

1.5.3 Doctor Program

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

Course Description

Related Courses

References

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 matress 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 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

1. According to topic.
2. ASCE Journals.
3. AACE Journals.

SI 7071 Special Topics in Ocean Engineering (Elective, 3 credits)

Course Description

Related Courses

References

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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 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 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 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.

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 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 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. Journal 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 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", Diklat 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 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 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 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 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 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 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 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

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 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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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 7211 Earthquake Engineering (Mandatory, 3 credits)

Course Description

Related Courses

References

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 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 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 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 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 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-requisites

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 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 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.

**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

SI 8001 Seminar on Elective Topics (Mandatory, 3 credits)

Provides an opportunity for students to conduct preliminary research on a specific subject with supervision from lecturers/staffs.

Prerequisites

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References

Related to the specific topic chosen

SI 8002 Preparation of Research Proposal (Mandatory, 6 credits)

Each student is required to prepare a research proposal for the Doctoral program.

Prerequisites

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References

Related to the specific topic chosen

SI 8111 Advanced Continuum Mechanics (Elective, 3 credits)

Course Description

Materials covered include: theory of material behavior, Helmholtz free energy concept, non-Newtonian mechanics, Beatty hypothesis, hypoelastic materials, hyperelastic materials, Hadamard materials, pseudoplanar motion.

Prerequisites

1. SI7214 Continuum Mechanics

References

1. Malvern, L.E., "Introduction to the Mechanics of a Continuous Media", Prentice-Hall, Eaglewood Cliffs, N.J., 1969
2. Muller, "Homology and Constitutive Problems in Continuous Media".
3. Flugge, "Handbook der Physics".

SI 8112 Viscoelasticity (Elective, 3 credits)

Course Description

Materials covered include: linear theory of solid body and viscoelastic fluid, solving problems using transformation techniques, wave propagation, thermoviscoelasticity.

Prerequisites

1. SI7214 Continuum Mechanics

References

1. Christensen, R.M., "Theory of Viscoelasticity, and Introduction", Academic Press, N.Y., 1971

SI 8211 Advanced Finite Element Method (Elective, 3 credits)

Course Description

Materials covered include: basic theory, elements in 2D and 3D problems, topics in structural mechanics, plate bending, shells, dynamics and vibration, stress stiffening, buckling, heat conduction, problems in fluid, nonlinear geometry and materials, error analysis, convergency, adaptive methods.

Prerequisites

1. SI6211 Finite Element Method

References

1. Cook, R.D., et.al., "Concept and Applications of Finite Element Analysis", 4th Ed., John-Wiley & Sons, 2001.
2. Bathe, K.J., "Finite Element Procedures in Engineering Analysis", Prentice Hall, 1995
3. Zienkiewics, O.C., "The Finite Element Method", McGraw-Hill, 2000.

SI 8212 Elastic Wave Propagation (Elective, 3 credits)

Course Description

Materials covered include: spectral analysis, Fast-Fourier Transform, wave motion, beams and plates, semi-infinite media, Rayleigh, Lamb and Love waves, dispersive wave, approximation techniques.

Prerequisites

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References

1. Doyle, J.F., "Wave Propagation in Structures", Springer Verlag, 1989.
2. Elmore, W.C., Heald, M.A., "Physics of Waves", 1969.

SI 8121 Soil Constitutive Laws In Geotechnical Engineering (Elective, 3 credits)

Course Description

Basic concepts of soil elasticity; Continuum soil mechanics; Non-linear behaviors of soil; laboratory test data evaluation; soil constitutive models based on elasticity; hyperbolic soil constitutive model; stress-strain relationship; determination of elastic model parameters; soil constitutive models based on plasticity theory; Mohr-Coulomb; Drucker-Prager; Critical state models: Cam-Clay, Modified Cam-Clay, Cap; Matrix of Soil Constitutive; Soil Parameter calculations; New Developments in Soil Constitutive Models; Advanced Soil Constitutive Models based on Plasticity; Introduction to Stress-Strain-time relationship for Clays; Applications of Soil Modeling in Engineering Practice.

Prerequisites

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References

1. Desai, C. S. and Siriwardane, H. J., "Constitutive Laws for Engineering Materials" Prentice Hall, Inc., Englewood Cliff, N.J., 1984.
2. Chen, W. F. and Baladi, G. Y., "Soil Plasticity Theory and Implementation", Elsevier, Series No. 38, New York, 231 pp., 1985.
3. Chen, W. F. and Saleeb, A. F., "Constitutive Equations for Engineering Materials", Vol. 1 – Elasticity and Modeling, Wiley Interscience, New York., 1982
4. Malvern, L. E., "Introduction to the Mechanics of Continuous Medium" Prentice Hall, Inc., Englewood Cliff, N.J., 1969.