COURSES SILLABUS

2009 COMPETENCY BASED CURRICULUM

S-1 UNDERGRADUATE PROGRAM,
CIVIL ENGINEERING DEPARTMENT OF ITS

SEMESTER I

COURSE : ENGLISH
CODE : IG09-1308
LOAD : 2 credits

Course Objectives:

1. Student will be able to comprehend the content of articles, or papers in journals, or academic text in the field of science and technology that are written in English;
2. Student will be able to describe orally the written information after comprehending the text;
3. Student will be able to convey their arguments and ideas in English for both oral and writing.

Competency:

1. Student will be able to apply effective reading strategy to read textbook in English the field of science and technology;
2. Student will be able to comprehend the text books written in English.
3. Student will be able to convey their arguments and ideas in English in the form of written or spoken information.

Course outline:

Scanning: scanning in everyday life; scanning tables; scanning academic articles/journals,; scanning encyclopedia entry. **Previewing and predicting:** previewing and predicting book covers to foresee the contents; listen to spoken text and predict the suitable picture or figures; Say out loud the undelined reasons for predicting. **Vocabulary knowledge for effective reading and listening:** guessing meaning from context in sentences; using grammar to guess word meaning; recognizing words connecting ideas. **Topics:** stating and recognizing topics from a paragraph or a text in written and spoken text; working with the topics, finding and writing the topic sentence. **Main Ideas:** finding the main idea in the topic sentence, stating main ideas of a paragraph, develop topic to main ideas, develop supporting details for the main ideas, producing an outline. **Patterns of organization:** recognizing signal words to identify the types of patterns, recognizing the patterns of various written texts; writing an essay with some selected patterns. **Skimming:** skimming book reviews skimming jurnal or articles. **Making inference:** Infering missing information, making inferences from conversations. **Summarizing and analysis:** summmarizing a paragraph or passages, and making a text or article analysis.

Principal References :

1. Mikulecky and Jeffries, *More Reading Power*, Addison-Wesley publishing Company, 2003;
2. Supriyanto, *Critical Reading*, ITB, 2007;
3. ITS English Teaching Team, *English for Science and Technology*, ITS, 2008.

Supporting References:

1. Rooks, *Paragraph Power:* **Communicating Ideas through Paragraphs**, Prentice Hall Regents, 1999;
2. Hayden, R.E., Pilgrim, D.W, and Haggard, A.Q., **Mastering American English**, Prentice

Hall, Inc., 2000;
3. Thomson and Martinet, **A Practical English Grammar**, Oxford University Press, 2011;
4. Anderson and Anderson, **Text Types in English**, Macmillan, 2003.

COURSE : CALCULUS I
CODE : SM09-1201
LOAD : 3 credits

Course Objectives:

Student will be able to comprehend and solve Calculus problems on function of real numbers, limits, differential and its application, and function of integral.

Competency:

1. Student will be able to solve probles of inequations, determination of domain, range, and drawing of the functions;
2. Student will be able to determine limit of functions, and continuity of functions;
3. Student will be able to find derrivative of functions and use them for applications;
4. Student will be able to compute finite integrals, and apply them to compute area under a curve.

Course Outline :

Sytem of Real Numbers: definition of absolute value, inequality, lines, distence between two points, circles. **Functions and Limits**: Domain and range fungsi : linear, quadratic and trigonometry and graphs, identification of linear functions dan graphical functions, limit of functions and continuity. **Differential/Derrivation:** definition of derrivation, rule for derrivation of functions, derrivation of trigonometric funtions, rules of series, implicit functions. **Appication of Differential/Derrivation:** continuous funtions, determination of increse and decrease interval of graphical funtions,optimization problems. **Integral:** definition, finite integral, non-finite integral, larea under a curve.

Principal References :

Tean of Lecturers Dept. Of Mathematicc, **Buku Ajar Kalkulus I,** Edisi ke-5, Jurusan Matematika ITS, 2009.

Supporting References :

1. Purcell, J.E. and Rignon, **Calculus**, 8th ed., Prentice Hall, 2000;
2. Thomas, G., **Calculus**, Pearson Addison and Wesley, 2005.

Prerequisite : ---

COURSE : ELEMENTARY PHYSICS
CODE : SF09-1201
LOAD : 3 Credits

Course Objectives:

Student will be able to explain phenomena of physics using the available basic principles.

Competency:

1. Student will be able to describe Vectors and apply vector operations;
2. Student will be able to explain and use the equations of kinematics of particles, dynamics of particles , work and energy, collision, dynamics of rotation, vibrations,, fluid mechanics and, dan calory.

Course Outline :

Magnitude and vector, **kinematics of partcles :** speed, acceleration, straight motion, parabolic motion, circular motion. **Dynamics of particles**: Newton's Law, frictional force. **Work and energy**: principal of work, kinetic energy, potential energy, consevation of mechanical energy, momentum dan collision. **Ratational motion:** angular speed and acceleration, force moment and innertial moment,rolling motion. **Vibration: simple harmonic motion**, coupling harmonic vibration. **Fluids Mechanics**: hydrostatics, hydrodynamics. **Calory**: thermometry and heat transfer.

Principal References :

1. Team of Lecturers, **Diktat Fisika I**, Dept. of Physisc FMIPA-ITS;
2. Team of Lecturers, **Soal-soal Fisika I**, Dept. of Physisc FMIPA-ITS;
3. Tipler, P.A., (terjemahan, L. Prasetio dan R.W. Adi), **Fisika : untuk Sains dan Teknik, Jilid 1**, Erlangga, Jakarta, 2001.

Supporting References :

1. Halliday & Resnick, **Fundamental of Physics**, John Wiley and Sons, New York, 2004;
2. Alonso & Finn, **Fundamental University Physics,** Addison Wesley Pub. Comp. Inc., 1st. ed., Calf, 1992;
3. Giancoli, DC., (terjemahan, Yuhilza H.), **Fisika, Jilid 1**, Erlangga, Jakarta, 2001.

Prerequisite : ---

COURSE: COMPUTER PROGRAMING AND APPLICATION
CODE : RC09-1311
LOAD : 3 Credits

Course Objectives :
The course content will help student to be able to utilize computers for apllications.

Competency:
Student will be able to describe the development of hardwares, to utilize computer programs for civil engineering works, to comprehend the programming language and their concepts, and to take safety precautions agaist computer virus attacts.

R**eferences :**

1. **Learning Python** 2nd Ed, O'Reilly
2. Mathematics help module.
3. Wikipedia: laptop, PC, Linux, Microsoft Windows, OS X, Computer Virus
4. Wikihow: **Be safe on the internet**
5. http://ergonomics.about.com/od/office/a/laptopasdesktop.htm
6. http://www.microsoft.com
7. http//www.apple.com

COURSE : CIVIL ENGINEERING DRAWING
CODE : RC09-1312
LOAD : 3 Credits

Course Objectives :

This course will explain the methods of drawing building projection, methods of drawing plan for simple buildings including foundation,s walls, wooden panels, roof plan, sanitation system, electrical plan, and details of spacific parts, also to estimate the need for building materials. Furthermore, introduction on hydraulic structures, railway structures, highway structures, harbour and airport principal structures will also be given to student.

Competency:

1. Student will be able to explain and produce projectory drawing of standard buildings using standard methods.
2. Student will be able to plan and arrange the building spaces in accordance to their purposes.
3. Student will be able to draw and read the drawing of simple buildings.
4. Student will be able to mention and show the types of hydraulic structures.
5. Student will be able to mention and show pertinent tructures of highways and railways.
6. Student will be able to mention and show important structures for harbour and airport.

References :

1. Dirjen Pengairan DPU, **Standar Perencanaan Irigasi**
2. Herman Wahyudi, Diktat **Jalan Rel I**
3. HR. Sugihardjo BAE, **Gambar-gambar Dasar Ilmu Bangunan**, Jilid I s/d IV", Bina Bangunan
4. Kardun, **Ilmu Proyeksi**
5. Silvia Sukirman, **Dasar-dasar Perencanaan Geometrik Jalan Raya**
6. Zainal A.Z., **Cara Terbaik Membangun Rumah**

COURSE : STATICALLY DETERMINATE ENGINEERING MECHANICS
CODE : RC09-1313
LOAD : 4 Credits

Course Objectives :

This course is launched as a basic for students to be able to apply other structural courses, in which it describes the principles of forces, stability of forces in the statically dterminate structures, influence lines, arches and 3-hinge portals, and truss structures.

Competency:

Student will be able to solve problems with statically determinate structures, to find the reactions, draw the M,N,D graphs of beam on simple supports, find indirect loading, solve problems with arches and 3-hinge portals, and to find forces in truss structures correctly.

References :

Suwarno, **Mekanika Teknik Statis tertentu** UGM , 1970
Soemono, **Statika** ITB, 1985
Triwulan, Soewardoyo, **Modul Ajar Mekanika Teknik I**, Jurusan Teknik Sipil ITS, 2005

SEMESTER II

COURSE : CALCULUS II
CODE : SM09-1202
LOAD : 3 Credits

Course Objectives:

Student will be able to comprehend and solve the following calculus problems, i.e.: trancendental functions, invers fungtions, integral and its applications, infinite series, and pole coordinate.

Competency:

1. Student will be able to perform operation and draw algorithmic and exponential fuctions , and to determine invers of a function and its derrivative ;
2. Student will be able to compute the value of integral using numerical approach, and to compute irrational integration;
3. Student will be able to apply techniques of integration to compute area between two curves, to find volume of rotated objects, moment of inertia, to locate the center of gravity of an object ;
4. Student will be able to draw graphic representation of function in polar coordinate, and ti caculate area in pole coordinate.
5. Student will be able to determine the convergence of invinite series.

Course Outline:

Trancendental Fungtion: logaritmic function, exponential function, graphs and inverse of functions. **Methods of Integration**: parsial integration, integration of trigonometric functions, rationally devided funtions. **Numerical Integration dan Irrational Integration :** numerical integration, Simpson's Rules, irrational integration,L'Hopital 's Rule. **Application of Finite Integral:** area between two curves, volume of rotational body, moment of inertia, center of gravity. **Polar Coordinate:** definition, graphical representation in polar coordinate, calculating area, tangential line. **Infinite Series:** Finite and infinite series, convergence test, Taylor's series ,and Maclaurin's series

Principal References :

Team of Lecturer – Department of Mathematics of ITS, **Buku Ajar Kalkulus II**, 5th edition, Department of Mathematics , 2009.

Supporting References :

1. Purcell, J.E. and Rignon, **Calculus**, 8th ed., Prentice Hall, 2000;
2. Thomas, G., **Calculus**, Pearson Addison and Wesley, 2005.

COURSE : NUMERICAL METHOD
CODE : RC09-1321
LOAD : 2 Credits

Course Objectives :
This course will explain methods of numerical approach to solve problems in civil engineering.

Competency:
Student taking this course will be able to apply menumerical approaches to solve problems in civil engineering.

References :

1. Conte, S. D.; and de Boor, C., **Elementary Numerical Analysis**, Mcgraw-Hill, Inc., 1980.
2. Atkinson, K. E., **An Introduction to Numerical Analysis**, John Wiley and Sons, Inc., 2008.

Prerequisite :
1. Calculus 1 (SM09 – 1201)
2. Calculus 2 (SM09 – 1202)

COURSE : APPLIED STATISTICS
CODE : RC09-1322
LOAD : 3 Credits

Course Objectives :

This course contains methods of data collecting, preparation, analysis, and interpretation of data for application in civil engineering.

Competency:

Student will be able to comprehend to function of statistics in solving civil engineering problems, to calculate parameters in Descriptive Statistics, to estimate the Probabilities and chances, to comprehend the use of random variables, probability distribution, to perform sampling, to conduct interverence/ inductuve statistical anlysisi, and to perorm forcasting. Furthermore, the student will be able to perform statisyical analysis to solve problems on at least one of the Civil Engineering disciplines, i.e : Structural Engineering, Geotechnical Engineering, Transportation Engr., Hydraulic Engr., and Contruction Management.

1. Bhattacharya G and R. A. Johnson, **Statistical Concepts and Methods**, John Wiley ans Sons Inc. 1977.
2. Soong, TT, **Fundamentals of Probability and Statistic for Engineers**, John Wiley ans Sons Inc. 2004.

COURSE : MECHANICS OF MATERIALS
CODE : RC09-1323
LOAD : 3 Credits

Course Objectives :
This course will deals about stresses, strains, and deformations in statically indeterminate structures.

Competency:
Student will be able to compute stresses, strains, and deformations in statically indeterminate structures.

References :

1. E.P Popov, **Mechanics of Materials**, Prentice Hall Inc., 2nd edition, 1991.
2. JM Gere, SP Timoshenko, **Mechanics of Material**, PWS Company, 4th edition, 2008.

Prerequisite : Statically Determinate Engineering Mechanics (RC09 – 1313)

COURSE : CONCRETE AND MATERIAL TECHNOLOGY
CODE : RC09-1324
LOAD : 4 Credits

Course Objectives :

This course deals about the importance and specification of concrete as building material, specification of concrete materials (water, sand, crushed stone, cement, admixture) in accordance with the current codes. Also described are the tests for fresh concrete and hardened concrete. Concrete job-mix design is performed following the DOE (Department of Environmental of U K) and ACI methods. The design of mix also uses mineral additives (fly ash, silica fume). Quality control and methods of concrete application in field are also mentioned. Included in the contents are: methods of concrete repair, high-strength high-quality concrete, and special innovative concrete. Finally, the course also describes knowledge about the use of other materials in buildings.

Competency:

Student will be able to comprehend the use of concrete in construction world, the specification for concrete as structural materials, the characteristics of fresh concrete and hardened one. Student will be also able to design concrete mixture, to excecute the concrete construction properly in field, to control concrete production to the quality specified, and to be able to perform concrete repairing when necessary

1. Mehta, P.K. **,"Mineral Admixture"** Civil Engineering Dept. Univ. of California USA. Neville, Concrete Technology, 1994.
2. Aman Subakti,Bambang Piscesa, Januarti JE, **Teknologi Beton Dalam Praktek**, 2012.
3. Young and Mindness , **Concrete**.
4. Departemen Pekerjaan Umum , **Peraturan Beton Indonesia 1971**.
5. ACI Committee 226, **Silica Fume in Concrete**, ACI Material Journal, 1987.
6. SNI 03-2847-2002, **Tata Cara Perencanaan Struktur Beton untuk Bangunan Gedung**, Departemen Pekerjaan Umum.
7. American Standard Testing Mathod, 2012.

Prerequisite: -

COURSE : TRAFFIC ENGINEERING
CODE : RC09-1325
LOAD : 3 Credits

Course Objectives :
This course contains methods to evaluate performance of traffic in roads, and intersections.

Competency:

1. Student will be able to identify problems related with traffic.
2. Student will be able to identify identify characteristics of components that causing traffic problems.
3. Student will be able to identify analize parameters of traffic.
4. Student will be able to explain methods of traffic surveys and the suvey execution in field.
5. Student will be able to explain the use and regulation for traffic signs, markings, and traffic lights.
6. Student will be able to analize performance of traffic in any urban road, inter-urban, and in expressway.
7. Student will be able to calculate delay ang the length of queue using queuing theory.
8. Student will be able to analize the performance of non-signalized intersection.
9. Student will be able to analize the performance of single trunk.
10. Student will be able to analize theperformance of roundabout.
11. Student will be able to analize the performance of signalized intersection.
12. Student will be able to analize the performance of several coordinated signalized intersections simultaneously.
13. Student will be able to analize the performance traffic management in limited area.

References :

1. Oglesby CH., Teknik Jalan Raya, (translated) Erlangga, Cetakan ke 3, 1993
2. Morlock (1995). **Pengantar Teknik Transportasi** (translated).
3. Tamin, OZ., **Perencanaan dan Pemodelan Transportasi**, ITS Press, Edisi ke dua Tahun 2000
4. **Indonesian Highway Capacity Manual** (IHCM), 1997.

SEMESTER III

COURSE : NATIONALISM
CODE : IG09-1306
LOAD : 2 Credits

Course Objectives:

1. Student will be able to develop their best potential regarding knowledge, skill, and attitude as responsible citizents in apllying their knowledge, profession, and expertise to be proactively participating as part of their community, country, and the world.
2. Student will be able to become smart, democratic, civilized, and rsponsible citizents in achieving natinal competitiveness in the era of globalization. This task will be achieved through the following items :
   a. Basic undersatanding on democratic procedures and their representing houses.
   b. Understanding on the "rule of law" dan basic human rights as they are reflected in seperti tercermin dalam rumusan-rumusan perjanjian dan kesepakatan internasional dan lokal;
   c. Sthrengtening the participative skill to rimpower student in order to both responsing and solving problems with society democratically.
   d. Development ot both democatic cultural and peace in student life.

Competency:

According to the Order by Dirjen Dikti No.43/DIKTI/Kep/2006, the competency of the teaching of Nationalism is to aim the sudents to become professional scientists who possess deep affection to their country and people, also to have sense of civilized democracy, to become competitive citizens with high discipline, and to be able to participate in building the peaceful world based on the principles of Pancasila.

Course Outline :

Phylosophy of Pancasila, National Identity, Rights and Obligation as Citizen, Nation and Constitutional System, Democracy in Indonesia, Basic Human Rights and Rule of Law, Geopolitics of Indonesia, and Geostrategy of Indonesia.

Principal References :

1. Armaidy Armawi, **Geostrategi Indonesia**, Direktorat jenderal Pendidikan Tinggi, Jakarta, 2006;
2. Azyumardi Azra, **Paradigma Baru Pendidikan Nasional dan Rekrontruksi dan Demokratisasi**, Penerbit Kompas, Jakarta, 2002;
3. Bahar, Dr. Saefrodin, **Konteks Kenegaraan, Hak Asasi Manusia**, Pustaka Sinar Harapan, Jakarta, 2000;
4. Cassesse, Antonio, **Human Right In a Change Word**, *Hak-Hak Asasi Manusia di Dunia yang Berubah*, (terjemahan R. Zainudin), Yayasan Obor Indonesia, Jakarta, 1994;
5. Kaelan, **Pendidikan Kewarganegaraan**, UGM Press, Yogyakarta, 2005;
6. Koento Wibisono Siswomihardjo, **Identitas Nasional**, Direktorat Jenderal Pendidikan Tinggi, Jakarta, 2006;
7. Slamet Soemiarno, **Geopolitik Indonesia**, Direktorat Jenderal Pendidikan Tinggi, Jakarta, 2006;

8. Soegito. H.A.T., **Rule of Law**, Direktorat Jendral Pendidikan Tinggi, Jakarta, 2001;
9. _____, **Hak Dan Kewajiban Warga Negara**, Direktorat Jenderal Pendidikan Tinggi, Jakarta, 2006;
10. Udin Saripudin Winatraputra, **Demokrasi dan Pendidikan Demokrasi**, Direktorat Jenderal Pendidikan Tinggi, Jakarta, 2006;
11. PULSE, ITS, 2005 (E-Learning)
12. UUD 1945 dan Perubahannya
13. UU RI No 39 tahun 1999 tentang Hak Asasi Manusia.
14. UU RI No 12 tahun 2006 tentang Kewarganegaraan RI
15. UU RI No 32 Tahun 2004 tentang Otonomi Daerah.
16. UU RI No 10 Tahun 2008 tentang Pemilihan Umum.

COURSE : LAND SURVEYING
CODE : RC09-1331
LOAD : 3 Credits

Course Objectives :

Applying sraight line and right angle in field, measurement of height, azimuth, and coordinate in filed, determination of horizontal position, measure area and volume, and to perform horizontal and vertical alignments, terristical mapping, civil engineering survey, photogrametric mapping, hydrogrametric mapping, and apply least square method in fileld, and introduction with the modern surveying tools.

Competency:

Student will be able to :

- Perform straight line and right angle in field
- Measure height, azimuth, and coordinate in filed, determine horizontal position, measure area and volume, and to perform horizontal and vertical alignments.
- Perform terristical mapping, civil engineering survey, photogrametric mapping, hydrogrametric mapping, and apply least square method in fileld.
- Become familiar with the modern surveying tools.

References :

1. Kissam C.E, Philip, **Surveying for Civil Engineer**, Mcgraw-Hill Book Company, 1981.
2. Wongsotjitro, Soetomo, **Ilmu Ukur Tanah,** Swada Print, 1981.
3. Wolf, Paul R & Charles D. Ghilani, Pearson, **Elementary Surveying**, Prentice Hall, 2012.

COURSE : ENGINEERING MATHEMATICS
CODE : RC09-1332
LOAD : 3 Credits

Course Objectives :

This course contains vector calculus, linier algebra, differential equation, advanced application of integral, double integral, and integration within vector space.

References :

1. Erwin Kreyszig, **Advanced Engineering Mathematics**, 10th edition, John Willey & Son Inc. Singapore, 2010.
2. Howard Anton, **Calculus**, 4th edition, John Willey & Son Inc. Singapore 2005.
3. Steven J. Leon, **Linear Algebra with Application**, MacMilan Publication Company, 2009.

COURSE : FLUID MECHANICS AND HYDRAULICS
CODE : RC09-1333
LOAD : 4 Credits

Course Objectives :

Fluid Mechanics is a branch of Engineering Science, and it consists of statics, kinematics, and dynamics of fluid, in which the fluid here includes luquid and gas substences. This course deals about the movement of fluid due to instability of forces working on the fluid. The method of analysis is based on Newton's Law, the First and Second Law of thermodynamics, the principal of mass conservation, equation related of characteristics of fluid channel, Newton's Law of viscosity, the concept of mixing distance, and friction along the the channel wall. Hydraulics is the other branch of science than study about the behavior of liquid (water) when it is not moving or when it is flowing. The Hydraulics is also part of Civil Engineering scince studying about methods of designing open channel or conduit for water conveyance, which also includes : definition and behavior of fluid, hydrostatics, stability of floating body, equation of energy, continuity and momentum, and the principles of steady uniform flow and gradually varied steady flow.

Competency:

Student will be able to comprehend and apply the principles of fluid mechanics and hydraulics on the design of hydraulic structures, which include design of water gates, stability of floating pontoon, calculating discharge of flow in open channel and conduit, design of open channel and conduit, and calculate the profile of back water.

References :

1. Streater V.L and Benyamin Willie, **Fluid Mechanics**, McGraw-Hill inc.
2. Anggrahini, **Hidrolika Saluran Terbuka**, Citra Media, 2005.
3. Chow, V.T., **Open Channel Hydroulics**, McGraw-Hill, New York, 1959.

COURSE : STATICALLY INDETERMINATE ENGINEERING MECHANICS
CODE : RC09-1334
LOAD : 3 Credit

Course Objectives :
This course contains methods for calculating statically indeterminate structures, which are: method of consistent deformation, three-moment equation, methods of slope deflection and distribution moment, and influence line of continuous beam on statically indeterminate supports using Muller-Breslau's principles.

Competency:
Student will be able to solve problems of statically indeterminate structures using method of consistent deformation for beams, for fixed portals, for swaying symetrical portals, and for trusses; using three-moment equation for continuous beam; to derive the equations and draw the influence lines of continuous beam of statically indeterminate supports; and to find support reactions, shear forces, and support and field moments using simple or superposition methods.

References :

1. Wang, Chu-Kia (2009),**Statically Indeterminate Structures**, McGraw-Hill Book Co.
2. Asslam Kassimali, 2005, Structural Analysis, Thomson.
3. Sidharta, Ananta S (2007), **Modul Ajar Mekanika Teknik** , 2nd edition.
4. Isdarmanu, (2004), **Buku Ajar Mekanika Teknik** , 1st edition.
5. Hibbeler,

Prerequisite : Mechanics of materials (R009 – 1323)

COURSE : TRANSPORTATION PLANNING AND MODELLING
CODE : RC09-1346
LOAD : 2 Credits

Course Objectives :

This course contains the concept of planning the city and regional transportation network, method of performing survey of transportation demand, and application of transportation model for forecasting and controlling transportation demand.

Competency:

Student will be able to explain the concept of planning transportation network for city, metropolitan areas, and regional area between cities. Student will be also able to explain method of travel demand survey to find the pattern of people and vehicle movements in a study area, they will be able to determine and calibrate parameters used for simple transportation modeling, and to perform demand forecasting and control using transportation modeling.

References :

1. Tamin, O.F. (2000) Perencanaan dan Permodelan Transportasi
2. Taafe E.J. and Gauthier Jr, H.L. (1996) Geography of Transportation
3. Dickey (1975) Metropolitan Transportation Planning. Tata Mc Graw-Hill Publishing. New Delhi
4. Black, J. (1981) Urban Transport Planning Theory and Practice. Croom Helm London
5. Simon, J. and Furth, P.G. (1985) "Generating a bus route O-D matrix from on-off data". Journal of Transportation. ASCE.
6. Stopher and Meyburg (1981) Urban Transportation Modeling and Planing

Prerequisite :

- Traffic Engineering (RC09-1325)

SEMESTER IV

COURSE : HIGHWAY AND RAILWAY GEOMETRY
CODE : RC09-1335
LOAD : 2 Credits

Course Objectives :
This course deals about the basics for designing geometry of road and railway that include: design of horizontal and vertical allignment; to design the plan profile of roadway and railway, and to be able to design thikness of road pavement.

Competency:
Student will be able to comprehend the scope and concept in designing roadway and railway, able to design the horizontal and vertical allignments, to design the profile plan of both, and to design thickness of road pavement.

References :

1. Bina Marga, **Perencanaan Geometrik Jalan Luar Kota**.
2. Bina Marga, 1987, **Perencanaan Tebal Perkerasan Lentur Berdasarkan Metode Analisa Komponen**.
3. Satria Sukirman, **Dasar-dasar Perencanaan Geometrik Jalan Raya**
4. SK Menteri PU, Struktur H
5. Spesifikasi Standard

Prerequisite :

- Land surveying (RC09-1331)

COURSE : CONSTRUCTION PROJECT MANAGEMENT
CODE : RC09-1336
LOAD : 2 in Credits

Course Objectives :
This course contains the method managing the civil engineering projects.

Competency:

The student will be able to comprehend types of projects, to understand cycle and management of projects, project stakeholders, and project organization. They will also learn about project management body of knowledge, the concept of feasibility srudy, identification of aspects for project feasibility. The student will also be able to explain the process of planning for project construction, to make detailed cost estimation, to explain various methods in project scheduling and their application, and to observe directly in field the practices of project construction.

References :

1. Soeharto, I, 1997, **Manajemen Proyek: Dari Konseptual sampai Operasional** , Erlangga, Jakarta.
2. Hendrickson, C., dan Au, T., **Project Management for Construction: Fundamental Concepts for Owners**, Engineers, Architects and Builders, Prentice Hall
3. Project Management Institute (2004), **A Guide to the Project Management Body of Knowledge**, 3rd edition, Pennsylvania, USA
4. Kerzner, H, (2006), **Project Management: A Systems Approach to Planning Scheduling and Controlling**, John Willey & Sons, New Jersey.
5. Gray, C.F., dan Larson, E.W., (2008), **Project Management: The Managerial Process**, McGraw-Hill, USA.

Prerequisite : -

COURSE : APPLIED ENGINEERING MECHANICS
CODE : RC09-1336
LOAD : 2 Credits

Course Objectives :
This course deals with the matrix methods on engineering analysis and basics of finite element analysis, and application structural analysis using SAP.

Competency:
Student will be able to use matrix method for general civil engineering application, to understand the history and overview of the strucrural analysis program SAP, and to be able to model civil engr. structures with SAP and to read the results of SAP analysis.

Principal References :
1. Mario Paz "Struktural Dynamic Theory and Computation", 2006 Help Module program SAP 2000

Prerequisite :
- Statically Indeterminate Engineering Mechanics (RC09-1334)

COURSE : SOIL MECHANICS AND FOUNDATION
CODE : RC09-1342
LOAD : 4 Credits

Course Objectives :

This course contains : soil composition and soil classification, effevtive stress concept in soil, stress distribution, soil compressibility, soil shear strength, and design aspects for shallow foundations and deep foundations.

Competency:

Student will be able to classify soils, calculate soil strength, calculate bearing capacity and settlement of shallow foundations under working load, and calculate bearing capacity of pile foundation, driven or bored piles, for many cases in field.

References :

1. Das, Braja M. (2010). **Priciples of Geotechnical Engineering**. PWS Publishers, New York.
2. Das, Braja M. (2011). **Priciples of Foundation Engineering**. 2nd Edition, PWS-Kent Publishing Company, Boston
3. Bowles, Joseph E. (2001). **Foundation Analysis and Design**. 5th Edition. The McGraw-Hill Companies, Inc. New York.
4. Poulos, H. G. and E. H. Davis (1980). **Pile Foundation Analysis and Design**. John Wiley and Sons, New York.

Prerequisite : -

COURSE : HYDROLOGY
CODE : RC09-1343
LOAD : 3 Credits

Course Objectives :

This course explains about : hydrologic cycle of water, including rain, evaporation and infiltration; hydrometry, hydrograph, unit of hydrograph, and the methods of flood design and tracing of the flood routing.

Competency:

The student willbe able to comprehend the meaning of hydrologyc cycle, to analize rain data, calculate water eveporation and infiltration, to estimate discharge of water expected to flow into the river, to calculate discharge of river during flood, and to perform flood routing along the river catchment area.

References :

1. Linsley, R et al, **Hydrology for Engineers**, McGrawHill, Kogakhusa, Ltd, Tokyo, 1982
2. Sosrodarsono, S, **Hidrologi untuk Pertanian**, Pradnya Paramita, Jakarta, 1978
3. Subramanya, K, **Engineering Hydrology**, Tata McGraw-HillPublishing Company Limited, 1994
4. Wilson E.M, **Engineering Hydrology**, Mac Milan Education, Ltd, 1990.

Prerequisite :

- Applied Statistics (RC09- 1322).
- Fluid Mechanics and Hydraulics (RC09-1333)

COURSE : EARTHQUAKE ENGINEERING
CODE : RC09-1344
LOAD : 2 CREDITS

Competency:

The student will be able to describe the cause and mechanism of earthquake, damages produced, relationship among the earthquake magnitude, energy , and frequency of earthquake occurence, and earthquake scale; also to understand the appropiate earthquake zoning of an area, to know design concept for building in eathquake zone, to make analysis of structural response due to dynamic loading, to understand spctral response, to be able to analyze and design earthquake loading for high-rise buildings, and to calculate earthquake influence on civil engineering structures.

References :

1. Mario Paz , **Structural Dynamics Theory and Computation** , 2004.
2. Okamoto, **Fundamental of Earthquake Engineering**
3. Aman Subakti , **Teknik Gempa**
4. Steven L. Kramer , **Geotechnical Earthquake Engineering**

Prerequisite :

Statically Indeterminate Engineering Mechanics (RC09 – 1334)

COURSE : ELEMENTS OF STEEL STRUCTURE
CODE : RC09-1345
LOAD : 3 Credits

Course Objectives :

- Introduction to steel as building material, and mechanical characteristics of steel.
- Designing elements of steel structure, i.e. tensile bar, compression bar, beam element, column; also design of bolted joints end welded joints using LRFD method in accordance with SNI 03-1729-2002.

Competency:

Student will be able to design elements of steel structure, i.e. tensile bar, compression bar, beam element, column; and to design bolted joints and welded joints using LRFD method in accordace with SNI 03-1729-2002.

References :

1. Tata cara Perencanaan Struktur Baja Untuk Bangunan Gedung, **SNI 03-1729-2002**
2. Marwan, Isdarmanu, Diktat **Struktur Baja I**,.
3. Mc Cormack, J.C., Structural Steel Design – LRFD Method, 2nd Edition Harpen Collins College Publishers, 1995.
4. Salmon C.G. and Johnson J.E., **Steel Structures: Design and Behavior, LRFD**, 3rd Edition, Harper Collins Publisher.
5. AISC, latest edition.

Prerequisite :

- Mechanics of materials (RC09-1323)

COURSE : PROJECT FINANCIAL FEASIBILITY STUDY
CODE : RC09-1347
LOAD : 3 Credit

Course Objectives :

The feasibility study of project is intended assess whether a project will be beneficial to the contractor. This course will emphasize on financial aspects of feasibility study, such as: market, engineering, and management aspects. To perform this study, student will also learn about financial source, cash flow, and criterias for evalution of investors.

Competency:

Student will be able to determine feasibility of a project based on financial aspects.

References :

1. Husnan, S , dan Suwarsono Muhammad. 2000. **Studi Kelayakan Proyek**, UPP AMP YKPN, Yogyakarta
2. Pudjawan, Nyoman. 2004. **Ekonomi Teknik**, Guna Widya. Jakarta
3. Sullivan, William G., Elin M. Wicks, dan James T. Luxhoj .2003. **Engineering Economy.** Edisi keduabelas. Prentice Hall. New jersey.

Prerequisite :

- Construction Project mManagement (RC09-1336).

SEMESTER V

COURSE : EMBANKMENT AND EARTH-RETAINING STRUCTURES
CODE : RC09-1351
LOAD : 4 Credits

Course Objectives :
This course contains elements in designing embankment, such as seepage, compaction, and slope stability calculation. Also included are: design of earth retaining structures, design of sheetpile wall, and designing with geotextiles for earth retaining wall.

Competency:
Student will be able to design compaction specificatin and method for embankment, tp compute the amount of water seepage through embankment, to calculate the pore water pressure, and to estimate the stability of the embankment. The student will also be able to compute the stability of sheetpile wall, and to design earth retaining wall using geotextiles as reinforcement.

References :

1. Das, Braja M. (1995). **Principles of Geotechnical Engineeing**. PWS- Kent Publishing Company, New York.
2. Das, Braja M. (1990). **Principles of Foundation Engineering**. 2nd Edition, PWS-Kent Publishing Company, Boston.
3. Bowles, Joseph E. (1996). **Foundation Analysis and Design**. 5th Edition, The Mc Graw-Hill Companies, Inc. New York.
4. Koener, Robert M. (2012). **Designing with Geosyntetics**. 2nd Edition, Prentice-Hall Inc. New Jersey.

Prerequisite :
Soil Mechanics and Foundation (RC09-1342).

COURSE : PRINCIPLES OF COASTAL ENGINEERING AND PORT PLANNING
CODE : RC09-1352
LOAD : 4 Credits

Course Objectives :

This course explains the phenomena occurs along coastal line such as: wave, sea current, tides, and longshore sediment transport. The course of port planning introduce the system of port planning and operation in Indonesia, the terminology applied in port, basic planning of waterways, general cargo terminal, container terminal and passenger terminal

Competency:

The student is able to compute and design dimension and layout of port waterways, and to compute and design berth and equipment requirements and the layout of the general cargo terminal, the container terminal, and the passenger terminal based on the guidance of law of Indonesia as wel as international rule.

References :

1. Undang Undang No.17/2008, PP 61/2009, KM 52/2002, KM 54/2002 .
2. Prof.Ir. Hermann Velsink, 1993, Port and Terminal. TU DELFT.
3. Ernst G Frankl, 1987, Port Planning and Development, John Wiley and Sons.
4. Per Bruun ed., Port Engineering Volume I and Volume II, 1990.
5. Port and Harbour Bureau, Ministry of Transport, Technical Standard for Port and Harbour Facilities in Japan OCDI, 2002.

Prerequisite :

- Applied Statistics (RC09-1322)
- Fluid Mechanics and Hydraulics (RC09-1333)

COURSE : DRAINAGE SYSTEM AND STRUCTURES
CODE : RC09-1353
LOAD : 3 Credits

Course Objectives :
This course is an application of Hydrology and Hydraulics courses, and it deals about method to design drainage system and its supporting structures for city dwelling areas, roads, and airports. Included in this course is the general drainage problems faced by cities. Experience with design is also given through several minor assignments that is to completed with the main assignment of designing dranage system of certain part of a city.

Competency:
Student will be able to design system of drainage for city dwelling area, road, and airport, including the design of supporting drainage structures.

References :

1. ASCE dan WPCF (American Society of Civil Engineers dan The Water Pollution Control Federation), **Design and Construction of Sanitary and Storm Sewers**, 1996.
2. *ASSTHO,* **Pedoman Jalan Raya**, Penerbit Pradnya Paramita Jakarta, 1992.
3. Cendergen, Harry R, **Drainage of Highway and Airfield Engineering Pavement**, John Wiley and Sons, New York, 1974
4. Chow, Ven Te, **Open Channel Hydraulics**, versi Bahasa Indonesia, Penerbit Erlangga, Jakarta 2009.
5. Fair, M.Gordon., Geyer, John C.. Okun, Daniel A., **Water and Wastewater *Engineering,*** *Volume 1*, John Wiley and Sons, Inc, New York, 1966.
6. Fifi Sofia dan Sofyan Rasyid, **Modul Drainase revisi 2008.**
7. Gupta Ram S, **Hydrology and Hydraulic System**
8. Horonyeff, Robert, **Planning and Design Airports**, McGraw-Hill Series in Transportation, New York, 2010.
9. Masduki, Hardjosuprapto M., ***Diktat Kuliah Drainase***.
10. Seelye, Elwyn E., **Data Book For Civil Engineers, Design**, John Wiley & Sons, Inc, New York.
11. Suripin, **Sistem Drainase Perkotaan Yang Berkelanjutan**, Penerbit Andi Yogyakarta, 2004.

Prerequisite :
- Fluid Mechanics and Hydraulics (RC09-1333)
- Hydrology (RC09-1343)

COURSE : ELEMENTS OF REINFORCED CONCRETE STRUCTURES.
CODE : RC09-1354
LOAD : 3 Credits

Course Objectives :
This course is about method to design concrete member of structure that includes dimension, crossection, and reinforcement, due to working inner forces.

Competency:

With this course, Student will be able to:

1. Comprehend the types and characteristics of materials, elements of concrete structural system, and method of Load Resistance Factor Design (LRFD);
2. Comprehend method to obtain stress-strain diagram using elastic method or ultimate-strength method, compute balanced reinforcement ratio for single or double reinforcement of rectangular and non-rectangular shapes, and for reinforcement of T-beam due to pure bending.
3. Comprehend the behavior of one-directional slab and two-directional slab under flexural load and be able to design the demension and reinforcement.
4. Comprehend the behavior of reinforced concrete beam under lateral load, with or without diagonal tension reinforcement, and be able to calculate crossection and reinforcement of simple beam , flexible structural component, and short console.
5. Comprehend the behavior of concrete beam due to tortional moment, and be able to calculate crossection and reinforcement due to tortional moment, and combination of flexural shear and tortional moment.
6. Comprehend the behavior of beam and plate due to delection and crack under working load, including their specifications, and be able to calculate the magnitude of deflection and crack.
7. Comprehend the behavior of columns, i.e. short column and thin column, and be able to design dimension of crossection and reinforcement of coulmns under axial and flexural loads.
8. Comprehend to method to design length of frictional resistance for reinforcement, to calculate the minimum development length of reinforcement, with or without hooks.
9. Comprehend the behavior of various types of reinforced concrete foundation under shear, flexural, and tortional loadings, and be able to calculate their crossections and reinforcements

References :

1. Edward G. Nawy, **Reinforced Concrete a Fundamental Approacch**, 2005.
2. Chu – Kia Wang Charles G. Salmon, **Reinforced Concrete Design**, Sixth Edition, 2007.
3. **SNI 03 – 2847 – 2002** "Tata Cara Perhitungan Struktur Beton untuk Bangunan Gedung".
4. **SNI 03 – 1727 – 2002** " Peraturan Pembebanan Indonesia untuk Gedung ".
5. Kurdian Suprapto " Catatan Kuliah Elemen Struktur Beton Bertulang ".

Prerequisite :
- Concrete and material technology (RC09-1324)

COURSE : STEEL BUILDING STRUCTURES
CODE : RC09-1335
LOAD : 4 Credits

Course Objectives :
Student will be taught to design steel structure warehouse, also to include the use of plate girders and composite members, and to desIgn multy-story steel building using LRFD.

Competency:
Student will be able to calculate steel structure warehouse, steel joints, plate girders, composite girders, and D multy-story steel building. late girder, komposit dan bangunan baja bertingkat.

References :

1. J.C. Smith , **Structural Steel Design – LRFD Approach**, John Willey & Sons. Inc.
2. Mc Cormac, J.C., **Structural Steel Design – LRFD Method**, 2nd Edition Harpen Collins College Publishers, 2011.
3. Ir. A. P. Potma dan Ir. J. E. De Vries , **Konstruksi Baja**
4. SNI 03-1729-2002
5. SNI 03-1727-1989
6. AISC Edisi terbaru

Prerequisite :
- Elements of Steel Structure (RC09-1345)
- Statically Determinate Engineering Mechanics (RC09-1313)

COURSE : MODELING OF SYSTEM FOR CIVIL ENGINEERING
CODE : RC09-1356
LOAD : 2 Credits

Course Objectives :

This course contains definitions about civil engineering system, system analysis, definition about modelling, and application of several operation-research methods for linear programming, transportation modelling, and network analysisi.

Competency :

Student will be able to solve system modeling within the area of civil engineering.

References :

1. Anwar, Nadjadji, **Analisa Sistem dan Penelitian Operasional**, Modul Kuliah, Jurusan T. Sipil FTSP-ITS, 1996.
2. Meredith,D.D., K.W. Wong, R.W. Woodhead and R.H. Worfman, **Design and Planning of Engineering Systems**, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 2008.
3. Ossembruggen, P.J., **Systems Analysis for Civil Engineers**, John Willey & Sons, New York, 1984.
4. Taha, H.A., **Operations Research, on Introduction**, Fifth edition, MacMillan Publishing Company, New York, 1992.

Prerequisite :

- Engineering Mathematics (RC09-1332)
- Construction Project Management (RC09-1336)

SEMESTER VI

COURSE : INTRODUCTION TO ENVIRONMENTAL SCIENCE
CODE : IG09-1309
LOAD : 2 Credits

Course Objectives :

- This course will include :
    - Peoblems with living environment.
    - Concept of ecosystem.
    - Relationship among human, living environment, and development.
    - Policy and Regulation for living environment.
- Also described are the project activities that cause impact to living enviranment, and how to implement civil engineering science and technology to minimize and remedy the damages afflicted to living environment.

Competency:

1. Student will be able to comprehend and expalin the purpose of studying environmental science and its connection with civil engineering activities.
2. Student will be able to relate other disciplines of knowledge to solve problems with living environment using ecological approach.
3. Student will be able to explain the need to perform sustainable development.
4. Student will be able to design environmentally conscious project construction, with as minimum impact to environment.

References :

1. Diktat Pengantar Ilmu Lingkungan, MKU ITS
2. Dasar-dasar Ekologi
3. Peraturan Perundangan yang terkait

Prerequisite :

1. Hydrology (RC09-1343)
2. Soil Mechanics and Foundation (RC09-1342)
3. Drainage System and Structures (RC09-1353)
4. Embankment and Earth-Retaining Structures (RC09-1351).
5. Principles of Coastal Engineering and Harbor Planning (RC09-1352)
6. Traffic Engineering (RC09-1325).

COURSE : IRRIGATION SYTEM AND STRUCTURES
CODE : RC09-1361
LOAD : 4 Credits

Course Objectives :

This course contains :

- Comprehension about how topographical map can be made to describe the general surface flow movement of an area or complex.
- Aspects of hydraulics and hydrology related to the direction and magnitude of flow, and possible changes in flow conditions could be expected in the process of design so that the changes will not be damaging.
- Aspects of capability of the drainage structures selected to convey and withstand the flow, and to inform the result of design by means of drawings

Competency:

- Student will be able to design irrigation system on a designated area and to control the accuracy of their design.
- Student will be able to produce drawings of their design appropriately.

References :

- Standart Perencanaan Irigasi KP. 01 s/d KP. 06 & Petunjuk Perencanaan Irigasi
- Imam Subarkah, **Hidrologi Untuk Perencanaan Bangunan Air** , IDEA DARMA, Bandung
- Sukarto dan Imam Hartoyo, **Ilmu Irigasi 2**, Dep. P7K RI
- Eman Mawardi & Moch. Memed, **Desain Hidraulik Bendung Tetap**, ALFA BETA, Bandung
- USBR, **Design of Small Dam**, US Government Printing Office, 1977.

Prerequisite :

- Hydrology (RC09-1343)
- Fluid Mechanics and Hydraulics (RC09-1333)

COURSE : CONCRETE BUILDING STRUCTURES
CODE : RC09-1362
LOAD : 4 Credits

Course Objectives :
This couse comprises of individual design assignment to support the course Elements of Reinforced Concrete Structure (RC09-1354)

Competency:
Students will be able to design earthquake-resistant structure using special moment resistant frame in accordance with the SNI 2847-2002 dan SNI 03-1726-2002.

References :

1. Purwono, R.; Tavio; I. Imran.; and IGP Raka, **Tata Cara Perhitungan Struktur Beton untuk Bangunan Gedung** (SNI 03-2847-2002) dilengkapi penjelasan (S-2002)," ITS-press, 2007.
2. Purwono, R.; and Tavio, **Evaluasi Cepat Sistem Rangka Pemikul Momen Tahan Gempa**, its press, 2007.
3. BSN, **Tata Cara Perencanaan Ketahanan Gempa untuk Bangunan Gedung," Puslitbang Pemukiman**, 2002.

Prerequisite :
1. Elements of reinforced Concrete Structure (RC09-1354)
2. Earthquake Engineering (RC09-1344)

COURSE : PRESTRESSED CONCRETE STRUCTURES
CODE : RC09-1363
LOAD : 3 Credits

Course Objectives :

This couse explains the design method of prestressed concrete structures elements in accordance with SNI 03-2847-2002 dan SNI 03-1726-2002

Competency:

Student will be able to design presetressed concrete structures element in accordance with SNI 03-2847-2002 dan SNI 03-1726-2002.

References :

1. Purwono, R., Tavio, I. Imran; and IGP. Raka., **Tata Cara Perhitungan Struktur Beton untuk Bangunan Gedung (SNI 03-2847-2002)** dilengkapi penjelasan (S-2002), ITS Press, 2007.
2. Nawy, E. G. **Prestressed Concrete**, Pearson Education, Inc., 2008.
3. Lin, T. Y., and N.H. Burns, **Prestressed Concrete**, McGraw-Hill, 1982.

Prerequisite :

1. Elements of Reinforced Concrete Structure (RC09-1354).

COURSE : HIGHWAY PAVEMENT DESIGN
CODE : RC09-1364
LOAD : 3 Credits

Course Objectives :
This course contains the method to design pavement thickness, design of asphalt job-mix formula, understand the construction method of pavement as well as evaluate the pavement condition.

Competency:
Student will be able to design pavement thickness, design asphalt job-mix formula, understand the construction method of pavement as well as evaluate the pavement condition.

References :

1. Bina Marga, 1987, **Perencanaan Tebal Perkerasan Lentur Jalan Raya dengan Metode Analisa Komponen.**
2. AASHTO, 1993. **Guide for Design of Pavement Structures**, Washington DC.
3. Asphalt Institute, 1983. **Asphalt Technology and Construction Practices**, ES-1, College Park, Md.
4. Yoder & Witzchak , 19.. , **Pavement Design**,
5. Bina Marga, 19.., **Metode Pemeliharaan Jalan**

Prerequisite :
- Traffic Engineering (RC09-1325)

COURSE : CONSTRUCTION METHOD AND TECHNOLOGY
CODE : RC09 – 1365
LOAD : 3 Credits

Course Objectives :

- The scope of this course are as follow :
  - The concept of lay-out planning, logistic and & inventory
  - Construction equipments.
  - The construction method of hydraulic structures such as: open channel, close channel, and reservoir (dam).
  - The construction method of high-rise building, concrete structure, steel structure, and composite structure.
  - The construction method of concrete bridge structure, steel bridge structure, composite bridge structure, and cable stayed bridge structure.
  - The construction method of sub-structures and underground openings.
  - The construction method of railway, harbor wharf, and coastal structure.
- Feld excursions are also added to complement class lectures.

Competency:

5. Student will be able to plan lay-out, logistic and & inventory.
6. Stdent will be able to select suitable construction's equipment as well as to plan construction work sequences in accordance with both time and cost eficiency.
7. Student will be able to devise construction steps regarding various construction project.
8. Student will be able to take proper decision with regard to construction problems.

References :

1. Peurifoy,R. L, **Constuction Planning,Equipment and Method**
2. Susy Fatena R, **Alat Berat untuk Proyek Konstruksi**
3. Rchundly, **Constuction Technology**
4. Khard, M., **Formwork for concrete**
5. Edward R.Strun, **Design and Typical Details of Connections for Precast and Prestress** ,PCI
6. John Breen and Antoine Norman, **External Prestressing in Bridge**
7. Patrick J.Dawling, **Costruction Steel Design**
8. **Manual of Concrete Practice** ,ACI
9. Troistky, M.S., **Prestressed Steel Bridges**
10. Rene Walter, "**Cable Stayed Bridge**"
11. **Pedoman Perencanaan Jembatan**, SNI & SKBI tentang Jembatan.
12. "Ground Water Handbook"
13. "Rock Mechanics"
14. William W. Hang, "**Railroad Engineering**"
15. Coenraad Esveld, "**Modern Railway Track**", MRT Production,2001.
16. Herman Wahyudi, "**Jalan Kereta Api Lanjut**, Sistem dan Fasilitas Jalan Rel", Diktat Kuliah Jurusan Teknik Sipil FTSP-ITS.
17. "**Technical Standard for Port and Harbour Facilities in Japan**", The overseas coastal area development Institut of Japan, 1991.
18. "**Perencanaan, Perancangan dan Pembangunan Pelabuhan**",PT. Pelabuhan Indonesia Persero, 2000.

19. Tomlinson M.J., "**Pile Design and Construction Practice**", A Viewpoint Publication, 2008
20. USBR, **Design of Small Dam**

Prerequisite :

1. Land Surveying (RC09-1331)
2. Highway and Railway Geometric (RC09-1335)
3. Soil Mechanics and Foundation (RC09-1342)
4. Embankment and Earth-Retaining Structures (RC09-1351)
5. Principles of Coastal Engineering and Harbor Planning (RC09-1352)

SEMESTER VII

COURSE : METHOD OF SCIENTIFIC WRITING – INDONESIAN
CODE : IG09-1307
LOAD : 2 Credits

Course Objectives :
This course is expexted to help student to understand about the method to write technical report, including the proposal of Final Project and the Final Project itself.

Competency:
Student will be able to conduct gap analysis so that he/she can write the background and problem statements clearly. The student will be expected to be able to write the first proposal based on the standard format. Additionaly, the student will be expected to present and defend their proposal in front of several reviewers.

References :

1. Sekaran Uma, **Research Methods for Business: A Skill-Building Approach 2nd Edition**, John Wiley & Sons, Inc
2. Direktorat Penelitian dan Pengabdian Kepada Masyarakat Direktorat Jenderal Pendidikan Tinggi, **Panduan Pengelolaan Hibah**.

Prerequisite :

COURSE : BRIDGE ENGINEERING
CODE : RC09-1371
LOAD : 4 Credits

Course Objectives :

This cource contains recent knowledge about the state of the art of the bridge structure, several types of short span bridge and its elements, the method to select the best location of the bridge, the bridge materials, data required regarding the bridge design, the method of bridge design, and the technique to draw the bridge structure's design result.

Competency:

Student will be able to understand about the recent knowledge regarding the state of the art of the bridge design, the types of short span bridge, the way to select best location to install the bridge, the data required in term of bridge design, and the bridge materials. Student is expected to be able to design bridge correctly expecially the steel frame structure bridge and its components as well as drawing the design' result including layout, cross section and details.

References :

1. Johnson Victor, **Essenstials of Bridge Engineering**
2. M.S.Troitsky, **Planning and Design of Bridges**
3. Hool and Kinne, **Movable and Longspan Steel Bridge** .
4. Badan Ltbang Departemen PU, **RSNI T - 02 - 2005**
5. Wai - Fah Chen, **Bridge Engineering Handbook**

Prerequisite :

1. Steel Building Structures (RC09-1355)

COURSE : AIRPORT DESIGN
CODE : RC09-1372
LOAD : 3 Credits

Course Objectives :
Ths course contains methods to design both air side and land side of airport.

Competency:
Student will be able to understand the concept and scope of elements of airport system, to design the layout, explain the classification and configuration of airport, to design air side and land side of airport, to design the thickness of runway's pavement, to calculate the terminal are required, to understand the marking, signing and lighting method as well as to design the drainage system in the airport area.

References :

1. Norman Ashford dan Paul H. Wright., **Airport Engineering**, John Wiley & Sons, Cetakan ke 2, 2011.
2. Robert Horonjeff dan Francis X. McKelvey., **Planning & Design of Ariports,** McGraw-Hill, Inc, Cetakan ke 4, 2010.

Prerequisite :
- Transportation Planning and Modelling (RC09-1346)

COURSE : PLANNING AND PROCUREMENT OF CONSTRUCTION PROJECT
CODE : RC09-1373
LOAD : 3 Credits

Course Objectives :
This course contains input, process and document required during process of planning construction project; mechanism and the preparation of biding document as well as simulation of tender procedure.

Competency:
Student will be able to produce sets of procurement document (technical document: RKS (terms and conditions), schedule; cost estimation and administration document, proposal document, and conduct tender simulation as well as evaluate the tender process.

References :

1. Barry and Paulson, **Manajemen Konstruksi Professional**
2. Keppres 80,2003, **Pengadaan Barang dan Jasa Pemerintah**.

Prerequisite :
- Construction Project Management (RC09-1336)
- Civil Engineering Drawing (RC09-1312)

SEMESTER VIII

COURSE : RELIGION – (ISLAMIC TEACHING)
CODE : IG09-1301
LOAD : 2 Credits.

Course Objectives:

Student will be able to comprehend, attain faith, and practice their religious teachings in daily activities.

Competency:

1. Student will be able to possess faith, high moral, and good conscience, with critical thinking, broad mindedness, and to use their religious techings to identify and solve actual problems.
2. Student will be able to communicate well with others, with independent mind and tollerance in developing hormonious existence with other people.

Course Outline:

(Islamic Religion)

The concept of theism in (Islam). The basic concept of human existence. Law, human rights, and democracy in Islam. Ethics, moral, and human conduct. Science and technology in Islam. Living together among other religious believers. Mature society and people wellfares. Islamic cultures, political system in Islam, the family filosophy in Islam.

Principal References :

1. Departemen Agama RI*, Terjemah* **Al Qur'an**,;
2. Departemen Agama RI**, Panduan Pendidikan Agama Islam di PTU**
3. Tim Dosen Pendidikan Agama Islam ITS, **Kuliah al Islam**;
4. Muslim Nurdin, **Moral dan kognisi Islam**;
5. Yusuf Qardawi, **Karakteristik Islam**;
6. M. Imarah, **Islam dan Pluralitas**;
7. Nur Cholis Majid, **Cita-cita politik Islam**;
8. Hamzah Ya' kub, **Etika Islam**;
9. M. Rosyidi, **Filsafat Islam**.

Supporting References : ---

Prerequisite : ---

COURSE : INTRODUCTION TO TECHNOPRENEURSHIP
CODE : IG09-1311
LOAD : 2 Credits

Course Objectives:

1. To change the mindset of student as job seekers into job creators;
2. To give student the ability to draw a business plan.

Competency:

1. Student will posses mindset as a technopreneurs;
2. Student will be able to draw good business plan.

Course Outline :

Introduction: Definition, types, orientatition, spirit, and behavior of enterpreneur in dealing with risks; Emotional quotient to success; the difference among enterpreneur, technopreneur, and small bussiness. **Mindset Changing:** Positive thinking, changing the perpective by game, to propose alternative solutions. **Success Story to build technopreneurship carrier:** reasons to select the field of bussiness, the benefit as a technopreneurship, soft skill factor needed, how to build competency and network. **Bussiness Opportunity:** Techniques to identify business opportunity, constraints and risks of product and new products, Identification of main stream bussiness. **Bussiness Marketing:** The forming process of marketing strategy (STP and 4P), identification of competition, to win the competition constraints. **Bussiness Management and Legal Aspect of Bussiness:** Identification of the need of business equipment, Identification of qualification of human resources, organization structure design, type of bussiness, legal aspect of business establishment. **Financial Management and business budgeting:** type of accounting book and financial reporting, business feasibility by using NPV, IRR, PP, ARR, cash flow assessment, the benefit of using equity and or third party's loan, Strategy and technique to propose third party's capital. **Bussiness Proposal**.

Principal References :

1. Tim dosen Technopreunership ITS, **Diktat Teknoprenersip;**
2. Yoseph Murphi, **Membangkitkan Kekuatan Bawah Sadar**, Pioner Jaya, 2002;
3. Carol Draeck, **Change Your Mindset Change Your Life**, Serambi, 2006;
4. Wiwoho, **Reframing**, Gramedia, 2005;
5. Michael Lum, **NLP Secret,** Mitra Media, 2008;
6. Sherwood, **Innovation and Creativity,** Elex Media, 2006;
7. Arman Hakim Nasution, **Creative Thinking**, Andi Publisher, 2006;
8. Arman Hakim Nasution dkk., **Membangun Spirit Technopreneurship**, Andi Publisher, 2007.

Supporting References : ---

Prerequisite : ---

COURSE : FINAL PROJECT
CODE : RC09-1380
LOAD : 4 Credits

Course Objectives :
This couse is an exclusive individual project, and it is a partially required as the final examination for S-1 degree. The procedures of the Final Project include writing up the report under supervision of lecturer, and taking final examination by means of performing oral presentation in front of peer audience and defending their Final Project in front of team of examiners.

Prerequisite :
Student shall have passed all courses in Semester VII and before, as well as completed all their individual assignments.

ELECTIVE COURSES

COURSE : FINITE ELEMENT METHOD
CODE : RC09-1400
LOAD : 2 Credits

Course Objectives :
This course contains the application of finite element in solving structural problems related to civil engineering field.

Competency:
Student will be able to develop finite element method in order to analyze structural problems in civil engineering.

References :

1. Weaver, W. and J. M. Gere, **Matrix of Frame Structures,** D. Van Nostrand Company, 1980
2. Reddy, J. N., **Finite Element Method**, John Wiley and Sons, Inc., 2006.
3. Logan, D., **A First Course of Finite Element Analysis**, McGraw-Hill, 2011.
4. Cook et al, Principles of Finite Element Analysis, John Willey and Sons, 2010.

Prerequisite :

1. Applied Engineering Mechanics (RC09-1341)

COURSE : ENGINEERING GEOLOGY
CODE : RC09-1401
LOAD : 2 Credits

Course Objectives :

This course consists of basic concept of geology and endogenic process, rocks, exogenic process, soil and rocks formation process, geological and geotechnical investigation, and field study.

Competency:

- Student will be able to understand about the basic concept of Geology, endogenic and exogenic process, as well as the formation process of both soil and rocks.
- Student will be able to understand geological and geotechnical investigation.

References :

- Billing, MP, **Structural Geology**, 1980.
- Hamblin and Howard, **Earth Dynamics System**, 2004.
- John Pits, HS, **A Manual of Geology for Civil Engineering,** 1984

Prerequisite :

COURSE : GROUND IMPROVEMENT METHOD
CODE : RC09-1402
LOAD : 2 Credits

Course Objectives :

This course contains the method of dealing with special condition of soil including; swelling soil, collapsible soil, improvement of soft soil with various methods, ground improvement by Menard, dealing with peat soil and natural slope improvement as well as rock slope improvement.

Competency:

Student will be able to deal with swelling and collapsible soil regarding sub structure problems, to design ground improvement method of embankment on top of soft soil through preloading, micro pilies, and PVD. Student will also capable in explaining method in dealing with road construction in on top of peat soil, other ground improvement method by Menard, improvement method of natural slope, to evaluate rock slope stability as well as its improvement method.

References :

1. Mochtar, Indrasurya B.(2000). **Teknologi Perbaikan Tanah dan Alternatif Perencanaan pada Tanah Bermasalah (Problematic Soils)** , Jurusan Teknik Sipil FTSP – ITS
2. MacFarlane, Ivan J. (1969). **Muskeg Engineering Handbook**, University of Toronto Press.
3. Menard (2007). **Soil Improvement Specialist, Soltraitement Around the World**, publikasi oleh Menard.
4. ASCE (1996). **Rock Foundation**. ASCE Press.

Prerequisite :

- Soil Mechanics and Foundation (RC09-1342)
- Embankment and Earth-Retaining Structures (RC09-1351

COURSE : ADVANCED FOUNDATION ENGINEERING
CODE : RC09-1403
LOAD : 2 Credits

Course Objectives :

This course contains: mat foundations, cellular cofferdam, Caisson foundation, and foundation on rock mass.

Competency:

Student will be able to design mat foundations, cellular cofferdam, Caisson foundation, and foundation on rocks.

References :

1. Das, Braja M. (2011). **Priciples of Foundation Engineering**. 2nd Edition, PWS - Kent Publishing Company, Boston.
2. Tomlinson, M. J. (2001). **Foundation Design and Construction**. Pearson Prentice Hall.
3. ASCE (1996). **Rock Foundation**. ASCE Press.
4. Smoltczyk, Ulrich (2003). **Geotechnical Engineering Hand Book**: Element and Sructure. Vol. 3. Ernst & Sohn.

Prerequisite :

- Soil Mechanics and Foundation (RC09-1342)

COURSE : DYNAMICS OF FOUNDATIONS
CODE : RC09-1404
LOAD : 2 Credits

Course Objectives :
This course contains vibration theory with 1 and 2 DOF, the calculation of foundation for engine, geotechnical considerations, hole as and active and passive isolation, the pile elactic analysis with the lateral load, introduction to liquefaction, the impact of vibration produced by piling process to the adjacent structure as well as the introcution to Pile Dynamic Analyzer.

Competency:
Student will be able to design foundation for engine by 3 methods of approachs; Linear Elastic Half Space and Linear Lumped Parameter System, identify the impact of shape of foundation, installation, soil force, and lateral soil force. He/she will also able to calculate the dimension of hole as an active and passive isolation, and calculate the dimension of pile-shape hole as an active and passive isolation. Moreover, student is capable in calculating lateral shift, momen shift as well as soil force occurred as the impact of lateral load, understanding the liquefaction phenomenon, understanding the impact of vibration produced by piling process to the adjacent structure as well as understanding about Pile Dynamic Analyser

References :

1. Arya, S., O'Neill, M. dan Pincus, G., (1979), **Design of Structures and Foundation for Vibrating Machines**, MacFarlane, Ivan J. (1969). Muskeg Engineering Handbook, University of Toronto Press.
2. Prakash, S. (1981), **Soil Dynamics**, McGraw-Hill Book Company, chapter 1, dan 9.
3. Richart, F.E., Jr., Hall, J.R., Jr., dan Wood, R.D. (1970),**Vibration of Soils and Foundations**, Prentice Hall Inc.
4. Sidharta, Ananta S. (2009), Course Textbook, **Pondasi Beban Dinamis**, Jurusan Teknik Sipil, FTSP – ITS..

Prerequisite :

- Soil Mechanics and Foundation (RC09-1342)

COURSE : FOUNDATION ON ROCKS
CODE : RC09-1405
LOAD : 2 Credits

Course Objectives :

This course contains the rock characteristic, the calculation of foundation on top of rocks from various point of views including settlement aspect, bearing capacity, sliding stability, and anchorage system.

References :

- Canadian Geothectical Society, **Foundation Engineering Manual**, 1993
- Panet M, **La mechaniques des roches, Appliquee aux auvrages du Genie Civil**, ENPC
- Tomlison M.J, Pile Design and Construction Practice", 2008.

Prerequisite :

- Soil Mechanics and Foundation (RC09-1342)

COURSE : WATER RESOURCE MANAGEMENT
CODE : RC09-1406
LOAD : 2 Credits

Course Objectives :
This course contains knowledge on performing hydrosystem approach in water resource management, so that student will be able to notice the potency and capacity of the hydraulic infrastructures, and to perform and economic feasibility.

Competency:
Student will be able to understand the hydrosystem approach in water resource management, so that they will be able to notice the potency, capacity of infrastructure, and perform the economic feasibility.

References :

1. Anwar, Nadjadji, **Rekayasa Pengembangan Sumber Daya Air**, Penerbit Kartika Yudha, Surabaya, 1986.
2. Linsley, R.K., J.B. Franzini, D.L. Freyberg and G. Tschobanoglous, **Water-Resources Engineering**, Mc Graw-Hill,Inc., New York, 1992.
3. Mays, L.W. and Y.K. Tung, **Hydrosystems Engineering & Management**, Mc Graw-Hill,Inc., New York, 2002.
4. Mays, L.W., **Water Recources Engineering**, John Wiley & Sons, Inc., New York, 2001.

Prerequisite :
- Irrigation System and Structures (RC09-1361)

COURSE : RIVER ENGINEERING
CODE : RC09-1407
LOAD : 3 Credits

Course Objectives :

This course is about study of river from upstream to downstream, which consists of three parts: sediment transport, river engineering, estuary.

From the sediment transport section, the student will learn about flow, distribution of velocity, sediment and water properties, beginning of sediment movement, stable flow channel, the shape and surface roughness of river bed. Furthermore, the formula for calculating sediment transport including bed load, suspended load and total load transport are also given. From the river engineering section, student will learn about river characteristic and its catchment area, and techniques of river training, flood debit, and sediment (debris). From the estuary section, student will learn water circulation and the shape of estuary.

Competency:

Student will comprehend the characteristic of river in terms of water flow and sediment transport, starting from catchment area, uptream to the estuary as well as the problem that might appear due to any anconstruction in the river. Students are also expected to understand the concept of river control. From previous courses, i.e. hydrology and open channel hydraulics, student will be able to apply those knowledges in designing the hydraulic structures to control the river channel, debit and debris.

References :

- Aalst, W. van, **The Closure of Tidal Basin**, Delft University Press, The Netherlands, 1987.
- Chih, Ted Yang, **Sediment Transport Theory and Practice**, McGraw-Hill, New York, 2003.
- Ippen, Arthur T., **Estuary and Coastline Hidrodynamics**, McGraw-Hill, New York, 1966.
- Jansen P. Ph, **Principles of River Engineering**
- Kuiper, Edward, **Water Resources and Project Economics**, Butterworths, London, 1971.
- Rijn, Leo C. van, **Handbook of Sediment Transport,** by Current and Waves, Delft Hydraulic, the Netherlands
- Simons, Daryl B., Senturk, Fuad, **Sediment Transport Technology**, Litho Crafters, Ann Arbor, Michigan USA, 1992.

Prerequisite :

- Irrigation System and Structures (RC09-1361)

COURSE : SMALL DAM AND HYDRO POWER
CODE : RC09-1408
LOAD : 2 Credits

Course Objectives :

This course is offered as enrichment to hydraulic engineering, and it contains:

- Comprehension on maximum utilization of topographic map so that student may obtain more complete picture of multipurpose reservoir in an area.
- The hydraulics aspect related to the magnitude and direction of flow as well as the impact of sedimentation to the reservoir so that preventive measures may be taken prior to any damaging impact.
- The aspect of selecting types of hydraulic structures with ability to stand against working load so that the structures will not be damaged.
- Method to utilize water resourses for hydro power plant and suppoting structures.
- Method to adopt economics theory regarding the development of hydro power.

Competency:

- Student will be able to design reservoir together with supporting structure as well as to control the design itself.
- Student will be able to draw the result of the design.

References :

1. Sudibyo, **Teknik Bendungan**, PT. Pradaya Paramita, 1993
2. Suyono, **Bendungan Tipe Urugan**, PT. Daenippon Gita Karya Printing.
3. USBR, **Design of Small Dam**
4. Patty, **Tenaga Air**

Prerequisite :

- Irrigation System and Structures (RC09-1361)

COURSE : COASTAL STRUCTURE DESIGN
CODE : RC09-1409
LOAD : 2 Credits

Course Objectives :

This course contains wave theory, Longshore Sediment Transport (LST) as the impact of the wave, Sediment transport produced by sea current, Sediment transport produce by current and wave, accumulation of Sediment at the port's access channel, cross-shore transport, coastal morphology, coastal behaviour and coastal structure design.

Competency:

- Able to calculate the speed of water particle in both shallow and deep water sea.
- Able to calculate wave refraction, wave breaking and wave reflection.
- Able to compete wave force by using both Sainflu and Minikindan Goda method.
- Able to calculate the amount of Long shore sediment transport as well as its direction by using CERC method.
- Understanding the emerging process of sediment transport and its distribution.
- Able to calculate the amount of Sedimen transport as the impact of both wave and current.
- Able to calculate the accumulation of Sediment transport at the port's access channel.
- Able to calculate the cross shore sediment tranport.
- Able to analyze and predict the changing of coast line by using single and multi line theory.
- Able to calculate the behavior of stable coastal, erosion or sedimentation and shore protection structure.
- Able to design coastal structure including seawall, groin, detached breakwater.

References :

- W.W. Masie, P.E**, Coastal Engineering** Volume I, II, III Breakwater Design, TU Delft, 1986
- Van Der Velden, E.T.J.M, **Coastal engineering** Volume II, TU Delft, 1995.
- **Shore Protection Manual** Volume I, II Coastal Engineering Research Center, Dept. of The Army, Vicksburg, Mississipi, 1984
- Bambang S, Fuddoly, Sudiwaluyo, Wahyu Herijanto, **Coastal Engineering I**, Diktat kuliah, 1990
- Horikawa, Kiyoshi, Nearshre, **Dynamics and Coastal Processes**, University of Tokyo, 1988
- Van Der Meer, J.W. , "Stability of Breakwater Armour Layers – Design Formula," **Coastal Engineering II**, 1987, pp 219 – 239
- Van Der Meer, J.W., **Rock Slopes and Gravel Beachs Under Wave Attack,** Delft Hydraulics Publications number 396, 1988

Prerequisite : Principles of Coastal Engineering and Harbor Planning (RC09-1352).

COURSE : DUCTILE STEEL STRUCTURES
CODE : RC09-1410
LOAD : 2 Credits

Course Objectives :
This course contains basic principles of ductile steel structure analysis including stiffening frame, symmetric and asymmetric frame, moment resistant truss and its detail with its application based on earthquake codes in Indonesia.

Competency:
Student will be able to analyse steel frame including stiffening frame, symmetric and asymmetric frame, momen absorber and its detail with its application based on earthquake codes in Indonesia.

References :

- AISC. (1997, 2005) : **Seismic Provisions for Structural Steel Building**, American Institute of Steel
- Applied Technology Council (ATC) 40. (1996) : *Seismic Evaluation and Retrofit of Concrete Buildings,* **ATC-40, ATC, Vol.1,2,** Redwood City, CA.
- Beedle, L.S. (1958) : **Plastic design of Steel Frames**, John Wiley and Sons, New York.
- Bruneau, M., Uang, C.M., dan Whittaker, A. (1998) : **Ductile Design of Steel Structures**, McGraw-Hill
- Englekirk, R. (1994) : **Steel Structures, Controlling Behavior Through Design**, John Wiley and Sons, New York
- **Perencanaan Struktur Baja untuk Bangunan Gedung Menggunakan Metoda LRFD**. (2000) : Laboratorium Mekanika Struktur, Pusat Penelitian Antar Universitas, Bidang Ilmu Rekayasa, ITB, Bandung.

Prerequisite : Steel Building Structures (RC09-1355)

COURSE : LONG SPAN BRIDGE STRUCTURES
CODE : RC09-1411
LOAD : 2 Credits

Course Objectives :
This course contains introduction to the principles of long span bridge (≥120m) design as well as its construction method. This course covers arch bridge, cable stayed bridge, pre-stressed concrete bridge, and prestressed steel bridge.

Competency:
Student will be able to understand the principles of design and construction of long span bridge (≥120m).

References :

1. Hool, G.A and Kinne, W.S. (1943), **Movable and Long-Span Steel Bridges,** McGraw-Hill, New York
2. Pugsley, S.A. (1968), **The Theory of Suspension Bridges**, 2.nd Ed, Edward Arnold, London
3. Podolny, W. and Scalzi, J.B. (1976). **Construction and Design of Cable Stayed Bridges**, John Wiley
4. Troitsky, M.S. (1990), **Prestressed Steel Bridges : Theory and Design**, Van Nostrand Reinhold,
5. Walther, R et.al (1999), **Cable Stayed Bridges**, Thomas Telford, London.

Prerequisite : Bridge Engineering (RC09-1371)

COURSE : TIMBER STRUCTURES
CODE : RC09-1412
LOAD : 2 Credits

Course Objectives :

This course contains the knowledges related to the properties of wood as a construction material, basic wood structural design, codes regarding wood structure design, detail design of wood as the structure component, design of joint, and various types of joint.

Competency:

Student will be able to design and control the reliability of building structure and to design the component of timber structure.

References :

1. SNI 03-3527-1994,**Mutu kayu bangunan**
2. SNI-14 2023-1990,**Kayu lapis struktural**-1999
3. SNI-03-1726-1989, **Tata cara perencanaan ketahanan gempa untuk rumah dan gedung.**
4. SNI-03-1727-1989, Tata cara perencanaan pembebanan untuk rumah dan gedung.
5. Howard J.Hansen: **Modern Timber Desing**.
6. **Wood Handbook**,Agriculture Handbook No.72,USA.

Prerequisite : -

COURSE : MASS TRANSPORT AND TRANSPORTATION FACILITY
CODE : RC09-1413
LOAD : 2 Credits

Course Objectives :
This course contains the system and the performance of mass transport including route system, mode, ROW, preferential treatment system, stops, calculation of performance indicators, mass transportation management, demand analysis for pedestrian, bikeway, toll booth, parking facilities, rest area, passenger and cargo terminal, and container terminal.

Competency:
Student will be able to analyse mass transport system including route system, mode, ROW, preferential treatment system, stops, calculation of performance indicators, mass transportation management, demand analysis for pedestrian, bikeway, toll booth, parking facilities, rest area, passenger and cargo terminal, and container terminal.

References :

- Vuchic, V.R. (2007) **Urban Transportation Planning System and Technology**
- Abubakar, I. et al (1995) **Menuju Lalu Lintas dan Angkutan Jalan yang Tertib**. Departemen Perhubungan
- NAASRA (1988) **Guide to Traffic Engineering Practice**.
- Giannopoulos, G.A. (1989), **Bus Planning and Operation in Urban Areas: A Practical Guide**. Avebury.

Prerequisite :
- Transportation Planning and Modeling (RC09-1346).
- Traffic Engineering (RC09-1325)

COURSE : HIGHWAY ECONOMICS
CODE : RC09-1414
LOAD : 2 Credits

Course Objectives :

This course contains the method to calulate user costs benefits as the impact of either betterment or development new road infrastructure projects. Morever, based on those benefits and the cost, the economic and financial analysis of those projects is carried out as the part of Feasibility Study. This course will discuss about case studies with regard to feasibility study of road projects.

Competency:

Student will be able to understand the concept of highway economy, generalized cost, before-after approach (do nothing-do something, existing-planning). He/she will also be abe to calculate the changing of generalized cost due to the changing of the both geometric and the capacity of the road, so that he/she can calculate the benefits/savings taken place. Additionally, he/she will be able to asses the toll fee needed based on the user cost benefits as well as capital invested.

References :

- Oglesby C.H.dan R.G. Hicks , **Teknik Jalan Raya**, Erlangga, Ceetakan ke 3, 1993
- Tamin, O.Z., **Perencanaan dan Pemodelan Transportasi**, Penerbit ITB Press, Edisi ke dua Tahun 2000.
- N.D. Lea Consultant & Associates Ltd. **Traffic Economic Studies and Analyses, Road Improvement Project**, Draft Final Report 1975
- Pacific Consultant Internatonal Consultant, **Surabaya-Mojokerto Toll Road.**
- DeGarmo E.P, W.G. Sullivan, J.R. Canada, **Engineering Economic**, Seventh edition, 1994.
- Kartika A.A.G, Modul **Ekonomi Jalan Raya**, Jurusan Teknik Sipil ITS, 2006

Prerequisite :

- Project Financial Feasibility Study (RC09-1347)
- Traffic Engineering (RC09-1325)
- Transportation Planning and Modeling (RC09-1346)

COURSE : PORT FACILITIES
CODE : RC09-1415
LOAD : 2 Credits

Course Objectives :
The course introduce the overall technical method to design port facilities starting from survey method and analysis continued with design of jetty structure including fender and bollard, quay-wall, sheet-pile, breakwater structure, dredging, and navigation aids.

Competency:
The student will be able to compute and design from the foundation (sub structure) to the upper structure and the construction procedure of the jetty, the quay-wall, sheet-pile, and the breakwater including analyzing data, evaluating the lay out, analyzing dredging requirement and navigation aid implementation.

References :

1. Alonzo De F Quinn, 1977, Port Engineering
2. Per Bruun, Port Engineering, Gulf P.C., 1981.
3. Thoresen, C. A., Port Design, Tapir Publisher, 1988.
4. Per Bruun ad., Port Engineering Volume I and Volume II, 1990.
5. Port and Harbour Bureau, Ministry of Transport, Technical Standard for port and Harbour Facilities in Japan OCDI, 2002.
6. Herbich, Dredging Engineering, 2000.

Prerequisite :
Principle of Coastal Engineering and Harbor Planning (RC09-1352)

COURSE : RAILWAY ENGINEERING
CODE : RC09-1416
LOAD : 2 Credits

Course Objectives :
Student have capability in design railway construction and emplacement lay-out

Competency:
- Able to design railway construction
- Able to plan signal and sign
- Able to plan emplacement lay-out

Course Outline:
- Track elements
- Signal and sign planning concept
- Emplacement and stations planning concept

Principal References :

1. Wahyudi, H (1993) Teknik Jalan Rel. Diktat Teknik Sipil ITS
2. Hapsoro, S (2000) Jalan Kereta Api

Prerequisite :
Highway and Railway Geometrics (RC09-1335)

COURSE : UTILITY
CODE : RC09-1417
LOAD : 2 Credits

Course Objectives :
Water, fire prevention system, transportation system inside building, air-conditioned system, lighting system, acoustical system, and sound system

Prerequisite **:** - Civil Engineering Drawing (RC09-1312)

COURSE : LEGAL ASPECTS IN CONSTRUCTION MANAGEMENT
CODE : RC09-1419
LOAD : 2 Credits

Course Objectives :
This course contains the definition, characteristic and types of contract; conflict might appear during the project contract period, the mechanism to solve the conflict, and the claim assesment. It also contain the regulation regarding construction services including water related structure construction, bridge constructio, and bulding construction.

Competency:
Student will be able to understand the definition, characteristic and types of contract so that she/he can prepare simple construction contract based on the contract requirement mention in Goverment Regulation as well as can assess the claim that might appear. Additionally, student will understand the regulation relating to the civil engineering codes and construction services.

References :

3. Barry and Paulson, Manajemen Konstruksi Professional
4. FIDIC
5. Jervis, Levin , 1988, Construction Law
6. Undang-undang Jasa Konstruksi, 1999.

Prerequisite :

- Construction Project Management (RC09-1336).

COURSE : SPECIAL TOPICS
CODE : RC09-1420
LOAD : 2 Credits

Course Objectives :
Construction project is in the dinamic condition. The knowledge and science regarding the construction project are continuously growing to answer problems in terms of construction projects. Those knowledge and science must be shared to all parties involving in construction management project. This course is held to facilitate student to understand recent knowledge and science within the construction project management through discussing recent topic regarding construction project management.

Competency:
Student will comprehend and be able to explain the more recent topics in construction project management

References :
1. Literatures related to operational management in construction world
2. Literatures related to the recent innovation in construction world
3. Literatures related to recent construction technology
4. Literatures related to recent method of analysis in construction world

Prerequisite :
1. Planning and Procurement of Contruction Project (RC09-1373)
2. Modelling of System for Civil Engineering (RC09-1356)
3. Applied Statistics (RC09-1322)

COURSE : MAINTENANCE OF CIVIL ENGINEERING STRUCTURES
CODE : RC09-1421
LOAD : 2 Credits

Course Objectives :
This course contains the maintenance procedure of civil engineering structures, including bridge, building, road, and hydraulic structure.

Competency:
Students will be expected to be able to identify the type/level of decay/damage/deterioration as well as to measure the rate of damage of civil construction. Additionally, students will be introduced to the methods of maintenance and rehabilittation based on the type of damage.

References :
1. BMS, 1993, Bridge Inspection Manual

Prerequisite :
1. Drainage System and Structures (RC09-1353)
2. Highway Pavement Design (RC09-1364)
3. Concrete Building Structures (RC09-1362)
4. Bridge Engineering (RC09-1371)

COURSE : CONSTRUCTION PROJECT CONTROL AND MONITORING
CODE : RC09-1418
LOAD : 2 Credits

Course Objectives :
This course contains both supervision and controlling aspect of construction project as a part of project life cycle. In this course, students will be introduced with cost control, time control and quality control together with their method to control. Additional this course will discuss about scoupe control, project administration and K3 (safety, security of work) as well as the understanding of reporting process to meet the required criteria.

Competency:
Student will understand about both supervision aspect and controlling aspect of construction project as well as able to analize project performance.

References :
1. Gray, C.F., dan Larson, E.W.,(2008), Project Management : The Managerial Process, McGraw-Hill, USA.;
2. Soeharto, I, 1997, Manajemen Proyek : Dari Konseptual sampa Operasional, Erlangga, Jakarta.;
3. Project Management Institute (2004), A Guide to the Project Management Body of Knowledge, 3rd edition, Pennsylvania, USA.;
4. Kerzner, H, (2006), Project Management : A System Approach to Planning Schedulling and Controlling, John Willey & Sons, New Jersey.

Prerequisite :
- Planning and Procurement of Construction Project (RC09-1373)