

4. Programs in Ocean Engineering

4.1 General Description of Curriculum

The Ocean Engineering Program ITB was established to answer infrastructure problems in a nation whose 70% of its territory is covered by the ocean.

As stated in the Strategic Plan of the Ocean Engineering Program, the purpose of the program are as follows:

- Providing quality undergraduate and graduate education.
- Providing short course, training, seminar, and workshop on Ocean Engineering topics.
- Performing basic research involving graduate students through competitive fundings.
- Performing applied research in colaboration with industries.
- Operating state-of-the-art laboratory facility for numerical, physical, and field modeling in the area of coastal engineering, offshore engineering, ship engineering, and ocean resources management.
- Colaborating with professional associations for certification and professional development.
- Receiving the highest accreditation from national and international accreditation institutions.

4.2 Competency of Graduates

Competency of Ocean Engineering Program graduates were formulated based on the program's education objectives, these are:

- Having capability to answer the national development challenges regarding to human-resources needs in Ocean Engineering fields.
- Having capability in engineering concepts, environment insight, and become conscious that availability of natural resources are limited.
- Having eagerness to always develop themselves, having enough provisions to lengthen their study to higher level, and having the self-flexibility regarding to availability of job opportunity.
- Having working-capability in design, planning, construction, supervision, management, operation, and evaluation fields, based on general concepts that have been standardized.
- Having good quality in comprehension of basic science such as mathematics, physics, chemistry, and also elementary knowledge of ocean engineering fields such as wave mechanics, hydrodynamics, geotechniques, structures, materials, and hydrography.
- Having good quality in comprehension of applied sciences of ocean engineering fields that comprise coastal engineering, offshore engineering, and shipbuilder engineering.

4.3 Area Expertise and Laboratories

Ocean Engineering Program develops technology that emphasizes in these body of knowledges:

- Coastal Engineering
- Offshore Engineering
- Shipbuilder Engineering

Coastal Engineering

Coastal engineering covers subjects related to coastal protection engineering and technology, reclamation and dredging technology, development of tidal basin as agriculture and fisheries production area, and port engineering. Moreover, technologies related to the protection of marine environment such as pollution control, ocean wastes, and ocean environment impact analysis, are also studied.

Offshore Engineering

Offshore engineering covers offshore structures and related technology, such as pipelines and under sea cable.

Shipbuilder Engineering

Ship engineering is more emphasized on the technology of transportation media, such as ship and other floating devices.

No.	Area of Expertise	Laboratory
1	Coastal Engineering	Wave Observation Laboratory, Physical Model Test Laboratory, Fluid Mechanics Laboratory
2	Offshore Engineering	Wave Observation Laboratory
3	Shipbuilder Engineering	Fluid Mechanics Laboratory

4.4 Curriculum Structure

4.4.1 Undergraduate Program

Semester 1				Semester 2			
No.	Course Code	Course Title	Credit	No.	Course Code	Course Title	Credit
1	MA1122	Calculus I	4	1	MA1222	Calculus II	4
2	FI1101	Elementary Physics IA	4	2	FI1201	Elementary Physics IIA	4
3	KI1111	Basic Chemistry I A	3	3	KI1211	Basic Chemistry II A	3
4	KU1011	Scientific Writing in Indonesian	2	4	KU102X	Bahasa Inggris	2
5	KU1131	Sport I	1	5	KU12XX	Sport II	1
6	KL10T1	Concepts of Technology	2	6	BI1001	Environmental Science	2
7	KL1101	Introduction to Ocean Engineering I	2	7	KL1201	Introduction to Ocean Eng. II	2
Total			= 18	Total			= 18
Total Credit of common preparatory level = 36							
Semester 3				Semester 4			
1	KL2101	Basic Engineering Analysis I	3	1	KL2201	Basic Engineering Analysis II	3
2	KL2102	Fluid Mechanics	3	2	KL2202	Water Wave Mechanics	3
3	KL2103	Engineering Mechanics I	3	3	KL2203	Engineering Mechanics II	3
4	KL2104	Computer Language & Programming	3	4	KL2204	Numerical Analysis	3
5	KL2105	Technical Drawing	2	5	KL2205	Hydrography	2
6	KL2106	Statistic and Probability Analysis	2	6	KL2206	Hydrology & Hydrolics	3
7	KL2107	Physical Oceanography	2				
Total			= 18	Total			= 17
Total Credit of Sarjana Muda Level , phase 1 = 35							
Semester 5				Semester 6			
1	KL3101	Hydrodynamics	2	1	KL3201	Random Waves	3
2	KL3102	Marine Geotechniques I	3	2	KL3202	Marine Geotechniques II	3
3	KL3103	Material For Marine Environment	2	3	KL3203	Marine Structures Const. Management	3
4	KL3104	Ocean Environment	2	4	KL3204	Structural Dynamics	3
5	SI3112	Concrete Structures	3	5	KL3205	Marine Field & Experimental Methods	3
6	KL3105	Engineering Economics	2	6	SI3212	Steel Structures	3
7	KL3106	Basic Finite Element	3				
8	KU206X	Religion & Ethics	2				
Total			= 19	Total			= 18
Total Credit of Sarjana Muda Level , phase 2 = 37							

Semester 7				Semester 8			
No.	Course Code	Course Title	Credit	No.	Course Code	Course Title	Credit
1	KL4111	Coastal Process	3	1	KL40Z0	Final Project	4
2	KL40K0	Job Training	2	2	KL4211	Reclamation & Dredging Engineering	2
3	KL4112	Coastal Structures	2	3	KL4212	Marine Fisheries Infrastructures	3
4	KL4113	Design of Port Infrastructures	2	4	KL40T1	Capita Selecta and Prof Ethics	2
5	KL4121	Offshore Structures I	3	5	KL4221	Offshore Structures II	2
6	KL4131	Basic Ship Engineering	3	6	KU2071	Pancasila and Civic Education	2
7	XXXXXX	Pilihan	3	7	XXXXXX	Pilihan	3
Total			= 18	Total			= 18
Total Credit of Sarjana Level = 36							
Total Credit = 144							

Elective Courses

No.	Course Code	Course Title	Credit
1	KL4101	Longwave	2
2	KL4102	Computational Hydrodynamics	2
3	KL4103	Basic to Underwater Acoustics	2
4	KL4201	System Analysis	2
5	KL4202	Ocean Pollution	2
6	KL4203	Boundary Element Method	2
7	KL5201	Ocean Zone Management	3

4.4.2 Master's Program

The Master's program in Ocean Engineering was established to fulfil continuous demand in coastal and offshore engineering related research suitable for Indonesia's ocean environment.

Several research topics that were developed by Ocean Engineering Program:

- Wave transmission over submerged structures
- Beach erosion and coastal protection
- Stability of coastal structures
- Design of port and harbour
- Ocean environment modeling
- Ocean environment measurement and data processing techniques
- Marine/coastal resources management
- Dynamic response of offshore structures
- Response base platform monitoring
- Platform reliability assessment for reuse and resertification
- Pile installation monitoring
- Innovative platform design for marginal field

Curriculum

Semester 1				Semester 2			
No.	Course Code	Course Title	Credit	No.	Course Code	Course Title	Credit
1	KL6101	Engineering Analysis I	3	1	KL6201	Engineering Analysis II	3
2	KL6102	Water Wave Mechanics	3	2	KL6202	Random Wave	3
3	KL6103	Marine Hydrodynamics	3	3	XXxxxx	Elective	3
Total			= 9	Total			= 9
Semester 3				Semester 4			
1	XXxxxx	Elective	9	1	KL70Z1	Thesis	6
				2	XXxxxx	Elective	3
Total = 9				Total			= 9
Total Credit = 36							

Elective Courses:

No.	Course Code	Course Title	Credit
1	KL5201	Ocean Zone Management	3
2	KL6104	Materials for Marine Environment	3
3	KL6105	Marine Geotechnique	3
4	KL6203	Advanced Physical Oceanography	3
5	KL6204	Finite Element Method for Ocean Eng	3
6	KL6211	Nearshore Hydrodynamics	3
7	KL6221	Fixed Structure Dynamics	3
8	KL7111	Design of Coastal Structures	3
9	KL7112	Ocean Modelling	3
10	KL7121	Design of Offshore Structures	3
11	KL7131	Dynamic of Floating Structure	3
12	KL7201	Underwater Acoustics	3
13	KL7202	Special Topics in Ocean Eng.	3

4.5 Courses Descripton

4.5.1 Undergrate Program

KL 10T1 Concepts of Technology (Mandatory, 2 credits)

This course will broaden student knowledge of technology, planning, and will give student alternative to understand other points of views of any sains to specific problems. Course covered include: infrastructure paradigm, management of water resources, settlement and any aspects related to civil and planning engineering.

Related Courses

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References

1. Anonym, "Dasar- dasar Teknologi dan Kerekayasaan", FTSP, 2001
2. Anonym, "Manusia Teknologi dan Lingkungan: Kemampuan dan Pengembangan", Penerbit ITB, 1996
3. David, et al., "The Man –made world", Mc Graw Hill 1971
4. Derry, T.K. and Williams, T.I "A short history of technology from the earliest time to AD 1990"

KL 1101 Introduction to Ocean Engineering I (Mandatory, 2 credits)

Course Description

This course contains the introduction and background of theory and concepts about body of knowledge in Ocean Engineering field, comprising coastal engineering, offshore engineering, shipbuilder engineering, underwater acoustics, and ocean resources management.

The objective of this course is to inform students of illustration and comprehensive understanding about coastal engineering field that become one of body of knowledge in Ocean Engineering.

Related Courses

References

1. Coastal Engineering Research Center, "ShoreProtection Manual", US Army Corps of Engineers, 1984.

KL 1201 Introduction to Ocean Engineering II (Mandatory, 2 credits)

Course Description

This course contains the introduction and background of theory and concepts about body of knowledge in Ocean Engineering field, comprising coastal engineering, offshore engineering, shipbuilder engineering, underwater acoustics, and ocean resources management.

The objective of this course is to inform students of illustration and comprehensive point of view about offshore engineering, shipbuilder engineering, underwater acoustics, and ocean resources management fields that become body of knowledge in Ocean Engineering.

Related Courses

References

1. Coastal Engineering Research Center, "Shore Protection Manual", US Army Corps of Engineers, 1984.

KL 2101 Basic Engineering Analysis I (Mandatory, 3 credits)

Course Description

This course contains sub topics about linear algebra, differential calculus, integral calculus, complex number analysis, ordinary differential equation, and introduction to partial differential equation.

The objective of this course is to provide the basic mathematical understanding that is used in looking for physical solution in Ocean Engineering problems.

Related Courses

1. MA1122 Calculus I, Prerequisites
2. MA1222 Calculus II, Prerequisites

References

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Inc., 1993.

KL 2102 Fluid Mechanics (Mandatory, 3 credits)

Course Description

This course contains sub topics about fluid statics, basic of fluid-flow analysis, flow in pipe system, open channel flow, and dimension and similarity analysis.

The objective of this course is to inform students of understanding about statics and fluid flow behavior, dimension and similarity analysis.

Related Courses

1. FI1101 Elementary Physics IA, Prerequisites

References

1. White, Frank M., "Fluid Mechanics", 3rd Edition, Mc Graw Hill, 1994.
2. Debler, Walter R., "Fluid Mechanics Fundamentals", Prentice Hall, 1990.

3. Shams, Irving H, “Mechanics of Fluid”, 3rd Edition, Mc Graw Hill, 1992.

KL 2103 Engineering Mechanics I (Mandatory, 3 credits)

Course Description

This course contains analysis of determinate structures (beams, trusses, frames), influence lines analysis, and elastic deformations of planar-determinate structures.

The objective of this course is to provide the understanding about analysis of determinate structures, comprising force-equilibrium concepts, concepts and determining methods of internal forces that work in several kind of structures, influence lines analysis, and elastic deformation analysis in simple structures.

Related Courses

1. FI1101 Elementary Physics IA, Prerequisites

References

1. Harry H. West, “Fundamental Analysis of Structures”, 2nd Edition, Wiley.
2. Timoshenko, “Engineering Materials”, 2nd Edition, Wadsworth Inc.

KL 2104 Computer Language and Programming (Mandatory, 3 credits)

Course Description

This course contains the introduction of computer language and programming using Fortran language.

The objective of this course is to provide the understanding about Fortran as a programming language that is often used in Ocean Engineering application.

Related Courses

1. MA1122 Calculus I, Prerequisites

References

1. Schaums, “Outline of Theory and Problems of Programming With Fortran 90”, Mc Graw Hill.

KL 2105 Technical Drawing (Mandatory, 2 credits)

Course Description

This course contains the substance of projection drawing, reduction drawing, scale and legend, layout drawing, detail drawing, and introduction to several drawings in Civil and Ocean Engineering field.

The objective of this course is to provide the understanding about technique and reading capability of the technical drawing.

Related Courses

References

1. Barsukor P, “Building Construction Drawing”, 2nd Edition.
2. Han Benz, “Building Construction Drawing”, 2nd Edition.

KL 2106 Statistic and Probability Analysis (Mandatory, 2 credits)

Course Description

This course contains sub topics about data processing, probability concepts, distribution, regression analysis and samples.

The objective of this course is to provide the understanding about data analysis and statistics and probability analysis of occurrence.

Related Courses

1. MA1222 Calculus II, Prerequisites

References

1. Draper NR, Smith H, "Applied Regression Analysis", 2nd ed., Wiley, Freund, John E., 1988.
2. Spiegel, Murray R, "Statistics: A First Course", Mc Graw Hill.
3. Spiegel, Murray R, "Statistics: A First Course", 5th Edition, Mc Graw Hill, 1992.

KL 2107 Physical Oceanography (Mandatory, 2 credits)

Course Description

This course contains introduction of the principle of Physical Oceanography science. Students are expected to understand ocean behavior in large scale, including physical characteristic of offshore and coastal zone, and other important characteristics.

The objective of this course is to provide the understanding about principle of ocean physical process.

Related Courses

1. FI1101 Elementary Physics IA, Prerequisites

References

1. Pickard, L., E.J. Emery, P., "Descriptive Physical Oceanography", Pergamon Press, 1994.
2. Pond S., G.L., Pickard., "Introduction Dynamical Oceanography", Pergamon Press, 1993.

KL 2201 Basic Engineering Analysis II (Mandatory, 3 credits)

Course Description

This course contains the solution method of Ordinary Differential Equation (ODE) using Laplace Transform, series solution, eigenvalues & eigenvectors, Fourier Analysis, and also the solution method of Partial Differential Equation (PDE). Differential Equation is very important in Engineering Mathematics. In addition, students are also expected to understand how to develop differential equation from physical process related to Ocean Engineering cases (such as structural dynamics, diffusion process).

The objective of this course is to provide the understanding about the solution method of Differential Equation which related to Ocean Engineering problems.

Related Courses

1. KL1201 Basic Engineering Analysis I, Prerequisites

References

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Inc., 1993.

KL 2202 Water Wave Mechanics (Mandatory, 3 credits)

Course Description

This course contains sub topics about introduction of wave theory, that is focused in linear wave theory, wave characteristic, wave parameter, wave transformation, and wave forces.

The objective of this course is to provide the understanding about wave behavior and wave parameter calculation based on linear wave theory.

Related Courses

1. KL2101 Basic Engineering Analysis I, Prerequisites
2. KL2102 Fluid Mechanics, Prerequisites

References

1. Dean R.G. and Dalrymple R.A., "Water Wave Mechanics For Engineers and Scientist", World Scientific, 1991.
2. Coastal Engineering Research Center, "Shore Protection Manual", US Army Corps of Engineers, 1984.

KL 2203 Engineering Mechanics II (Mandatory, 3 credits)

Course Description

This course contains sub topics about stress-strain analysis in area, elastic deformations of planar structures, and indeterminate structures analysis.

The objective of this course is to provide the understanding about stress-strain analysis, calculation of elastic deformations and indeterminate structures.

Related Courses

1. KL2103 Engineering Mechanics I, Prerequisites

References

1. Harry H. West, "Fundamental Analysis of Structures", 2nd Edition, Wiley.
2. Wang, "Computer Method for Structural Analysis", 2nd Edition, Wiley.

KL 2204 Numerical Analysis (Mandatory, 3 credits)

Course Description

This course contains sub topics about several methods in numerical analysis and simple applications in Ocean Engineering cases.

The objective of this course is to provide the understanding about several methods in numerical analysis.

Related Courses

1. KL2104 Computer Language and Programming, Prerequisites

References

1. F.B. Hildebrand, "Introduction to Numerical Analysis", 2nd Edition, Dover Publication, New York.
2. J.D. Hoffman, "Numerical Methods for Engineers and Scientists", Mc Graw Hill, New York.

KL 2205 Hydrography (Mandatory, 2 credits)

Course Description

This course contains sub topics about ocean physical aspects, determining position in the sea, tidal analysis, and also analysis and interpretation method of field data.

The objective of this course is to provide the understanding about ocean surveying concepts.

Related Courses

References

1. Alan E. Ingham, "Hydrography for The Surveyor and Engineers", 2nd Edition, Blackwell Publisher, 1998.

KL 2206 Hydrology & Hydrolics (Mandatory, 3 credits)

Course Description

This course teaches the counting in:

1. Hydrology: estimation of flood flow, land drainage loading.
2. Open Channel Hydrolics: estimation of river water elevation and artificial open channel, design of open channel, and physical phenomenon in open channel case.

The objective of this course is to provide the understanding about hydrology cycle and the rule of open channel flow that is directed of gravitation. In addition, students are also expected to carry out the estimation in flow assessment and river water elevation, drainage loading, and can design river normalization to fulfill the need that has been estimated.

Related Courses

1. FI1101 Elementary Physics IA, Prerequisites

References

1. Frankel Ernst, "Ocean Environmental Management", Prentice Hall, New Jersey, 1995.
2. US Army Corps of Engineer, "Shore Protection Manual", 1984.

KL 3101 Hydrodynamics (Mandatory, 2 credits)

Course Description

Concepts of fluid dynamics, Navier-Stokes equation, laminar and turbulent flows, continuity equation and flow modes.

Related Courses

1. KL2202 Water Wave Mechanics, Prerequisites

References

1. J. N. Newman, Marine Hydrodynamics, MIT Press, 1990.

KL 3102 Marine Geotechniques I (Mandatory, 3 credits)

Course Description

Soil mechanics for ocean engineering applications. Principles of soil materials, groundwater flow, stress-strain concept for soil, settlement and compaction.

Related Courses

1. KL2203 Engineering Mechanics II, Prerequisites

References

1. B. M. Das, "Principles of Geotechnical Engineering, PWS Engineering", Boston, USA, 1985.
2. R. D. Holtz and W. D. Kovacs, "An Introduction to Geotechnical Engineering", Prentice Hall, 1981.

KL 3103 Material for Marine Environment (Mandatory, 2 credits)

Course Description

Material technology for marine structures. Emphasize on suitable construction materials for marine environment. Durability of materials under attack from aggressive marine environment. Cathodic protection.

Related Courses

1. KL2203 Engineering Mechanics II, Prerequisites

References

1. P. K. Mehta, Concrete in the Marine Environment, Elsevier, New York, USA, 1991.
2. R. C. Smith and C. K. Andres, Material of Construction, McGraw-Hill, 1989.
3. Imran, Catatan Kuliah Teknologi Beton, 1996.

KL 3104 Ocean Environment (Mandatory, 2 credits)

Course Description

Biotic, non-biotic, and social aspects of marine environment problems. Simple cases of pollutant distribution computation, important parameters in water quality criteria.

Related Courses

1. KL2101 Basic Engineering Analysis I, Prerequisites
2. KL2102 Fluid Mechanics, Prerequisites
3. KL2201 Basic Engineering Analysis II, Prerequisites

References

1. R. V. Thomann and J. A. Mueller, Principles of Surface Water: Quality Modeling and Control, Addison-Wesley, 1997.
2. G. Tchobanoglous, F. L. Burton, et al., Wastewater Engineering: Treatment and Reuse, Metcalf & Eddy, 1991.

KL 3105 Engineering Economics (Mandatory, 2 credits)

Course Description

Elementary principles in decision making based on economics evaluation of engineering projects. Time-value of money, interest, effects of inflation, risk and uncertainty. Cost estimation of engineering projects.

Related Courses

4. MA1222 Calculus II, Prerequisites

References

1. Marsudi Joyowiyono, Ekonomi Teknik, 2nd edition, Badan Penerbit Pekerjaan Umum, 1990.
2. L. T. Blank and A. J. Tarquin, Engineering Economy, 3rd edition, McGraw-Hill, 1989.

KL 3106 Basic Finite Element (Mandatory, 3 credits)

Course Description

Structural analysis using finite element method. Introduction to computer softwares that apply finite element method.

Related Courses

1. KL2103 Engineering Mechanics I, Prerequisites
2. KL2203 Engineering Mechanics II, Prerequisites

References

1. D. L. Logan, A First Course in the Finite Element Method, Thomson Learning, 2001.
2. L. J. Segerlind, Applied Finite Element Analysis, John Wiley & Sons, 1984.

KL 3201 Random Waves (Mandatory, 3 credits)

Course Description

Random property of wave. Principles of random wave analysis, time series analysis, Fast Fourier Transform, frequency domain analysis, transfer function, filter.

Related Courses

1. KL2106 Probability and Statistical Analysis, Prerequisites
2. KL2202 Water Wave Mechanics, Prerequisites

References

1. Yoshimi Goda, Random Seas and Design of Maritime Structures, 2nd edition, World Scientific Publishing Co., 2000.
2. J. E. Newland, Introduction to Random Vibration, Longman Scientific, 1994.
3. M. K. Ochi, Applied Probability and Stochastic Processes, John Wiley, 1990.
4. J. S. Bendat and A. G. Piersol, Random Data: Analysis and Measurement Procedures, 2nd edition, Wiley Interscience, 1986.

KL 3202 Marine Geotechniques II (Mandatory, 3 credits)

Course Description

Design of foundation for marine structures. Slope stability, design of retaining wall, shallow foundations, pile foundations, geotextiles, and soil improvement.

Related Courses

1. KL3102 Marine Geotechnics I, Prerequisites

References

1. R. D. Holtz and W. D. Kovacs, An Introduction to Geotechnical Engineering, Prentice Hall, 1981.
2. American Society of Civil Engineers, Design of Pile Foundations, Technical Engineering and Design Codes, ASCE, New York, 1993.

KL 3203 Marine Structures Construction Management (Mandatory, 3 credits)

Course Description

Types of marine structures and their construction methods and management. Functions of components of structures and their construction problem. Construction methods for concrete, steel, and soil works. Project management and project organization.

Related Courses

1. KL3103 Marine Construction Material Technology, Prerequisites

References

1. P. Soekirno, Diktat Pengantar Manajemen Proyek Konstruksi, 2002.
2. D. S. Barry and B. C. Paulson, Professional Construction Management, McGraw-Hill, 1991.

KL 3204 Structural Dynamics (Mandatory, 3 credits)

Course Description

Vibrations of single-degree-of-freedom and multi-degree-of-freedom systems. Computational techniques for dynamic responses of SDOF and MDOF (shear building).

Related Courses

1. KL2101 Basic Engineering Analysis I, Prerequisites
2. KL2103 Engineering Mechanics I, Prerequisites
3. KL2201 Basic Engineering Analysis I, Prerequisites
4. KL2203 Engineering Mechanics II, Prerequisites

References

1. Mario Paz, Structural Dynamics, Van Nostrand Reinhold, 1980.
2. R. W. Clough and J. Penzien, Dynamics of Structures, 2nd edition, McGraw-Hill, 1993.

KL 3205 Marine Field and Experimental Methods (Mandatory, 3 credits)

Course Description

Methods of ocean engineering surveys and modeling. Modeling principles, dimensional analysis.

Related Courses

1. KL2202 Water Wave Mechanics, Prerequisites
2. KL2205 Hydrography, Prerequisites

References

1. R. G. Dean and R. A. Dalrymple, Water Wave Mechanics for Engineers and Scientists, World Scientific Publishing Co., 1991.

KL 4111 Coastal Process (Mandatory, 3 credits)

Course Description

Coastal physical processes: coastal zone wave and current, sediment transport, coastal erosion and disposition, and changes of shoreline.

Related Courses

1. KL2202 Water Wave Mechanics, Prerequisites
2. KL3101 Hydrodynamics, Prerequisites

References

1. R. G. Dean and R. A. Dalrymple, Water Wave Mechanics for Engineers and Scientists, World Scientific Publishing Co., 1991.
2. K. Horikawa, Nearshore Dynamics and Coastal Processes, University of Tokyo Press, 1988.
3. Coastal Engineering Research Center, Shore Protection Manual, US Army Corps of Engineers, 1984.

KL 40K0 Job Training (Mandatory, 2 credits)

Course Description

Practical training on an actual ocean engineering construction project, introducing engineering, construction methods, and contract and administrative aspects of the construction.

Related Courses

1. KL3203 Marine Structures Construction Management, Prerequisites

References

KL 4112 Coastal Structures (Mandatory, 2 credits)

Course Description

Planning and design of coastal structures: breakwater, seawall, jetty, and groin.

Related Courses

1. KL2202 Water Wave Mechanics, Prerequisites
2. KL3102 Marine Geotechnics I, Prerequisites

References

1. Coastal Engineering Research Center, Shore Protection Manual, US Army Corps of Engineers, 1984.

KL 4113 Design of Port Infrastructures (Mandatory, 2 credits)

Course Description

Planning and design of port infrastructures. Types of ports, design procedures, vessel types and dimensions, port organization, navigation aspects, breakwater, harbor, and stockyard. Conventional, multi-purpose, container, and bulk ports.

Related Courses

1. KL2103 Engineering Mechanics I, Prerequisites
2. KL2202 Water Wave Mechanics, Prerequisites
3. KL2203 Engineering Mechanics II, Prerequisites

References

1. Coastal Engineering Research Center, "Shore Protection Manual", US Army Corps of Engineers, 1984.
2. Per Bruun, "Port Engineering", Gulf Publishing Co., 1984.
3. Hang Tuah, "Merencanakan dan Merancang Pelabuhan".

KL 4121 Offshore Structures I (Mandatory, 3 credits)

Course Description

Design of fixed offshore structures.

Related Courses

1. KL2103 Engineering Mechanics I, Prerequisites
2. KL2203 Engineering Mechanics II, Prerequisites
3. KL3204 Structural Dynamics, Prerequisites

References

1. American Petroleum Institute, API Recommended Practice 2A-WSD, 21st edition, 2000.
2. T. H. Hsu, Applied Offshore Engineering, Gulf Publishing Co., 1984.
3. T. H. Dawson, Offshore Structural Engineering, Prentice Hall, 1983.

KL 4131 Basic Ship Engineering (Mandatory, 3 credits)

Course Description

Fundamentals of ship engineering: ship geometry, stability, computation of ship strength and resistance.

Related Courses

1. KL2102 Fluid Mechanics, Prerequisites
2. KL2203 Engineering Mechanics II, Prerequisites

References

1. J. P. Comstock, Principles of Naval Architecture, SNAME, 1967.
2. S. A. Harvald, Tahanan dan Propulsi Kapal, John Wiley (translated by Jusuf Sutomo).
3. K. J. Rawson and E. C. Tupper, Basic Ship Theory, Longman Publishing Group, 1994.

KL 40Z0 Final Project (Mandatory, 4 credits)

Course Description

Final assignment aimed at developing academic ability in analyzing and synthesizing ocean engineering problems and present it in quality writing.

Related Courses

1. KL40K0 Practical Training, Prerequisites

References

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KL 4211 Reclamation and Dredging Engineering (Mandatory, 2 credits)

Course Description

Principles and techniques of coastal dredging and reclamation. Sediment transport, demand and impact of dredging, dredging methods, survey, production estimation of dredging vessels, and costal reclamation.

Related Courses

1. KL3203 Marine Structure Construction Management, Prerequisites

References

1. R. N. Bray et al., Dredging: A Handbook for Engineer, Butterworth-Heinemann, 1996.
2. US Army Corps of Engineer, Dredging Market in US, Syncom Publishing Co., 1976.

KL 4212 Marine Fisheries Infrastructures (Mandatory, 3 credits)

Course Description

Analysis and design of types of infrastructures for marine fisheries.

Related Courses

1. KL2206 Hydraulics and Hydrology, Prerequisites

References

1. E. G. Frankel, Ocean Environmental Management, Prentice Hall, 1995.
2. Coastal Engineering Research Center, Shore Protection Manual, US Army Corps of Engineers, 1984.

KL 40T1 Capita Selecta and Professional Ethics (Mandatory, 2 credits)

Course Description

Current issues in infrastructure engineering, professional ethics.

Related Courses

References

KL 4221 Offshore Structures II (Mandatory, 2 credits)

Course Description

Structural design of fixed offshore structures using software packages; pipelines.

Related Courses

1. KL4121 Offshore Structures I, Prerequisites

References

1. American Petroleum Institute, API Recommended Practice 2A-WSD, 21st edition, 2000.
2. T. H. Hsu, Applied Offshore Engineering, Gulf Publishing Co., 1984.
3. T. H. Dawson, Offshore Structural Engineering, Prentice Hall, 1983.

KL 4101 Longwave (Elective, 2 credits)

Course Description

Basic theory and applications of long wave, long wave theory in ocean engineering problems.

Related Courses

1. KL2101 Basic Engineering Analysis I, Prerequisites
2. KL2102 Fluid Mechanics, Prerequisites
3. KL2201 Basic Engineering Analysis II, Prerequisites

References

1. R. G. Dean and R. A. Dalrymple, Water Wave Mechanics for Engineers and Scientists, World Scientific Publishing Co., 1991.

KL 4102 Computational Hydrodynamics (Elective, 2 credits)

Course Description

Computational hydrodynamics in ocean engineering problems: tide (vertical and horizontal), wave, non-tidal current, storm surge and estuary. Principles for numerical computation with at least one type of large hydrodynamics model.

Related Courses

1. KL2202 Water Wave Mechanics, Prerequisites

References

1. J. D. Anderson, Computational Fluid Dynamics: The Basics with Applications, McGraw-Hill, 1995.
2. R. L. Panton, Incompressible Flow, John Wiley and Sons, 1984.

KL 4103 Basic to Underwater Acoustics (Elective, 2 credits)

Course Description

Introduction to underwater acoustics and simple applications in ocean engineering.

Related Courses

1. KL2102 Fluid Mechanics, Prerequisites
2. KL2202 Water Wave Mechanics, Prerequisites

References

1. L.E. Kinsler, A. R. Frey, A. B. Coppens, and J. V. Sanders, "Fundamentals of Acoustics", John Wiley, New York, 1999.
2. R. J. Urick, "Principles of Underwater Sound", Peninsula Publishing, 1996.

KL 4201 System Analysis (Elective, 2 credits)

Course Description

General concepts of system analysis, identification, formulation, and solution of simple engineering problems related to ocean engineering systems. Applications of optimization techniques: linear and nonlinear programming.

Related Courses

1. KL2102 Fluid Mechanics, Prerequisites
2. KL2103 Engineering Mechanics I, Prerequisites
3. KL2107 Physical Oceanography, Prerequisites
4. KL2203 Engineering Mechanics II, Prerequisites

References

1. S. G. Nash and A. Sofer, "Linear and Nonlinear Programming", McGraw-Hill, 1995.
2. P. J. Ossenbruggen, "Systems Analysis for Civil Engineers", John Wiley & Sons, 1990.
3. M. S. Bazara, J. J. Jarvis, and H. D. Sherali, "Linear Programming and Network Flows", John Wiley & Sons, 2005.

KL 4202 Ocean Pollution (Elective, 2 credits)

Course Description

Basic theory of ocean pollutant distribution, water quality model (conservative, non-conservative, dissolved oxygen), and simple outfall design.

Related Courses

1. KL2101 Basic Engineering Analysis I, Prerequisites
2. KL2102 Fluid Mechanics, Prerequisites
3. KL2201 Basic Engineering Analysis II, Prerequisites

References

1. R. V. Thomann and J. A. Mueller, "Principles of Surface Water: Quality Modeling and Control", Addison-Wesley, 1997.
2. H. B. Fischer et al, "Mixing in Inland and Coastal Waters", Academic Press, 1979.

KL 4203 Boundary Element Method (Elective, 2 credits)

Course Description

Introduction to boundary element method and simple applications in ocean engineering.

Related Courses

1. KL2104 Computer Language and Programming, Prerequisites
2. KL2202 Water Wave Mechanics, Prerequisites
3. KL2204 Numerical Analysis, Prerequisites

References

1. C. A. Brebia, "The Boundary Element Method for Engineers", John Wiley & Sons, 1978.
2. S. Kirkup, "The Boundary Element Method in Acoustics", Integrated Sounds Software, 1998.

KL 5201 Coastal Management (Elective, 3 credits)

Course Description

Concepts of coastal zone management and development.

Related Courses

References

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

4.5.2 Master's Program

KL 6101 Engineering Analysis I (Mandatory, 3 credits)

Course Description

This course contains sub topics about extension of vector algebra, scalar product and orthogonal, convergency, Fourier Series, orthogonal projection, calculus for real function, vector function, differential equation, gradient, divergency and rotation, double integral, Green Gauss and Stokes Theorem.

The objective of this course is to provide the basic mathematical understanding that is used in looking for physical solution in advanced Ocean Engineering problems.

Related Courses

References

1. Peter V. O'Neal, "Advanced Engineering Mathematics".
2. Joe D. Hoffman, "Numerical Methods for Engineers & Scientists".
3. Bowker & Lieberman, "Engineering Statistics".

KL 6102 Water Wave Mechanics (Mandatory, 3 credits)

Course Description

This course contains sub topics about wave parameters, flux of wave energy, wave transformation, diffraction, and wave velocity potential.

The objective of this course is to provide the understanding about wave behavior and its applications.

Related Courses

References

1. Tuah H., "Diktat Mekanika Gelombang Air".
2. CERC., "Shore Protection Manual", 1984.
3. Dean R.G., dan Dalrymple R.A., "Water Wave Mechanics for Engineers and Scientis".

KL 6103 Marine Hydrodynamics (Mandatory, 3 credits)

Course Description

This course contains sub topics about Navier-Stokes equation, laminar and turbulent flows, continuity equation and flow modes.

The objective of this course is to provide understanding about the hydrodynamics concepts as an mathematical application and basic knowledge for other courses development related to fluid/hydro problems.

Related Courses

References

1. J.N. Newman, "Marine Hydrodynamics" MIT Press.
2. Chakrabarti S.K., "Hydrodynamics for Offshore Structure".
3. Ricky L.T., "Diktat Kuliah Hidrodinamika Laut".

KL 6201 Engineering Analysis II (Mandatory, 3 credits)

Course Description

Solution of differential equation in advanced engineering problems. Ordinary differential equations, linear differential equation with variable coefficients using power series, special function (Legendre, Bessel), boundary value problems (Sturm-Liouville), orthogonality of eigenfunction. Canonical partial differential equation: homogene and non-homogene, Green's function.

Related Courses

1. KL6101 Engineering Analysis I, Prerequisites

References

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 1993.

KL6202 Random Wave (Mandatory, 3 credits)

Course Description

Random properties of wave and principles of random wave analysis.

Related Courses

References

1. Yoshimi Goda, Random Seas and Design of Maritime Structures, 2nd edition, World Scientific Publishing Co., 2000.
2. J. E. Newland, Introduction to Random Vibration, Longman Scientific, 1994.
3. M. K. Ochi, Applied Probability and Stochastic Processes, John Wiley, 1990.

KL 70Z1 Thesis (Mandatory, 6 credits)

Course Description

Final assignment aimed at developing academic ability in research, analyzing and synthesizing ocean engineering problems and present it in quality writing.

Related Courses

References

KL 5201 Ocean Zone Management (Elective, 3 credits)

Course Description

Concepts of coastal zone management and development.

Related Courses

References

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

KL 6104 Materials for Marine Environment (Elective, 3 credits)

Course Description

This course contains sub topics about material technology and their application for marine environment, material repair and material protection process.

The objective of this course is to provide understanding about the material applications in marine environment, including material selection, material composition computation, protection and reparation process.

Related Courses

References

1. P. K. Mehta, "Concrete in the Marine Environment", Elsevier, New York, USA, 1991.
2. R. C. Smith and C. K. Andres, "Material of Construction", McGraw-Hill, 1989.
3. Mcleish, A, "Underwater Concreting and Repair", Edward Arnold, 1994.

KL 6105 Marine Geotechnique (Elective, 3 credits)

Course Description

This course contains sub topics about the principles that support design process of marine foundation system.

Related Courses

References

1. Poulos, H.G., "Marine Geotechnics". New edition.
2. Wrioth, S.G. (Ed.), "Geotechnical Practice in Offshore Engineering", New edition.
3. Norwegian Geotechnical Institute, "Lecture Notes on Geotechnical Engineering in Offshore Structures", New edition.

KL 6203 Advanced Physical Oceanography (Elective, 3 credits)

Course Description

Global physical properties and characteristics of ocean, elementary equations in ocean modeling.

Related Courses

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References

1. L. Pickard, E. J. Emery, and P. Press, Descriptive Physical Oceanography, 1994
2. S. G. Pond, L. Pickard, Introduction Dynamical Oceanography, 1993.

KL 6204 Finite Element Method for Ocean Engineering (Elective, 3 credits)

Course Description

Principles of finite element method and its applications to ocean engineering problems.

Related Courses

References

1. D. L. Logan, A First Course in the Finite Element Method, Thomson Learning, 2001.
2. L. J. Segerlind, Applied Finite Element Analysis, John Wiley & Sons, 1984.
3. K. J. Bathe, Finite Element Procedures in Engineering Analysis, Prentice-Hall, 1982.

KL 6211 Nearshore Hydrodynamics (Elective, 3 credits)

Course Description

Water circulation, sediment transport, wave transformation, and shore development.

Related Courses

References

1. K. Horikawa, Nearshore Dynamics and Coastal Processes, University of Tokyo Press, 1988.
2. C. C. Mei, The Applied Dynamics of Ocean Surface Waves, World Scientific Publishing Co., 1989.

KL 6221 Fixed Structure Dynamics (Elective, 3 credits)

Course Description

Dynamic analysis of fixed structures in ocean environment, influence of fluids on structure inertia and damping, deterministic and probabilistic response of single-degree-of-freedom structure, application to multi-degree-of-freedom structures.

Related Courses

References

1. Mario Paz, Structural Dynamics, Van Nostrand Reinhold, 1980.
2. R. W. Clough and J. Penzien, Dynamics of Structures, 2nd edition, McGraw-Hill, 1993.

KL 7111 Design of Coastal Structure (Elective, 3 credits)

Course Description

Design principles of port and other coastal structures.

Related Courses

References

1. Coastal Engineering Research Center, Shore Protection Manual, US Army Corps of Engineers, 1984.

KL 7112 Ocean Modelling (Elective, 3 credits)

Course Description

Simulation technique for physical processes of ocean environment (ocean hydrodynamics, sediment transport, heat transfer, pollutant distribution, tsunami).

Related Courses

References

1. R. V. Thomann and J. A. Mueller, Principles of Surface Water: Quality Modeling and Control, Addison-Wesley, 1997.
2. Kwalik & Murty, Numerical Modeling of Ocean Dynamic”, World Scientific, 1993.

KL 7121 Design of Offshore Structures (Elective, 3 credits)

Course Description

Planning and design of offshore structures, Morrison equation, linear wave theory, small and large structure, and dynamic response of offshore structures.

Related Courses

References

1. T. Sarpkaya and M. Isaacson, Sarpkaya, “Mechanics of Wave Force on Offshore Structures”, John Wiley and Sons, 1982.
2. Le Me Haute, “Introduction to Hydrodynamics and Water Waves”, Springer Verlag, 1976.
3. J. F. Wilson, ed., “Dynamics of Offshore Structures”, John Wiley and Sons, 1984.

KL 7131 Dynamic of Floating Structure (Elective, 3 credits)

Course Description

Dynamics of spring-mass-damper systems. Properties of surface wave, hydrodynamics forces, and transformation of hydrodynamics forces. Response of floating structures due to waves, response amplitude operator, random wave analysis, ocean spectra, and response spectra.

Related Courses

References

1. T. Sarpkaya and M. Isaacson, Sarpkaya, “Mechanics of Wave Force on Offshore Structures”, John Wiley and Sons, 1982.
2. J. N. Newman, “Marine Hydrodynamics”, MIT Press, 1990.
3. J. F. Wilson, ed., “Dynamics of Offshore Structures”, John Wiley and Sons, 1984.

KL 7201 Underwater Acoustics (Elective, 3 credits)

Course Description

Principles and behavior of sound in underwater environment and their applications.

Related Courses

References

1. L. E. Kinsler, A. R. Frey, A. B. Coppens, and J. V. Sanders, Fundamentals of Acoustics, John Wiley, New York, 1999.
2. R. J. Urick, Principles of Underwater Sound, Peninsula Publishing, 1996.
3. William S. Burdic, Underwater Acoustic System Analysis, Prentice Hall, 1991.

KL 7202 Special Topics in Ocean Engineering (Elective, 3 credits)

Course Description

This course is offered to accommodate current development in ocean engineering into the classroom.

Related Courses

References
