

Kurikulum Bahasa Inggris.
Pengutamaan : Rekayasa Sumberdaya Air
Program Studi : Teknik Sipil FTSL-ITB

SI6131 The Advanced of Fluid Mechanics (Wajib, 3 SKS)

Short Description

Definition and understanding in depth related to type, characteristics, mechanism derived governing equation used for prediction/ analyze of fluid dynamic. The course includes 1. Fluid physic and relation with its flow dinamic 2. about Control Volume, Static, Kinemathic and Dimension Analysis. 3. Introduction to Mechanic in Continue Media 4. momentum equation (Newton II) and Continuity 5. Navier-Stokes Equation 6. Turbulance Characteristic and Concept of Boundary Layer 7. The equation median act and fluctuation fluid schematics 8. Equation act of Reynold tension and Turbulance kinetic energy equation 9. Application of boundary layer concept derivation of differensial Governing Equation of flow equation 10. Application of Navier-Stokes equation to differensial Euler and Bernaulli equation 11. Governing Equation to flow of shallow water 12. Regulator equation for flow of irrevesible long waves 13. Turbulance equation

Related Courses:

1. SI2131 Fluid Mechanic and Hydraulic, Prerequisited
2. SI6101 Engineering Analysis I, Prerequisited

Reference

1. Leo Van Rijn, "*Principles of Fluid Flow and Surface Waves in Rivers, Estuaries, Seas and Ocean*".
2. M. White, Frank., 1999, *Fluid Mechanics*, Fourth Edition, WCB McGraw Hill.
3. M. White, Frank., 1991, *Viscous Fluid Flow*, 2nd Edition, McGraw Hill.
4. Currie, I.G., 1993, *Fundamental Mechanics of Fluids*, 2nd Edition, McGraw Hill.

SI5231 River Engineering (Pilihan, 3 SKS)

Short Description

Characteristics of river hydraulics, morphology and stability, river protection characteristics of river network, classification of river bed, river hydraulic, dynamics of morphology's change, meandering process, prevention and protection of river environment damaged, improvement of river degradation, river normalization, river purpose (navigation, flood control, dll), control structure and river benefit.

Related Courses:

1. SI2131 Fluid Mechanics and Hydraulics, Prerequisites
2. SI2231 Hydrology and Drainage, Prerequisites

Reference

1. Suyono Sosrodarsono., 1994, "*Pengaturan dan Perbaikan Sungai*", Pradnya Paramita
2. Jansen, P.Ph., et.al., 1979, "*Principles of River Engineering*", Pitman, London
3. Third Int. Workshop., 1989, "*Third Int. workshop on Alluvial River Problems*
A.A. Balkema
4. Henderson, F.M., 1966. *Open Channel Flow*, Prentice-Hall.
5. Leopold, L.B., 1994. *A View of the River*, Harvard University Press.
6. Dunne, T., and L.B. Leopold., 1978. *Water in Environmental Planning*.
7. Chang, H.H., 1987, "*Fluvial Processes in River Engineering*", John Wiley & Sons, NY.
8. Hey, R.D, et.al., 1982, "*Gravel-Bed Rivers*", John Wiley.
9. P. Smart and J.G Herbertson, 1992, "*Drainage Design*", Blackie and Son Ltd .

SI5232 Advanced Hydraulic (Pilihan, 3 SKS)

Short Description

Giving definition and basic concept of stream near flat and mass conservation with numerical technique to solve flow equation. Mathematical model 1-D, 2-D and 3-D. Turbulance model, metode of characteristic, some of numerical method to solve current equation, with finite difference method: explicit and implicit topology. numerical scheme for solving flow within 1-Dimension and 2-Dimension equation, al. Lax –Wendroff topology, MacCormack, Abbot-Ionescu, Preissmann, UNO and TVD. Some of splitting technics: ADI, optimal spitting, strang, etc.

Related Courses:

- 1.SI2131 Fluid Mechanics and Hydraulic, Prerequisites
- 2.SI3101 Numeical Method

Reference

1. Abbott, M.B., 1991 , “*Hyroinformatics: Information Technology and the Aquatic environment*”. Avebury Technical Aldershot.
2. Cahyono, M., 2001, “*Catatan Kuliah Hidraulika Lanjut* , ITB.
3. Cunge, J.A., Holly, I.M., & Verwey, A., 1980, “*Practical Aspect of Computational Hydraulics*”. Pitman, London
4. Fox, JA , 1984 . “*Hydraulic Analysis of Unsteady Flow in Pipe Networks* “.
5. Abbot, M.B and Minns, A.W., 1997, “*Computional Hydraulics: Element of the Theory of Free Surface Flows*”, Pitman Publishing Limited, London.
6. Abbot, M.B., and Basco, D.R., 1990, “*Computional Fluid Dynamics*”, John Wiley, New York.

SI6231 Advanced Hydrology Engineering (Wajib, 3 SKS)

Short Description

Hydrologic principles: precipitation, evaporation infiltration rate; Rainfall Runoff Modeling and analysis: hydrograph analysis, unit hydrograph derivation of gage watersheds, S-curve method, hydrograph unit convolution, forward substitution. Conceptual Models: Instantaneous Unit Hydrograph, Linear Models of linear reservoir linear channel, Nash model. Kinematic wave methods for overland flow. Flood Routing: hydrologic reservoir routing: storage indication method, detention basin routing, pools method, Goodrich method. Hydraulic river routing: governing equation, kinematic wave routing, finite difference approximation, Muskingum cunge method. Reliability and Risk Analysis of hydrologic design: Flood plain analysis and flood control application; stochastic hydrologic modeling.

Related Courses:

- 1.SI2102 Statistic analysis and Probability, Prerequisites.
- 2.SI3101 Numerical Method
- 3.SI2131 Fluid Mechanics and Hidraulics, Prerequisites
- 4.SI2231 Hydrology and Drainase Engineering, Prerequisites

Reference

1. Bras, R.I., Rodriguez-Iturbe, I., 1995, *“Random Functions and Hydrology”*, Dover Publications, Inc.
2. Bedient, P.B., 1992, *“Hydrology and Floodplain Analysis”*, Addison-Wesley Publishing Company
3. Chow, V.T., Maidment, D., and Mays, I.W., 1988, *“Applied Hydrology”*, McGraw-Hill.
4. Victor Miguel, 1989, *“Engineering Hydrology, Principles and Practices”*, Prentice-Hall.
5. H. McCuen, Richard, 1998, *“Hydrologic Analysis And Design Second Edition”*, Prentice Hall.
6. Yen, B.C, 1986, *“Stochastic And Risk Analysis In Hydraulic Engineering”*, Water Resources Publications.
7. Duckstein, L., Plate, E.J, 1987, *“Engineering Reliability and Risk in Water Resources”*, Martinus Nijhoff Publishers, Dordrecht, The Netherlands.
8. Jakeman A. J., and I. G. Littlewood and P. G.Whitehead (1990). *“Computation of the Instantaneous Unit Hydrograph and Identifiable Component Flows with Application To Two Small Upland Catchments.”* Journal of Hydrology 117: 275-300

SI5131 Reservoir and Water Power (Pilihan, 3 SKS)

Short Description

Elaborated of civil engineering aspect related to reservoir and water power development : type, purpose and reservoir capacity: method and data aquaition. Dam site location,, planning and hydraulic design reservoir operation Simulation, dam safety, reservoir Operation and maintenance, river runoff power plant.

Related Courses:

1. SI2131 Fluid Mechanic and Hydraulic, Prerequisites.
- 2.SI2231 Hydrology and Drainase Engineering, Prerequisites

Reference

1. USBR,1974, "*Design of Small Dam*",
2. ASCE, 1989, "*Civil Engineering Guidelines for Planning and Designing Hydroelectric Development*",
3. Suyono, 1981, "*Bendungan Tipe Urungan* " , PT. Pradnya Paramita , Jakarta.
4. Jiandong, T., et. all, 1997, "*Mini Hydropower*", John Wiley & Sons Ltd, Baffins Lane, Chichester, West Sussex PO19 1UD,England.

S17131 Hydraulic Physical Model (Pilihan, 3 SKS)

Short Description

Introduction, Idea and principle similaritas, dimension analysis, purpose of physical topology, scale and physical models classification. Distorted and undistorted model, method of scale selection, movable and fixed bed model. Dam physical model, flushing, spillway and river.

Related Courses:

1. SI5232 Advanced Hydraulic, Prerequisite
2. SI5231 River Engineering, Prerequisite

Reference

1. Henderson, F.M.,1966, "*Open Channel Flow* ".Macmillan, New York
2. Barr, D.I.H ., 1983". *A survey Procedures for Dimensional AnalysisInst.*" Jurnal Mechanical Engineering Education, 11 (3), 147-59
3. Novak, P., & Cabelka, 1981, "*Model in Hydraulic Engineering* ", Pitman, London.
4. Sharp, J.J., 1981, "*Hydraulic Modelling*", Butterworths, London.
5. Yalin, M.S., 1971, "*Theory of Hydraulic Models*", London, Macmillan.

SI7132 Water Quality Modeling (Pilihan, 3 SKS)

Short Description

Giving basic concept of physics process modelling, chemistry and biology occurring and reacting water in river, estuary, coastal area, lake and reservoir. Numerical derivation of water quality modelling: differential equation of discent substant transport, analytical solution and numerical solution of substant transport, callibration and verification of the model.

Related Courses:

1. SI5232 Advanced Hydraulic, Prerequisites
2. SI3101 Numerical Method, Prerequisites
3. SI6181 Mathematic

Reference

1. Thomann, R.V. and Mueller, J.A., 1987, "*Principles of Surface Water Quality Modelling and Control*", Harper & Row Publisher
2. Cahyono, "*Permodelan Kualitas Air di Sungai, Muara, Pantai, Danau dan Waduka*", Diktat Kuliah.
3. Olausson, E. and Cato, I., 1980, "*Chemistry and Biogeochemistry of Estuaries*", John Wiley & Sons.
4. Chapra, S.C., 1997, "*Surface Water-Quality Modelling*", McGraw-Hill International.
5. Canale, R.P., 1976, "*Modelling Biochemical Processes in Aquatic Ecosystem*", Ann Arbor Science.

S17232 Erosion and Sediment Transport (Pilihan, 3 SKS)

Short Description:

Definition of characteristic and behavior non-cohesion and cohesion sediment : falling velocity and influence of concentration and salinity, initial movement, bed load transport, bed form and the influence of coarse, suspended load transport. Sediment transport of wave effects. Moveable bed model, erosion and deposition, channel dynamic balancing. Land erosion. Numerical sediment transport.

Related Courses:

1. SI6181 Mathematic
2. SI3101 Numerical Method, Prerequisite
3. SI5232 Advanced Hydraulic, Corequisit

References

1. Julien, Y.P. 1995, "*Erosion and Sedimentation*. Cambridge Univ. Press
2. Cahyono, "*Teori Angkutan Sedimen dan Rekayasa Sungai*". Diktat Kuliah.
3. Van Rijn, L.,C., 1993, "*Principles of sediment Transport in Rivers, estuaries & Coastal Sea*". Aqua Publication.
4. Yang, C.T, 1996, "*Sediment Trnasport: Theory and Practies*", McGraw-Hill.
5. Prosser I. P., P. Rustomji, W. J. Young, C. Moran and A. Hughes (2001). Constructing River Basin Sediment Budgets for the National Land and Water Resources Audit. Canberra, CSIRO Land and Water.

S17133 Theory and Modeling of Groundwater (Pilihan, 3 SKS)

Short Description

Hydraulic of groundwater, Darcy's law, the equal of lines energy (ground water head), type of aquifer, (unconfined, confined, semi confined aquifer). Exploration and exploitation technique and ground water management, aquifer parameter, steady and unsteady well hydraulic, Groundwater Modelling technique: Finite difference and finite element method, finite difference method for transient flow. The solution to numerical and finite element method.

Related Courses:

1. SI2131 Fluid Mechanic and Hydraulic, Prerequisited
2. SI2231 Hydrology Engineering and Drainase, Prerequisited
3. SI3101 Numerical Method

References

1. Verruijt, A. . "*Groundwater Flower*". MacMilian Press
2. Kashef, "*Grounwater Engineering*", McGraw Hill
3. Haitjema, H. M., 1995, "*Analytic Element Modelling of GroundwaterFlow*", Academic Press, Inc.
4. Strack, O. D. L., 1989, "*Groundwater Mechanics*", Prentice Hall.
5. Strack, O. D. L. & Haitjema, H. M. (1981). Modeling double aquifer flow using a comprehensive potential and distributed singularities 2. Solution for inhomogeneous permeabilities. *Water Resour. Res.*, 17(5):1551–1560.

SI7233 Transient Flow in Closed Conduit (Optional, 3SKS)

Short Description

Deeper understanding of water hammer in pipes related to gradual closure of valve, sudden closure of valve and pipe (rigid), sudden closure of valve and pipe (elastic), time taken by pressure wave to travel from the valve to the tank and from tank to the valve.

Related Courses:

1. SI2131 Fluid Mechanic and Hydraulic, Prerequisites
2. SI6131 Advanced Fluid Mechanic, Prerequisites
3. SI3101 Numerical Method

References

1. Karney, B. W. 1990 . “*Energy relations in transient closed-conduit flow*”, *J. Hydraul. Eng.*, 116 10 , 1180.
2. Featherstone, R.E., and Nalluri,C., 1982, “*Civil Engineering Hydraulics Essential Theory With Worked Examples*”, Collins Professional and Technical Books William Collins Sons & Co.Ltd 8 Grafton Street, London.
3. Bansal, R.K., 2002, “*Fluid Mechanics And Hydraulic Machines*”, Laxmi Publications (P) LTD, New Delhi.

SI7234 Lake Hydrodynamics (Pilihan, 3 SKS)

Short Description

Deeper understanding of physical characteristic and flow dynamic related to lake or reservoir. The topic related to physical characteristic of lake/reservoir, important parameter affects flow, flow dynamic based on climate parameter and inflow-outflow.

Related Courses:

1. SI6131 Advanced Fluid Mechanic
2. SI6231 Advanced Hydrology Engineer

References

1. Walter H. Graf, and Clifford H.M.,1979, “*Hydro-dynamics of Lake*”. Elsevier Scientific Publishing Company
2. Hugo B.F. et al, 1979, “*Mixing in Inland and Coastal Water*”. Academic Press

S17235 Water Resources Planning and Management (Pilihan, 3 SKS)

Short Description

Arranging of planning concept, money analyst and economic aspect, planning of multi goals, multi sector, The policy analysis and the benefit of regulation and water resource processing, the relation between technology and society pressures how to make system for alternative evaluation to the development in the planning of water resources processing.

Related Courses

1. SI2131 Fluid Mechanics and Hydraulics, Prerequisites
2. SI2231 Hydrology and Drainase, Prerequisites
3. SI4251 Engineering Economics
4. SI3231 Water Resources Development

References

1. Kuiper, E., "*Water Resources Project Economics*".
2. Grigg, N.S., 1996, "*Water Resources Management Principles, regulations, and Cases*. McGraw-Hill
3. Loucks, Daniel P. and Eelco van Beek," *Water Resources Systems Planning and Management: An Introduction to Methods, Models and Applications*" , UNESCO, Paris, 2006.
4. Grigg, N.S., 1985, "*Infrastructure Engineering and Management*", John Wiley & Sons.
5. Koudstaal, R., "*Framework for Anaysis*", IHE-Delft.

S16001 The Advanced of Numerical Method (Wajib, 3 SKS)

Short Description

Introduction numerical method and in depth of application numerical method for problem solving in civil engineering. Concentrated to methods is needed to element methods design so that the main concept about efficient and accurate methods. Topic: Computer Arithmetic error, linier equation system (advance), non-linier equation system, eigen system.

Related Courses:

1. SI1201 Computer Programming, Prerequisites.
2. SI3101 Numerical Method, Prerequisites

References

1. Rice, J.R., "*Numerical Methods, Software, and Analysis*", McGraw-Hill
2. Golub, G.H and van Loan, C.F., "*Matrix Computation*", The Johns Hopkins University Press.
3. Al-Khafajj, A.W and Tooley, J.R., "*Numerical Methods in Engineering Practice*". Holt. Rinehart & Winston, Inc.

SI7236 Water Resources Decision Support System (Pilihan, 3SKS)

Short Description

Introduction, definition and concept of decision making process; Principle of Multiobjectives Analysis: multiobjective optimization and multicriteria decision analysis, noninferior or nondominated solution, objective and decision space; Outranking Method: Promeethe I and II; electre I and III; Weighted average Method; Analytical Hierarchy Process; Compromise programming; Goal Programming. Non traditional optimization technique: Fuzzy logic, Genetic algorithm; Modeling of artificial neural network: learning process, supervised learning, reduced gradient and backpropagation method expert system. The various method is applied to river basin planning, rainfall-runoff modeling, and reservoir operation modeling.

Related Courses

1. SI3231 Water Resources Development
2. SI7134 Water Resources System Analysis.
3. SI7235 Water Resources Planning and Management.
4. SI4252 Civil Engineering System

References

1. Mollaghasemi, M., and Pet-Edwards, J.,1997, “*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.
4. Fausett, Laurene, 1994, “*Fundamental of Neural Networks, Architectures, Algorithms, and Applications*”, Prentice Hall, Englewood Cliffs, NJ 07632, USA.
5. Giarratano, D.,and Riley Gary, 1993, “*Expert Systems, Principles and Programming Second Edition*”, PWS Publishing Company, Boston.
6. Gen Mitsuo & Cheng Runwei, 2000, “*Genetic Algorithms and Engineering Optimization*”, A wiley-Interscience Publication, John Wiley & Sons, Inc, USA.
7. Wurbs, A.R, 1996, “*Modelling and Analysis of Reservoir System Operations*”, Prentice Hall PTR,Upper Saddle River, NJ 07458, USA.
8. Saaty, T.L, and Vargas, L.G, “*Decision Making in Economic, Plitical, Social and Technological Environments*”, RWS Publications, 4922 Ellsworth Avenue Pittsburgh, PA 15213 USA.