc Graw, 1993
2. Meyer, M., Baber, R. and Pfaffenberger, B., "Computers in Your Future", Prentice Hall, 1999
3. Jackson, M.J., "Computers in Construction Planning and Control", Allen & Anwin, 1986

SI 6251 Construction Financial Management (Mandatory, 3 credits)

Course Description

This course covers the basic concept and techniques of cost control (earned value, SCSC/C, variance analysis) and financial accounting concept application which includes cost accounting basics, financial accounting in construction companies and projects. Assignments on cost control using commercial softwares are also given.

Related Courses

1. SI5151 Construction Cost Estimation, Prerequisited

References

1. Coombs, and Palmer “Construction Accounting and Financial Management”, 4th edition, McGraw Hill.
2. Hilton, Maher and Selto, “Cost Management: Strategies for Business Deisions”, McGraw Hill Int.
3. Jennings, A.R., “Accounting and Finance for Building and Surveying”, Macmillan Press

SI 6252 Applied Statistic

Course Description

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Related Courses

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References

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SI 70Z1 Research and Thesis (Mandatory, 6 credits)

Course Description

Improve academic abilities, supplies the students with analysis and synthesis capability, as well as directing and supplying the students to be independent in performing activity research and technical report writings.

Related Courses

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References

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SI 5252 Computer Applications in Construction (Elective, 3 credits)

Course Description

This course covers the knowledge on computer technology application in construction management and engineering, such as: significance of computer technology in construction activities, computer hardware and software technology, internet technology, CAD, cost estimation, project management, database integration, spreadsheet, simulation, programming language, and information system for owners, contractors, and construction managers.

The materials include knowledge on computer technology capability, hardware and software, and other related technologies which could be applied to support construction management and engineering activities. Through this course the students are expected to be able to design a computer application prototype that is relevant with construction activities.

Related Courses

1. SI3251 Construction Management, Prerequisites

References

1. Paulson, Jr., B.C., "Computer Application in Construction", McGraw Hill, 1995
2. Meyer, M., Baber, R. and Pfaffenberger, B., "Computers in Your Future", Prentice Hall, 1999
3. Jackson, M.J., "Computers in Construction Planning and Control", Allen & Anwin, 1986

SI 6152 Productivity and Quality Improvement in Construction (Elective, 3 credits)

Course Description

This course covers the concept and functions of planning, quality and productivity control and improvement in industry and construction activities; which include analysis of various concepts and applications of quality and productivity control and improvement.

Related Courses

1. SI6252 Applied Statistics, Prerequisites

References

1. Edosowman, J.A "Productivity and Quality Improvement", Springer Verlag
2. Ishikawa "Guide to Quality Control", Asian Productivity Organization.
3. Kubal, M.T"Engineered Quality in Construction Partnering and TQM", McGraw Hill

SI 7151 Risk Management in Construction (Elective, 3 credits)

Course Description

This course is designed to develop knowledge of students on the risks related to all aspects of uncertainty in the construction industry and to develop students' capability in state of the art techniques and methods applied in handling the risks in a construction project in terms of risk identification, analysis and management alternatives; offering risk management criteria according to analysis of people's attitude towards an uncertain condition.

Related Courses

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References

1. Eeckhoudt, L., and Gollier, C., "Risk, Evaluation, Management and Sharing•", Ediscience International
2. Flanagan, R., and Norman, G., "Risk Management and Construction•", Blackwell Science
3. Chapman, C., and Ward, S., "Project Risk Management and Processes•", Techniques and Insights, Wiley

SI 7251 Human Resources Management in Construction Industry (Elective, 3 credits)

Course Description

This course covers various aspects of human resources management in the construction industry (company, project). The scope of this course include human resources management in construction projects, recruitment, selection, orientation, training, and human resources development, motivation, directing, information and communication system, leadership, team work development in a construction project, conflict management, industrial work relationship, labor based construction activity.

Related Courses

SI6151 Construction Business Management, Prerequisites

References

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SI 6153 Advanced Construction Technologies (Elective, 3 credits)

Course Description

This course covers various technologies applied in construction processes that provide added value to their quality, efficiency, effectiveness and productivity. Construction technology includes equipment, material, software, and method. The construction technology covered in this course consists of soil improvement, foundation, super structure and its components' technology applied in the construction of various types of structures such as buildings, bridges, harbors, roads, etc. This course explores the need to apply a certain technology, the description of the technology and the supporting and related technologies, the required resources, the benefits and limitations of the technology, and an application example in a real project. At the end of this course the students are expected to be able to individually explore their chosen construction technology which could be an individual project topic of this course.

Related Courses

1. SI3251 Construction Management, Prerequisites
2. SI4151 Construction Method and Equipment, Prerequisites

References

1. Smith, R.C., and Andres, C.K., "Material of Construction", McGraw Hill
2. Antill, J.M, Ryan, P.W.S, and Easton, G.R "Civil Engineering Construction", McGraw Hill
3. Harris, F., "Modern Construction Equipment and Method", Longman Scientific & Technical

SI 6253 Design & Analysis of Construction Operations (Elective, 3 credits)

Course Description

This course explores the processes and techniques applied in the management of construction activities in field operations. This course covers construction processes and the supporting technology, design process and the aspects to be considered in order to improve productivity. Operation activities modeling techniques such as line of balance technique, queuing theory, CYCLONE, and simulation to analyze an operation activity are given. At the end of this course the students have to complete a major individual assignment to show their ability to design and analyze a certain construction operation.

Related Courses

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References

1. Halpin, D.W, and Riggs, L.S., "Planning and Analysis of Construction Operations•", John Wiley & Sons
2. Oglesby, C.H., Parker, H.W., and Howell, G.A., "Productivity Improvement in Construction•", McGraw Hill -

SI 7051 Special Topic in Construction Management and Engineering (Elective, 3 credits)

Course Description

This course covers an analysis of various important and contemporary aspects/issues, domestic and international, currently faced in construction management and/or engineering and technology.

Related Courses

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References

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SI 7162 Infrastructure Management Information System (Elective, 3 credits)

Course Description

This course covers the essence of management information system; management information system components; success and failure factors of an information system; application of information system in infrastructure; Pavement Management system (PMS), Bridge Management System (BMS); analysis of information technology: database, GIS, expert system; infrastructure management information system design: data and information needs identification, system design, data analysis technique, priority setting, hardware, software, model verification; system implementation: system procurement, training, operation and maintenance, system assessment and evaluation.

Related Courses

1. SI6262 Infrastructure Condition Assessment & Evaluation, Prerequisites
2. SI6263 Infrastructure Maintenance & Rehabilitation, Prerequisites

References

1. Burch, J.G., and Strater, F.R., "Information Systems: Theory and Practice", Wiley & Sons Inc., USA.
2. EasyCase, "Methodology Guide (Version 4.0).",
3. Haas, R., and Hudson, W.R., "Pavement Management Systems", McGraw-Hill Inc., USA

SI 6161 Infrastructure Management (Elective, 3 credits)

Course Description

This course covers the processes and techniques applied in the management of infrastructures such as transportation facilities or buildings in general. This course does not cover every aspect of infrastructure management in depth, but rather in a general manner.

Related Courses

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References

1. Hudson, Haas, R., Uddin "Infrastructure Management", McGraw Hill Company
2. Griggs, N.S, "Infrastructure Engineeringt and Management", John Wiley & Sons

SI 7152 Construction Decision under Uncertainty (Elective, 3 credits)

Course Description

This course covers the functions and applications of uncertainty concept in relation to the decision making in various construction engineering activities.

Related Courses

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References

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1.2.5.6 Infrastructure Engineering and Management

SI 6161 Infrastructure Management (Elective, 3 credits)

Course Description

This course covers the processes and techniques applied in the management of infrastructures such as transportation facilities or buildings in general. This course does not cover every aspect of infrastructure management in depth, but rather in a general manner.

Related Courses

1. -

References

1. Hudson, Haas, R., Uddin "Infrastructure Management", McGraw Hill Company
2. Griggs, N.S, "Infrastructure Engineeringt and Management", John Wiley & Sons

SI 6162 Decision Analysis (Mandatory, 3 credits)

Course Description

This course covers the concept of system modeling, decision modeling: elements of decision making, decision structuring (influence diagram, decision tree), sensitivity analysis; uncertainty modeling: probability basics, subjective probability, data utilization, simulation: preference modeling: risk attitudes, utility; non mathematical models (AHP, Delphi).

Related Courses

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References

1. De Neufville, R., "Applied Systems Analysis•.",
2. Devore, "Probability and Statistics for Engineering and the Sciences, 5th Ed. •", Duxburry
3. Clemen, R.T, "Making Hard Decisions•", PWS-Kent Publishing Company.

SI 6163 Infrastructure Feasibility Study and Financing (Mandatory, 3 credits)

Course Description

This course covers project characteristics and stages, scope and context, value of money, cost-profit analysis, project cost, project benefit, value of time vehicle operating cost, consumer & producer surplus, multi criteria analysis, investment and financing planning (public, private), risk management, case examples and assignments.

Related Courses

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References

1. Heggie, I.G, "Transport Engineering Economics", McGraw Hill.
2. Fiscus, "Pricing and Financing of Urban Mobility"
3. Winfrey, R., "Economic Analysis for Highway", International Textbook Company.

SI 6261 Operational Management of Infrastructure (Mandatory, 3 credits)

Course Description

This course covers the various aspects of infrastructure facilities operational management for public services, such as terminals, airports, harbors, dams, toll roads, drinking and waste water and other infrastructure facilities. The topics consists of material input procurement, human resources, equipment, processing or operations and service, as well as distribution of goods and services to the public as users.

Related Courses

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References

1. Knod, E.M., & Schonberger, R.J., "Operation Management: Meeting Consumer Demands", 7th Ed. McGraw Hill.

**SI 6262 Assessment and Evaluation of Infrastructure Condition
(Mandatory, 3 credits)**

Course Description

This course covers monitoring and evaluation processes which include types of infrastructure evaluation, user, functional, and physical evaluation; monitoring technology; physical evaluation technology: non destructive test and destructive test, performance modeling and infrastructure failure analysis, investigation planning; inspection process; data acquisition, inspection results analysis; interpretation of evaluation results; infrastructure monitoring and evaluation system application, Building Control System, Post Occupancy Evaluation, Bridge Management System.

Related Courses

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References

1. Ted Kay, "Assessment & Renovation of Concrete Structure", Penerbit Logman Scientific & Technical
2. V.K. Raina, "Concrete Briggess.",
3. ASCE, "Existing Sewer Evaluation and Rehabilitation", 2nd edition, WEF Manual of Practice FD-6, ASCE Manual and Report

SI 6263 Infrastructure Maintenance and Rehabilitation (Mandatory, 3 credits)

Course Description

This course covers infrastructure life cycle concept; infrastructure deterioration process; maintenance, repair, and replacement definition; infrastructure maintenance management, maintainability concept, reliability centered maintenance concept, maintenance program planning; maintenance and operation interaction, maintenance and repair techniques of concrete, steel and pavement construction; protection.

Related Courses

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References

1. Ted Kay, "Assessment & Renovation of Concrete Structure", Penerbit Logman Scientific & Technical
2. P. Kumar Mehta, "Concrete in The Marine Environment", Penerbit Elsevier Applied Science
3. V.K. Raina, "Concrete Briggess.",

SI 70Z1 Research and Thesis (Mandatory, 6 credits)

Course Description

Improve academic abilities, supplies the students with analysis and synthesis capability, as well as directing and supplying the students to be independent in performing activity research and technical report writings.

Related Courses

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References

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SI 5152 Project Planning and Control System (Elective, 3 credits)

Course Description

This course covers construction project planning and control aspects which include work budgeting, scheduling and progress measurement. The materials consist of project planning in various stages by applying several planning methods (strategic planning, SWOT analysis) and scheduling methods (bar chart, AOA, AON, linear scheduling, PERT), resources scheduling, and schedule – cost integration (CSCS/C), and computer applications in construction project management.

The objective of this course is that students will have the basic capability to analyze and plan construction project control system which include cost and schedule aspects in an integrated manner.

Related Courses:

1. SI3251 Construction Management, Prerequisites

References

1. Ahuja, Dozzi, and Abourizk, “Project Management: Techniques in Planning and Controlling Construction Projects”, 2nd edition, John Wiley, 1994
2. G. Oberlender, “Project Management for Engineering and Construction”, 2nd edition,, McGraw Hill, 2000
3. Callahan, Quackenbush & Rowing, “Construction Project Scheduling”, McGraw Hill, 1992

SI 5251 Legal Aspects and Contract Management (Elective, 3 credits)

Course Description

This course covers legal and contractual concept and aspects for construction projects. The materials consist of various direct and indirect legal and contractual aspects on the practices of procurement and contract management as well as contract development and management strategy (contract planning, contract formation, contract administration and contract auditing) for construction projects. Through this course students are expected to know and be able to develop legal and contractual aspects concept in contract development and management strategy for construction and infrastructure projects on all stages.

Related Courses:

1. SI3251 Construction Management, Prerequisited
2. SI6251 Management Financial Construction, Co-requisite

References

1. Hinze, "Construction Contracts.", Mc Graw, 1993
2. Meyer, M., Baber, R. and Pfaffenberger, B., "Computers in Your Future", Prentice Hall, 1999
3. Jackson, M.J., "Computers in Construction Planning and Control", Allen & Anwin, 1986

SI 7151 Risk Management in Construction (Elective, 3 credits)

Course Description

This course is designed to develop knowledge of students on the risks related to all aspects of uncertainty in the construction industry and to develop students' capability in state of the art techniques and methods applied in handling the risks in a construction project in terms of risk identification, analysis and management alternatives; offering risk management criteria according to analysis of people's attitude towards an uncertain condition.

Related Courses

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References

1. Eeckhoudt, L., and Gollier, C., "Risk, Evaluation, Management and Sharing•", Ediscience International
2. Flanagan, R., and Norman, G., "Risk Management and Construction•", Blackwell Science
3. Chapman, C., and Ward, S., "Project Risk Management and Processes•", Techniques and Insights, Wiley

SI 7261 Hazard Mitigation in Infrastructure (Elective, 3 credits)

Course Description

Related Courses

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References

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SI 5131 Dams and Water Power (Elective, 3 credits)

Course Description

Civil engineering aspect in the design of dam: type, function and capacity of dam; measurement method and data analysis; site determination, planning and hydraulic design of primary structure and supporting structure, operational and safety aspects.

Related Courses

1. SI2131 Fluid Mechanics and Hydraulics, Prerequisites

References

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SI 6221 Soil Improvement (Elective, 3 credits)

Course Description

Soil and site problems, soil origin and composition, clay-water system, clay soil behavior, expansive soils and treatment, soil erodibility and soil loss prediction, methods of ground improvement: Mechanics (rollers, compaction, vibration); Supports: shotcrete, anchors; surcharge, vertical drain; chemical stabilization: cement, lime, cement-lime mixture; Biotechnical measures; erosion control principles, methods, and procedures, biotechnical stabilization.

Related Courses

1. SI 2221 Soil Mechanics I, Prerequisites
2. SI 3121 Soil Mechanics II, Prerequisites
3. SI 3221 Foundation Engineering, Prerequisites

References

1. Bell, E. F. G., "Methods of Treatment of Unstable Soils", Balkema, Rotterdam, Netherland, 1975
2. Mitchell, J. K., "Fundamentals of Soil Behavior" 3rd edition, John Wiley & Sons, New York, 2005
3. Lambe, T. W. and Whitman, R. V., "Soil Mechanics, SI Version", John Wiley & Sons, 1979

SI 7161 Special Topics in Infrastructure Engineering and Management (Elective, 3 credits)

Course Description

This course covers an analysis of various important and contemporary aspects/issues, domestic and international, currently faced in infrastructure engineering and management.

Related Courses

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References

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KL 5201 Ocean Zone Management (Elective, 3 credits)

Course Description

Concepts of coastal zone management and development.

Prerequisite

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References

1. B. Cicin-Sain and R. W. Knecht, Integrated Coastal and Ocean Management Concepts and Practices, Island Press, 1998

SI 6151 Construction Business Management (Mandatory, 3 credits)

Course Description

This course covers the basic concept of construction business preparation, management, and development which includes various aspects of business management (business target, organization, human resources, capital and finance, marketing, business world regulations and policy, business climate, business collaboration) in various types of construction business (contractors, consultants).

Related Courses

1. SI3251 Construction Management, Prerequisited

References

1. Volpe and Volpe, "Construction Business Management", John Wiley, 1992
2. Lavender, S "Management for the Construction Industry", Longman.
3. Stewart and Stewart, "Proposal Preparation, 2nd Ed", John Wiley

SI 7162 Infrastructure Management Information System (Elective, 3 credits)

Course Description

This course covers the essence of management information system; management information system components; success and failure factors of an information system; application of information system in infrastructure; Pavement Management system (PMS), Bridge Management System (BMS); analysis of information technology: database, GIS, expert system; infrastructure management information system design: data and information needs identification, system design, data analysis technique, priority setting, hardware, software, model verification; system implementation: system procurement, training, operation and maintenance, system assessment and evaluation.

Related Courses

1. SI6262 Infrastructure Condition Assessment & Evaluation, Prerequisites
2. SI6263 Infrastructure Maintenance & Rehabilitation, Prerequisites

References

1. Burch, J.G., and Strater, F.R., "Information Systems: Theory and Practice", Wiley & Sons Inc., USA.
2. EasyCase, "Methodology Guide (Version 4.0).",
3. Haas, R., and Hudson, W.R., "Pavement Management Systems", McGraw-Hill Inc., USA

SI 6152 Productivity and Quality Improvement in Construction (Elective, 3 credits)

Course Description

This course covers the concept and functions of planning, quality and productivity control and improvement in industry and construction activities; which include analysis of various concepts and applications of quality and productivity control and improvement.

Related Courses

1. SI6252 Applied Statistics, Prerequisites

References

1. Edosowman, J.A "Productivity and Quality Improvement", Springer Verlag
2. Ishikawa "Guide to Quality Control", Asian Productivity Organization.
3. Kubal, M.T "Engineered Quality in Construction Partnering and TQM", McGraw Hill

SI 6251 Construction Financial Management (Mandatory, 3 credits)

Course Description

This course covers the basic concept and techniques of cost control (earned value, SCSC/C, variance analysis) and financial accounting concept application which includes cost accounting basics, financial accounting in construction companies and projects. Assignments on cost control using commercial softwares are also given.

Related Courses

1. SI5151 Construction Cost Estimation, Prerequisites

References

1. Coombs, and Palmer "Construction Accounting and Financial Management", 4th edition, McGraw Hill.
2. Hilton, Maher and Selto, "Cost Management: Strategies for Business Deisions", McGraw Hill Int.
3. Jennings, A.R., "Accounting and Finance for Building and Surveying", Macmillan Press

SI 7143 Public Transportation System (Elective, 3 credits)

Course Description

Covers the general description regarding public transportation system, including the classification of means and infrastructure as well as determining the demand, network planning, bus stops, terminals and operation system, economic analysis, financial and determination of public transportation system method, institutional aspect, system development and performance aspect.

Related Courses

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References

1. Vuchic, "Urban Public Transportation", Prentice Hall
2. White, "Public Transport", UCL Pers
3. Gray & Hoel, "Public Transportation", Prentice Hall

SI 6112 Advanced Concrete Technology (Elective, 3 credits)

Course Description

Physical, mechanical and chemical properties of concrete and its materials including material, correlation of concrete composition and its performance, admixtures, high strength concrete, repair and rehabilitation of components of concrete structures.

Related Courses

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References

1. Neville, A.M., "Concrete Technology",
2. Kevin L. Rens, "Forensic Engineering"
3. Ted Kay, "Assessment & Renovation of Concrete Structure."

SI 6264 Environment Management (Elective, 3 credits)

Course Description

This course covers man and environment interaction, environment issues, environment regulations, environment quality standard, air environment management, water quality management, solid waste and Management, noise, health and safety, environment impact analysis, economic considerations, and environment audit.

Related Courses

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References

1. McGraw-Hill, Singapore, "Introduction to Environmental Engineering•", Davis, M.L. and Cornwell, D.A.
2. Holmes, G. et.al., "Environmental Management & Technology•", John Wiley & Sons. Inc., USA

SI 7145 Environmental Impact and Safety Analysis (Elective, 3 credits)

Course Description

Provides basic understanding concerning environmental parameters, noise, vibration, air-pollution by transportation, impact of traffic load, impact of slope-cutting, expansion of quarry; blasting impact, impact which is related with air, social and culture, attempts to reduce pollution, reviews of existing or proposed laws, which influence the project development and construction, land acquisition, safety and traffic impact in transportation engineering, accident analysis and determination of environmental impact boundaries.

Related Courses

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References

1. Peraturan Pemerintah RI. No. 29 tahun 1986, " Analisis Mengenai Dampak Lingkungan", Kantor Menteri Negara Kependudukan dan Lingkungan
2. TRRL, "Towards Safer Roads in Developing Countries, A Guide for Planners and Engineers", Transport and Road Research Laboratory & Overseas
3. Undang-undang RI No. tahun 1982, "Ketentuan-ketentuan Pokok Pengelolaan Lingkungan Hidup", Kantor Menteri Negara Kependudukan dan Lingkungan