COURSES	CODE	: BASIC STATISTIC-CS234101
	CREDITS	: 3 CREDITS
	SEMESTER	: I (ODD)

COURSE DESCRIPTION

This course provides basic knowledge about various probability distributions. In addition, it also provides briefing to students to calculate sampling distributions, estimating parameters, regression & correlation and testing hypotheses and also gives students the ability to apply statistic application program.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to understand basic sciences consept, mathematic principels, theoretical science-engineering and engineering principles in the field of civil engineering;
2. Able to plan and design infrastructure based on engineering principles that apply modern engineering methods, skills and tools by considering technical standards, performance, reliability, ease of implementation.

COURSE LEARNING OUTCOMES

Students are able to calculate probabilities, solve probability events, calculate sampling distributions, estimate parameters, perform regression and correlation, and test hypotheses using statistical software.

MAIN SUBJECT

1. The concept of probability;
2. Normal distribution;
3. Sampling Distribution;
4. Parameter estimation;
5. Hypothesis testing;
6. Regression & Correlation Analysis; and
7. Statistical Aid Program.

PREREQUSITES

None

REFERENCES

1. Ang, A.H.S, and Tang, W.H. (2007), **"Probability Concepts in Engineering: Emphasis on Application in Civil & Environmental Engineering"**. 2nd Edition, John Wiley & Sons.
2. P. Mann (2010) , **" Introductory Statistic"**, John Wiley & Sons.
3. Ukestiyatno. (2014). **"Statistika Dasar"**.1st Edition, Andi Offset.

COURSES	CODE	: INTRODUCTION TO GEOLOGY-CSS234102
	CREDITS	: 2 CREDITS
	SEMESTER	: I (ODD)

COURSE DESCRIPTION

This course covers the formation of minerals, rocks, and soils; types of rocks on Earth's surface and the rock cycle; the theory of plate tectonics; Earth's crust deformation and earthquakes; the geologic time scale; occurrences of soils worldwide and in Indonesia; field geological investigations; and knowledge about the global warming process.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to assess and utilize knowledge and technology to apply them in a specific field of expertise, and capable of making well-informed decisions from one's own work as well as group work through logical, critical, systematic, and innovative thinking.
2. Able to self-manage learning and continuously develop oneself as a lifelong learner to compete at the national and international levels, with the aim of making a significant contribution to solving problems while considering sustainability principles..
3. Able to master the concepts of natural science, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.
4. Able to communicate effectively both orally and in writing.

COURSE LEARNING OUTCOMES

1. Able to explain the origins of the formation of rocks, continents, and oceans in the world.
2. Able to explain the basic principles behind the occurrence of volcanoes and earthquakes in Indonesia.
3. Able to predict soil types in Indonesia in a general sense before conducting field soil investigations.
4. Able to mention types of geological field investigations.
5. Able to explain the causes and consequences of global warming.

MAIN SUBJECT

1. Mineral Formation of Rocks and Soils
2. Types of Rocks on Earth's Surface and the Rock Cycle
3. Theory of Plate Tectonics
4. Deformation of Earth's Crust and Earthquakes
5. Geologic Time Scale
6. Soil Occurrences Worldwide
7. Soil Occurrences in Indonesia
8. Field Geological Investigations
9. Knowledge about the Global Warming Process

PREREQUSITES
None.
REFERENCES
1. Sheldon Judson, Kenneth S. Deffeyes, & Robert H. Hargraves (1990). **Physical Geology.** **2.** Thompson & Turk (1998). **Introduction to Physical Geology.** 3. Alan E. Kehew (2021). **Geology for Engineers and Environmental Scientist**.

COURSES	CODES	: COMPUTER PROGRAMMING-CS234103
	CREDITS	: 3 CREDITS
	SEMESTER	: I (ODD)

COURSE DESCRIPTION

This course covers: computer applications and programming.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to master the concepts of natural science, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.
2. Able to planning and designing infrastructure based on engineering principles that apply modern methods, skills, and technical tools while considering technical standards, performance, reliability, and ease of implementation.

COURSE LEARNING OUTCOMES

1. Students are able to use up-to-date software and applications to optimize their roles as students and as engineers.
2. Students are capable of using logic skillfully in the context of computer programming.

MAIN SUBJECT

1. Understanding Indeterminate Static Structures
2. Slope-Deflection Method
3. Structural Analysis Using Matrix Methods
4. Structural Modeling Using Auxiliary Programs
5. Structural Loading (Including Earthquake Loads)
6. Running Auxiliary Programs
7. Reading and Verifying the Output Results of Auxiliary Programs

PREREQUSITES

None.

REFERENCES

1. help file evernote
2. help file google product
3. help file microsoft product
4. help aplikasi program di android
5. https://www.tutorialspoint.com/python/index.htm

COURSES	CODES	: ENGINEERING MECHANICS-CS234104
	CREDITS	: 3 CREDITS
	SEMESTER	: I (ODD)

COURSE DESCRIPTION

This course covers: equilibrium conditions, reactions, equilibrium criteria, internal forces (moment, shear, axial), inclined beams, function loads, influence lines, maximum bending moments, indirect supports, Gerber beams, 3-hinged arches, and simple truss structures.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to demonstrate attitudes and character that reflect: devotion to the One Almighty God, noble manners, sensitivity and concern for social and environmental issues, appreciation for cultural differences and diversity, upholding the rule of law, prioritizing the interests of the nation and the broader society, through innovation, creativity, and other potential abilities.
2. Able to evaluate and utilize knowledge and technology for the purpose of applying them to specific areas of expertise, as well as being capable of making well-informed decisions based on individual work or group efforts through logical, critical, systematic, and innovative thinking.
3. Able to manage self-directed learning and develop oneself as a lifelong learner to compete at the national and international levels, with the aim of making a real contribution to problem-solving while considering sustainability principles.
4. Able to master the concepts of natural science, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.
5. Able to communicate effectively both orally and in writing.

COURSE LEARNING OUTCOMES

1. Able to understand the concept of force equilibrium.
2. Able to analyze and draw internal forces in beams, portals, and truss structures.
3. Able to analyze and draw influence lines.

MAIN SUBJECT

1. Support conditions, reactions, equilibrium criteria
2. Internal forces (moment, shear, axial)
3. Inclined beams, function loads
4. Influence lines
5. Maximum moment of maximum moments
6. Indirect supports
7. Gerber beams, 3-hinged arches
8. Simple truss structures

PREREQUSITES
None.
REFERENCES
1. Armenakas, Anthony E (1988). "**Classical Structural Analysis "** , McGraw Hill, Singapore. 2. Hibbeler, R.C. (2006). " **Structural Analysis** " 6th Edition , Prentice Hall, Singapore 3. Kassimali, Aslam. (2011)." **Structural Analysis** ". 4th Edition. Cengage Learning, USA . 4. Samuel E. French (1996). "**Determinate Structure Statics, Strength, Analysis, Design".** Copyright by Delmar Publisher a division of International Thomson Publishing Inc. **5.** Triwulan, **Mekaika Statis Tertentu**

COURSES	CODES	: CHEMISTRY-SK234102
	CREDITS	: 3 CREDITS
	SEMESTER	: II (EVEN)

COURSE DESCRIPTION

This course covers the basic concepts of chemistry, atomic models and structures, electron configurations and chemical bonding, states of matter and phase changes, stoichiometry and chemical reactions, solutions, concentration, colligative properties, chemical equilibrium, acid-base theory, ionic equilibrium in solutions (acid-base, solubility, complexes, and precipitation), chemical thermodynamics, chemical kinetics, and electrochemistry

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to demonstrate attitudes and character that reflect: devotion to the One Almighty God, noble manners, sensitivity and concern for social and environmental issues, appreciation for cultural differences and diversity, upholding the rule of law, prioritizing the interests of the nation and the broader society, through innovation, creativity, and other potential abilities.
2. Able to evaluate and utilize knowledge and technology for the purpose of applying them to specific areas of expertise, as well as being capable of making well-informed decisions based on individual work or group efforts through logical, critical, systematic, and innovative thinking.
3. Able to manage self-directed learning and develop oneself as a lifelong learner to compete at the national and international levels, with the aim of making a real contribution to problem-solving while considering sustainability principles.
4. Able to master the concepts of natural science, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.

COURSE LEARNING OUTCOMES

1. Students are able to use the basic principles of chemistry as a foundation for studying related scientific fields.
2. Students can perform basic chemical calculations.

MAIN SUBJECT

1. Basic Chemistry Concepts, Atomic Models, and Atomic Structure.
2. Electron Configuration and Chemical Bonding.
3. States of Matter and Phase Changes.
4. Stoichiometry and Chemical Reactions.
5. Solutions and Concentration.
6. Colligative Properties.

7. Chemical Equilibrium.
8. Acid-Base Theory.
9. Ionic Equilibrium in Solutions (Acid-Base, Solubility, Complexes, and Precipitation).
10. Chemical Thermodynamics, Chemical Kinetics, and Electrochemistry.

PREREQUSITES

None.

REFERENCES

1. D. W. Oxtoby, H.P. Gillis and A. Champion**,"Principles of Modern Chemistry",** 7th edition, Mary Finc.,USA, 2012
2. R. Chang, "**Chemistry", 7th edition**, McGraw Hill, USA, 2009.
3. D. E. Goldberg, "**Fundamental of Chemistry"**, Mc Graw Hill Companies, 2007.I. Ulfin,
4. I. K. Murwani, H. Juwono, A. Wahyudi dan F. Kurniawan, **"Kimia Dasar"**, ITS Press, Surabaya, 2010.

COURSES	CODES	: HYDROLOGY-CS234201
	CREDITS	: 2 CREDITS
	SEMESTER	: II (EVEN)

COURSE DESCRIPTION

This course provides knowledge about the hydrological cycle, climatological data, as well as types and kinds of meteorological data recording instruments.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to demonstrate attitudes and character that reflect: devotion to the One Almighty God, noble manners, sensitivity and concern for social and environmental issues, appreciation for cultural differences and diversity, upholding the rule of law, prioritizing the interests of the nation and the broader society, through innovation, creativity, and other potential abilities.
2. Able to assess and utilize knowledge and technology to apply them in a specific field of expertise, and capable of making well-informed decisions from one's own work as well as group work through logical, critical, systematic, and innovative thinking.
3. Able to self-manage learning and continuously develop oneself as a lifelong learner to compete at the national and international levels, with the aim of making a significant contribution to solving problems while considering sustainability principles.
4. Able to understand basic sciences consept, mathematic principels, theoretical science-engineering and engineering principles in the field of civil engineering.
5. Able to communicate effectively both orally and in writing.
6. Able to work in a multidisciplinary and multicultural team.

COURSE LEARNING OUTCOMES

1. Able to understand the hydrological cycle.
2. Able to understand climatological data.
3. Able to understand the types and types of climatological data recording instruments.

MAIN SUBJECT

1. Hydrological Cycle
2. Climatological Data
3. Meteorological Data Recording Instruments

PREREQUSITES

None.

REFERENCES

1. Sri Harto Br. (1993). Analisis Hidrologi. PT Gramedia REFERENCESUtama, Jakarta
2. Soewarno (1995). Hidrologi. Penerbit Nova, Bandung

COURSES	CODES	: TRAFFIC AND TRANSPORTATION ENGINEERING – CS234202
	CREDITS	: 2 CREDITS
	SEMESTER	: II (EVEN)

COURSE DESCRIPTION

This course contains information on traffic data collection methods; road section capacity and performance calculations, as well as intersection traffic; road traffic safety; traffic management; land use, transportation networks, and services; transportation control systems and policies; demand systems; and the fundamentals of transportation modeling.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to master natural science concepts, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.
2. Able to plan and design infrastructure based on engineering principles that apply modern methods, skills, and tools, taking into account technical standards, performance, reliability, and ease of implementation.
3. Able to communicate effectively both orally and in writing.
4. Able to work in multidisciplinary and multicultural teams..

COURSE LEARNING OUTCOMES

1. Able to understand traffic data collection techniques.
2. Able to calculate parameters for traffic performance on road sections and intersections.
3. Able to understand concepts related to traffic safety.
4. Able to understand traffic management concepts.
5. Able to understand transportation systems.
6. Able to understand the fundamentals of transportation modeling.

MAIN SUBJECT

1. Traffic and Transportation Overview.
2. Traffic Data Collection Techniques.
3. Road Section Capacity and Performance Calculations.
4. Intersection Traffic Capacity and Performance Calculations.
5. Road Traffic Safety.
6. Traffic Management.
7. Land Use, Transportation Networks, and Services Systems.
8. Transportation Control Systems and Policies.
9. Demand Systems.
10. Fundamentals of Transportation Modeling.

PREREQUSITES
None.
REFERENCES
1. _____, Undang-undang No. 22 Tahun 2009 Tentang Lalu Lintas dan Angkutan Jalan, 2009 2. _____, Undang-undang No. 38 Tahun 2004 Tentang Jalan, 2004 3. F.D. Hobbs, “Perencanaan dan Teknik Lalu Lintas” 4. Louis J. Pignataro, “Traffic Engineering” 5. C. Jotin Khisty, “Transportasi Engineering” 6. Morlock, “Pengantar Teknik Transportasi”, 1995 7. L.R. Kadiyali, “Traffic Engineering and Transport Planning” 8. Tamin, O.F., “Perencanaan dan Pemodelan Transportasi”, 2000 9. Taaffe E.J. and Gauthier Jr, H.L., “Geography of Transportation”, 1973 10. Dickey, “Metropolitan Transportation Planning”, 1975 11. Black, J., “Urban Transport Planning Theory and Practice”, 1981 12. Simon, J. and Furth, P.G., “Generating a bus route O-D matrix from on-off data. Journal of Transportation”, 1985 13. Ortuzar, J.deD. And Willumsen, L.G., “Moselling Transport”, 1990 14. Stopher and Meyburg, “Urban Transportation Modeling and Planning”, 1975

COURSES	**CODES**	**: MECHANICS OF MATERIALS-CS234204**
	CREDITS	**: 3 CREDITS**
	SEMESTER	**: II (EVEN)**

COURSE DESCRIPTION

This course covers the calculation of stress and strain, bending stress in beams, shear stress in beams, torsional stress, stress combinations, plane stress analysis, design of bars based on stress, deformation of statically determinate beams, and the stability of compression members.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to demonstrate attitudes and character that reflect: devotion to the One Almighty God, noble manners, sensitivity and concern for social and environmental issues, appreciation for cultural differences and diversity, upholding the rule of law, prioritizing the interests of the nation and the broader society, through innovation, creativity, and other potential abilities.
2. Able to evaluate and utilize knowledge and technology for the purpose of applying them to specific areas of expertise, as well as being capable of making well-informed decisions based on individual work or group efforts through logical, critical, systematic, and innovative thinking.
3. Able to manage self-directed learning and develop oneself as a lifelong learner to compete at the national and international levels, with the aim of making a real contribution to problem-solving while considering sustainability principles.
4. Able to master the concepts of natural science, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.
5. Able to communicate effectively both orally and in writing.

COURSE LEARNING OUTCOMES

1. Able to analyze stress and strain in surfaces
2. Able to analyze deformation in simple beams
3. Able to analyze the stability of compressed rods

MAIN SUBJECT

1. Stress and Strain
2. Bending Stress in Beams
3. Shear Stress in Beams
4. Torsional Stress
5. Stress Combinations
6. Plane Stress Analysis
7. Design of Bars Based on Stress
8. Deformation of Beams

9. Stability of Compression Members
PREREQUSITES
1. Engineering Mechanics 2. Calculus 1
REFERENCES
1. E.P Popov, "Mechanics of Materials", Prentice Hall Inc., 2nd edition, 1976 2. Timothy A. Philpot "Mechanics of materials", 2008 3. JM Gere, "Mechanics of Materials", 8th Edition.

COURSES	CODES	: CALCULUS 3-CS234301
	CREDITS	: 3 CREDITS
	SEMESTER	: III (ODD)

COURSE DESCRIPTION

This course is about matrices, vectors, eigenvalues, and differential equations.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to assess and utilize knowledge and technology in order to apply them in a specific field of expertise, and capable of making informed decisions based on individual and group work results through logical, critical, systematic, and innovative thinking.
2. Able to self-manage learning and develop oneself as a lifelong learner to compete at the national and international levels, with the aim of making a real contribution to solving problems while considering sustainability principles.
3. Able to master the concepts of natural science, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.

COURSE LEARNING OUTCOMES

1. Able to solve linear equation systems.
2. Able to solve 2D and 3D vector equations.
3. Able to solve differential equations.

MAIN SUBJECT

1. Matrix.
2. Vector.
3. Eigen value.
4. Differential equation.

PREREQUSITES

None.

REFERENCES

1. Anton, Howard. "**Aljabar Linear Elementer**" Terjemahan Refina Indriasari, Irzam Harmein, dkk. Edisi 5. Erlangga, Jakarta. 1997.
2. Clements, D. & Sarama, J. (2009). **Learning and teaching early math: the learning trajectories approach.** New York: Routledge.
3. Ekawati, R., Lin, F. & Yang, K. (2014). **Developing an instrument for measuring teachers' mathematics content knowledge on ratio and proportion: a case of Indonesian primary teachers**. International Journal of Science and Mathematics Education. National Science Council, Taiwan

COURSES	CODES	: NUMERICAL METHODS-CS234302
	CREDITS	: 2 CREDITS
	SEMESTER	: III (ODD)

COURSE DESCRIPTION
This course contains topics on calculating linear algebraic equations, interpolation, regression, root-finding equations, numerical integration, initial value problems, and an introduction to optimization.
GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE
1. ble to master the concepts of natural science, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering. 2. Able to plan and design infrastructure based on engineering principles, applying modern methods, skills, and technical tools while considering technical standards, performance, reliability, and ease of implementation.
COURSE LEARNING OUTCOMES
Students are able to calculate linear algebraic equations, interpolation, regression, root-finding equations, numerical integration, initial value problems, and introduction to optimization.
MAIN SUBJECT
1. Introduction. 2. System of Linear Algebraic Equations. 3. Interpolation. 4. Regression. 5. Root-Finding Equations. 6. Numerical Integration. 7. Initial Value Problems. *8.* Introduction to Optimization
PREREQUSITES
1. Calkulus 1. 2. Calkulus 2.
REFERENCES
1. W. F. Riley and L. Zachary, **Introduction to Mechanics of Materials**, Wiley & Sons, Inc., New York, 1989. 2. K. N. Tong, **Theory of Mechanical Vibration**, Wiley & Sons, Inc., New York, 1960. 3. Y. C. Pao, "**A General Program for Computer Plotting of Mohr's CiCODESle," Computers and Structures**, V. 2, 1972, pp. 625–635. This

paper discusses various souCODESes of how eigenvalue problems are formed and also methods of analytical, computational, and graphical solutions.

4. Y. C. Pao, "**A General Program for Computer Plotting of Mohr's CiCODESle,"** (for twodimensional cases), Computers and Structures, V. 2,1972, pp. 625–635.
5. F. B. Seely and J. O. Smith, **Advanced Mechanics of Materials, Second Edition**, John Wiley, New York, 1957, pp. 59–64.
6. F. B. Hilebrand**, Methods of Applied Mathematics, Prentice-Hall**, Englewood Cliffs, NJ, 196

COURSES	CODES	:FLUID MECHANICS AND HYDRAULICS-CS234304
	CREDITS	: 2 CREDITS
	SEMESTER	: III (ODD)

COURSE DESCRIPTION

This course provides knowledge about the definition of fluids and determining fluid properties, hydrostatic forces, hydrostatic applications in water infrastructure, basic hydraulic equations, energy lines, critical flow characteristics, uniform flow, energy loss, gradually varied flow profiles, hydraulic jumps, and waterfalls.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to demonstrate attitudes and characteristics that reflect: devotion to the One Almighty God, noble morals, sensitivity and concern for social and environmental issues, appreciation for cultural differences and diversity, upholding the rule of law, prioritizing the interests of the nation and society, through innovation, creativity, and other potential abilities.
2. Able to assess and utilize knowledge and technology in order to apply them in a specific field of expertise, and capable of making informed decisions based on individual and group work results through logical, critical, systematic, and innovative thinking.
3. Able to manage one's own learning and develop oneself as a lifelong learner to compete at the national and international levels, with the aim of making a real contribution to solving problems while considering sustainability principles.
4. Able to master the concepts of natural science, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.
5. Able to design and conduct experiments in the laboratory and/or field, as well as analyze and interpret data to strengthen engineering decisions in the field of civil engineering.
6. Able to communicate effectively both orally and in writing.

COURSE LEARNING OUTCOMES

1. Students are able to calculate pressure and hydrostatic forces on water infrastructure.
2. Student can calculate energy losses in a hydraulic system and depict the water surface profile in open and closed channels.
3. Students are capable of applying fluid mechanics theory in laboratory activities.

MAIN SUBJECT

1. Fluids and Determining Fluid Properties.
2. Pressure and Hydrostatic Forces.
3. Hydrostatic Applications in Water Infrastructure.
4. Flow in Pipes.
5. Basic Hydraulic Equations.
6. Characteristics of Critical Flow and Uniform Flow.
7. Open Channel Design.
8. Gradually Varied Flow Water Surface Profile.
9. Hydraulic Jumps.

PREREQUSITES

Physics 1.

REFERENCES

1. Streeter Victor L. and E.B Wylie, Fluid Mechanics, Mc Graw Hill Kugakusha, Ltd, 1954
2. Streeter Victor L. and E.B Wylie, Arko Prijono (alih bahasa), Mekanika Fluida, Penerbit Erlangga Jakarta, 1999
3. Chow, V.T. Open Channel Hydraulics, Mc Graw Hill, Ltd. 1959
4. Anggrahini. Hidrolika Saluran Terbuka, Penerbit Srikandi, 2005

COURSES	CODES	: CONSTRUCTION MANAGEMENT-CS234303
	CREDITS	: 3 CREDITS
	SEMESTER	: III (ODD)

COURSE DESCRIPTION

This course contains information on the construction project life cycle, project stakeholders, project organization, personnel management, and leadership; project communication, information management, and building teamwork; emerging topics in construction management; project feasibility studies; project design and planning; introduction to procurement and contracts; project implementation, monitoring, and control; an introduction to the field of project management; and project site visits.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to master the concepts of natural science, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.
2. Able to plan and design infrastructure based on engineering principles, applying modern methods, skills, and technical tools while considering technical standards, performance, reliability, and ease of implementation.
3. Able to understand methods for supervising and controlling the construction execution resulting from planning or engineering design in the field of civil engineering, following applicable regulations, norms, standards, guidelines, and manuals.
4. Able to communicate effectively both orally and in writing.
5. Able to work in multidisciplinary and multicultural teams.

COURSE LEARNING OUTCOMES

1. Students are able to understand project concepts, project management, and the various fields within construction project management.
2. Students are able to understand the application of construction project management concepts in the field.
3. Student are able to understand the latest developments in construction project management concepts.

MAIN SUBJECT

1. Pengantar Manajemen Konstruksi: Introduction to Construction Management.
2. Construction Project Life Cycle.
3. Project Stakeholders.
4. Project Organization, Personnel Management, and Leadership.
5. Project Communication, Information Management, and Building Teamwork.
6. Emerging Topics in Construction Management.
7. Project Feasibility Studies.

8. Project Design and Planning.
9. Introduction to Procurement and Contracts.
10. Project Implementation, Monitoring, and Control.
11. Introduction to the Field of Project Management.
12. Project Site Visit.

PREREQUSITES

None.

REFERENCES

1. Erik W Larson & Clifford F Gray, **Project Management: The Managerial Process - 7th Edition**, Mc-Graw Hill Education, 2017
2. Jack R Meredith, Samuel J Mantel Jr., Scott M Shafer, **Project Management: A Managerial Approach - 9th Edition**, Wiley, 2016
3. Harold Kerzner, **Project Management: A Systems Approach to Planning, Scheduling, and Controlling - 12th Edition**, Wiley, 2017
4. **Project Management Body of Knowledge (The PMBOK® Guide) - Sixth Edition**, Project Management Institute, 2017

COURSES	CODES	: RAILWAY CONSTRUCTION-CS234305
	CREDITS	: 2 CREDITS
	SEMESTER	: III (ODD)

COURSE DESCRIPTION

This course provides knowledge about regulations related to railroad construction, types of railroad infrastructure, types of railroad facilities, various railroad structures/constructions, different forces acting on railroad tracks, and the execution of railroad construction work. Additionally, this material equips students with the process of calculating forces on railroad tracks, ballast support, and subgrade soil structures.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to master the concepts of natural science, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.
2. Able to plan and design infrastructure based on engineering principles, applying modern methods, skills, and technical tools while considering technical standards, performance, reliability, and ease of implementation.
3. Able to design and conduct experiments in the laboratory and/or field, as well as analyze and interpret data to strengthen engineering decisions in the field of civil engineering.
4. Able to communicate effectively both orally and in writing.
5. Able to work in multidisciplinary and multicultural teams.

COURSE LEARNING OUTCOMES

1. Able to understand regulations related to railroad construction.
2. Able to comprehend the types and components of railroad construction.
3. Able to calculate the forces and loads acting on the track.
4. Able to design railroad construction.

MAIN SUBJECT

1. Infrastructure Overview.
2. Network and Facility Overview.
3. Forces on the Track.
4. Track Dimensions and Strength.
5. Track Connections.
6. Rail Fastenings.
7. Wooden Sleepers.
8. Concrete Sleepers.
9. Upper Ballast.
10. Ballast Reinforcement and Fast Track.
11. Lower Ballast.
12. Subgrade Soil.

PREREQUSITES
None.
REFERENCES
1. _____, Undang-undang No. 23 Tahun 2007 tentang Perkeretaapiaan. 2. _____, PM No. 60 Tahun 2012 tentang Persyaratan Teknis Jalur Kereta Api. 3. Wahyudi, H (1993) Teknik Jalan Rel. Diktat Teknik Sipil ITS. 4. Hapsoro, S (2000) Jalan Kereta Api. 5. Profilidis, V.A., (2009), “Railway Management and Engineering”, 3rd Edition.

COURSES	CODES	: CONCRETE AND ADVANCED MATERIAL TECHNOLOGY-CS234308
	CREDITS	: 3 CREDITS
	SEMESTER	: III (ODD)

COURSE DESCRIPTION

This course provides knowledge about concrete as a building material, concrete quality control, concrete durability, concrete mix design, concrete testing, concrete assessment and improvement proposals, and specialized concrete technology.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to demonstrate attitudes and character that reflect: devotion to the One Almighty God, noble morals, sensitivity and concern for social and environmental issues, appreciation for cultural differences and diversity, upholding the rule of law, prioritizing the interests of the nation and society, through innovation, creativity, and other potential abilities.
2. Able to assess and utilize knowledge and technology in order to apply it in a specific field of expertise, and capable of making informed decisions based on individual and group work results through logical, critical, systematic, and innovative thinking.
3. Able to manage one's own learning and develop oneself as a lifelong learner to compete at the national and international levels, with the aim of making a real contribution to solving problems while considering sustainability principles.
4. Able to plan and design infrastructure based on engineering principles, applying modern methods, skills, and technical tools while considering technical standards, performance, reliability, and ease of implementation.
5. Able to design and conduct experiments in the laboratory and/or field, as well as analyze and interpret data to strengthen engineering decisions in the field of civil engineering.
6. Able to communicate effectively both orally and in writing.
7. Able to work in multidisciplinary and multicultural teams.

COURSE LEARNING OUTCOMES

1. Students are able to understand the concepts of concrete technology and building materials.
2. Students can design mixtures with specific compressive strength using ACI and SNI methods.
3. Students can understand the concept of environmentally conscious concrete technology.

MAIN SUBJECT
1. Introduction to Concrete as a Building Material. 2. Cement. 3. Aggregates. 4. Concrete Mix Design. 5. Mixing and Curing of Concrete. 6. Quality Control of Fresh Concrete. 7. Testing of Hardened Concrete. 8. Concrete Durability. 9. Assessment and Proposals for Concrete Damage Repair. 10. Special Concrete Technology.
PREREQUSITES
None.
REFERENCES
1. Beton dalam praktek. 2. **Concrete Technology** by A. M. Neville 2nd Edition 3. SNI 2847 **4.** ACI 214r - 11 **Guide To Evaluation of Strength Test Result of Concrete** **5.** ACI 211.4r - 93 **Guide For Selecting Proportion For High Strength Concrete** **6.** ACI 3641r-94 **Guide For Evaluation of Concrete Struktur** **7.** ACI SP-002(07): **Manual of Concrete Inspection**

COURSES	CODES	: STRUCTURAL MODELING AND ANALYSIS-CS234307
	CREDITS	: 3 CREDITS
	SEMESTER	: III (ODD)

COURSE DESCRIPTION

This course is about: the definition of irregular static structures, deflection slope methods, structural analysis using matrix methods, modeling using auxiliary software, structural loading, using auxiliary software, interpreting results, and verifying modeling.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to demonstrate attitudes and character that reflect: devotion to the One Almighty God, noble morals, sensitivity and concern for social and environmental issues, appreciation for cultural differences and diversity, upholding the rule of law, prioritizing the interests of the nation and society, through innovation, creativity, and other potential abilities.
2. Able to assess and utilize knowledge and technology to apply it in a specific field of expertise, and capable of making informed decisions based on individual and group work results through logical, critical, systematic, and innovative thinking.
3. Able to manage one's own learning and develop oneself as a lifelong learner to compete at the national and international levels, with the aim of making a real contribution to solving problems while considering sustainability principles.
4. Able to master the concepts of natural science, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.
5. Able to plan and design infrastructure based on engineering principles, applying modern methods, skills, and technical tools while considering technical standards, performance, reliability, and ease of implementation.
6. Able to communicate effectively both orally and in writing.

COURSE LEARNING OUTCOMES

1. Able to analyze structures using the slope deflection method.
2. Able to analyze structures using matrix methods.
3. Able to analyze structures using auxiliary software.

MAIN SUBJECT

1. Basic Concepts of Indeterminate Static Structures.
2. Structural Analysis using the Slope Deflection Method.
3. Structural Analysis using Matrix Methods.
4. Structural Modeling using Auxiliary Software.
5. Structural Loading (Including Earthquake Loading).
6. Running Auxiliary Software Programs.
7. Reading Results and Verifying Output of Auxiliary Software Programs.

PREREQUSITES
Mechanics of Materials.
REFERENCES
1. Norris, Charles H., Wilbur, John B, and Utku, S., "**Elementary Structural Analysis"**, 1976 2. McGuire, et al, "**Advanced Structural Analysis**", 2002 3. Daryl L Logan"**A First Course in the Finite Element Method**", 6th Edition.

COURSES	CODES	: RAILWAY GEOMETRIC-CS234306
	CREDITS	: 2 CREDITS
	SEMESTER	: III (ODD)

COURSE DESCRIPTION

This course provides knowledge about regulations in the field of roads that determine the criteria for highway geometric design and the concept of highway geometric design. In addition, the material also equips students with the process of calculating horizontal alignment, vertical alignment, and the application of calculation results in the form of drawings.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to master the concepts of natural science, mathematical principles, theoretical science, and engineering principles in the field of civil engineering.
2. Capable of planning and designing infrastructure based on engineering principles by applying modern technical methods, skills, considering technical standards, performance, reliability, and ease of implementation.
3. Competent in designing and conducting experiments in the laboratory and/or field, along with analyzing and interpreting data to strengthen engineering decisions in the field of civil engineering.
4. Proficient in effective communication, both orally and in writing.
5. Capable of working in a multidisciplinary and multicultural team.

COURSE LEARNING OUTCOMES

1. Able to understand regulations related to highway geometric design.
2. Able to comprehend the scope and concept of highway geometric design.
3. Capable of calculating the horizontal alignment of highways.
4. Capable of calculating the vertical alignment of highways.
5. Capable of applying the results of horizontal and vertical alignment calculations to drawings (plans and profiles).

MAIN SUBJECT

1. Highway Geometric Design Criteria
2. Scope and Concept of Highway Geometric Design
3. Horizontal Alignment of Highways
4. Vertical Alignment of Highways
5. Designing and Drawing Geometric Road Sections on Topographic Maps

PREREQUSITES

None.

REFERENCES

1. Undang-undang No. 2 Tahun 2022 tentang Perubahan Kedua UU No. 38 Tahun 2004 tentang Jalan.
2. Peraturan Pemerintah No. 34 Tahun 2006 tentang Jalan.
3. AASHTO, "A Policy on Geometric Design of Highways and Streets, Fifth Edition", 2004.
4. Bina Marga, "Pedoman Desain Geometrik Jalan", SE No/ 20/SE/Db/2021, Direktorat Jenderal Bina Marga, Kemeterian Pekerjaan Umum dan Perumahan Rakyat (2021).

COURSES	CODES	: CONSTRUCTION OPERATION-CS234403
	CREDITS	: 2 CREDITS
	SEMESTER	: IV (EVEN)

COURSE DESCRIPTION

This course contains information about construction operations, site layout, heavy equipment in construction operations, quality management, risk management, basic concepts of occupational health and safety (K3L), and potential hazards.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to master the concepts of natural science, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.
2. Able to plan and design infrastructure based on engineering principles, applying modern methods, skills, and technical tools while considering technical standards, performance, reliability, and ease of implementation.
3. Able to communicate effectively both orally and in writing.
4. Able to work in multidisciplinary and multicultural teams.

COURSE LEARNING OUTCOMES

1. Students are able to understand the concept of site layout planning.
2. Students are able to understand various types of construction equipment.
3. Students are able to understand the concept of quality management.
4. Students are able to understand the concept of risk management.

MAIN SUBJECT

1. Introduction to Construction Operations.
2. Construction Operations.
3. Site Layout.
4. Heavy Equipment in Construction Operations.
5. Introduction to Quality Management.
6. Quality Management Systems.
7. Risk Management.
8. Basic Occupational Health and Safety (K3L) Concepts.
9. Potential Hazards (Hazards).

PREREQUSITES

Construction Management

REFERENCES

1. Robert L Peurifoy, Clifford J. Schexnayder, Robert Schmitt, Aviad Shapira, Construction Planning, Equipment, and Methods - 9th Edition, McGraw Hill, 2018.

2. Douglas D. Gransberg, Calin M. Popescu, Richard Ryan, Construction Equipment Management for Engineers, Estimators, and Owners (Civil and Environmental Engineering) - 1st Edition, Taylor & Francis, 2006.
3. Edward Allen, Joseph Iano, Fundamentals of Building Construction: Materials and Methods 6th Edition, Wiley, 2013.
4. Coenraad Esveld, Modern Railway Track, MRT Production,1989.
5. Herman Wahyudi, Jalan Kereta Api Lanjut, Sistem dan Fasilitas Jalan Rel, Diktat Kuliah Jurusan Teknik Sipil FTSP-ITS.

COURSES	CODES	: DECISION MAKING TECHNIQUES-CS234402
	CREDITS	: 2 CREDITS
	SEMESTER	: IV (EVEN)

COURSE DESCRIPTION

This course contains concepts related to cost, the concept of the time value of money, investment feasibility, optimization techniques including linear programming, transportation modeling, assignment modeling, and multi-criteria decision-making.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to master the concepts of natural science, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.
2. Able to communicate effectively both orally and in writing.
3. Able to work in multidisciplinary and multicultural teams.

COURSE LEARNING OUTCOMES

1. Students are able to apply the theory of engineering economics.
2. Students are able to apply optimization techniques for decision-making.

MAIN SUBJECT

1. Introduction to Decision-Making Techniques.
2. Time Value of Money.
3. Present Value and Annual Value.
4. Internal Rate of Return.
5. Benefit-Cost Analysis.
6. Investment Feasibility Analysis.
7. Linear Programming.
8. Transportation Model.
9. Multi-Criteria.

PREREQUSITES

Construction Management

REFERENCES

1. Barry Render, Ralph M. Stair, Jr., Michael E. Hanna, Trevor S. Hale, Quantitative Analysis for Management - 12th Edition, Pearson, 2015
2. William G. Sullivan, Elin M. Wicks, C. Patrick Koelling, Engineering Economy - 16th Edition, Pearson Education, 2014
3. Thomas L. Saaty, The Analytic HieraCODEShy Process: Planning, Priority Setting, ResouCODESe Allocation (Decision Making Series), McGraw-Hill, 1980.

COURSES	CODES	: DRAINAGE PLANNING AND DESIGN-CS234404
	CREDITS	: 3 CREDITS
	SEMESTER	: IV (EVEN)

COURSE DESCRIPTION

This course provides an understanding of river characteristics and its issues, characteristics of watersheds (DAS) and hydrological principles in watersheds, river hydraulics, characteristics of sediment transport parameters and sediment transport initiation mechanisms, river equilibrium, changes in river morphology, and riverbank protection structure planning.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to demonstrate attitudes and qualities reflecting: faith in the Almighty, noble ethics, sensitivity and concern for social and environmental issues, respect for cultural diversity and multiculturalism, upholding the law, prioritizing the interests of the nation and the wider community, through innovation, creativity, and other potential talents.
2. Capable of assessing and utilizing knowledge and technology to apply it to specific areas of expertise, and making well-founded decisions based on individual or group work through logical, critical, systematic, and innovative thinking.
3. Competent in managing self-directed learning and developing oneself as a lifelong learner to compete nationally and internationally, with a focus on making a real contribution to problem-solving while considering sustainability principles.
4. Proficient in mastering the concepts of natural science, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.
5. Capable of planning and designing infrastructure based on engineering principles using modern methods, skills, and technical tools while considering technical standards, performance, reliability, and ease of implementation.
6. Able to communicate effectively both verbally and in writing.
7. Capable of working in multidisciplinary and multicultural teams.

COURSE LEARNING OUTCOMES

Students are able to plan a drainage system along with its complementary structures, considering engineering principles based on technical standards, performance aspects, reliability, ease of implementation, sustainability, and taking into account economic, social, and environmental factors.

MAIN SUBJECT

1. Drainage System.
2. Planned Flood Discharge.
3. Canal Planning.
4. Complementary Drainage Building Planning.
5. Road Drainage.
6. Subsurface Drainage and P System.

PREREQUSITES

1. Fluid Mechanics and Hydraulics
2. Introduction to Geology

REFERENCES

1. US ARMY Corp of Engineers, Coastal Engineering Manual, Coastal Engineering ReseaCODESh Center, Misissipi, 2003.
2. British Standard (BS 6349) Maritime structures – Part 7: Guide to the design and construction of breakwaters
3. Center for Civil Engineering ReseaCODESh and Codes. Manual on the use ofRock in Coastal and shoreline Engineering, CIRIA - CUR, London,2003
4. Goda, Yoshimi, Random Seas and Design of Maritime Structures' University of Tokyo Press, 1985
5. Kamphuis, J.William, Introduction to Coastal Engineering and Management, World Scientific Singapore, 2000
6. Silvester, Richard, CODES Hsu, John, Coastal Stabilization, World Scientific,Singapore 1997
7. Triatmodjo, Bambang, Teknik Pantai, Beta Offset, Yogyakarta, 1999
8. Triatmodjo, Bambang, Perencanaan Pantai, Beta Offset, Yogyakarta, 1999
9. van Rijn, Leo C, Principles of Sediment Transport in Rivers, Estuaries and Coastal Area, Aqua Publication, Amsterdam, 1993

COURSES	**CODES**	**: SOIL MECHANICS AND FOUNDATION-CS234401**
	CREDITS	**: 4 CREDITS**
	SEMESTER	**: IV (EVEN)**

COURSE DESCRIPTION

This course provides fundamental knowledge about soil, as well as the physical properties and soil classification. It also equips students with the ability to calculate effective stress, stress distribution, soil pressure, soil shear strength, shallow foundations, and deep foundations (pile and drilled shaft foundations).

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to grasp the concepts of natural science, mathematical principles, theoretical science and engineering principles in the field of civil engineering.
2. Capable of planning and designing infrastructure based on engineering principles, applying modern methods, skills, and technical tools, while considering technical standards, performance, reliability, and ease of implementation.
3. Proficient in designing and conducting experiments in the laboratory and/or field, along with analyzing and interpreting data to reinforce engineering decisions in the field of civil engineering.
4. Effective in oral and written communication.
5. Able to work effectively in multidisciplinary and multicultural teams.

COURSE LEARNING OUTCOMES

1. Able to calculate the magnitude of soil compression and the time it takes due to loads on the ground surface.
2. Capable of designing shallow foundations for simple houses and deep foundations for multi-story buildings using soil data from both laboratory and field sources.
3. Proficient in explaining how to obtain physical and technical soil parameters directly in the laboratory and in the field.

MAIN SUBJECT

1. Soil Composition
2. Soil Classification
3. Effective Stress and Stress Distribution
4. Soil Shear Strength
5. Soil Compression
6. Shallow Foundations
7. Deep Foundations (Piles and Bored Piles)

PREREQUSITES
None.
REFERENCES
1. Das, Braja M. (2013). **Principles of Geotechnical Engineering**. 2. Al-Khafaji, A.W. and Andersland, O.B. (1995). **Getechnical Engineering and Soil Testing**. 3. Wesley, L. D. (1981). **Fundamentals of Soil Mechanics for Sedimentary and Residual Soils**. 4. Bowles, J.E. (1997). **Foundation Analysis and Design**.

COURSES	CODES	: DESIGN OF REINFORCED CONCRETE ELEMENTS-CS234408
	CREDITS	: 3 CREDITS
	SEMESTER	: IV (EVEN)

COURSE DESCRIPTION

This course covers the fundamental concepts of reinforced concrete structures, the design of flexural elements, shear and shear-torsion element design, two-way slab design, reinforced concrete column design, reinforcement detailing, substructure and secondary structure concrete building, and the design of reinforced concrete structural elements using the strut-and-tie method.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to demonstrate attitudes and character that reflect: devotion to the One Almighty God, noble ethics, sensitivity and care for social and environmental issues, respect for cultural diversity and pluralism, upholding the rule of law, prioritizing the interests of the nation and the broader society, through innovation, creativity, and other potentials.
2. Capable of evaluating and utilizing knowledge and technology to apply them in a specific field of expertise, and making precise decisions based on individual or group work through logical, critical, systematic, and innovative thinking.
3. Capable of managing self-learning and developing oneself as a lifelong learner to compete at the national and international levels, with a real contribution to solving problems while considering sustainability principles.
4. Proficient in the concepts of natural sciences, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.
5. Able to plan and design infrastructure based on engineering principles, applying modern methods, skills, and technical tools while considering technical standards, performance, reliability, and ease of implementation.
6. Capable of effective oral and written communication.

COURSE LEARNING OUTCOMES

1. Able to understand the basic concepts of reinforced concrete structures.
2. Able to design elements of reinforced concrete structures.

MAIN SUBJECT

1. Basic Concepts of Reinforced Concrete Structures
2. Flexural Element Design
3. Shear and Shear-Torsion Element Design
4. Two-Way Slab Design
5. Reinforced Concrete Column Element Design
6. Reinforcement Detailing

7. Substructure and Secondary Structure of Concrete Buildings
8. Design of Reinforced Concrete Structural Elements with Strut-and-Tie Method

PREREQUSITES

1. Engineering Mechanics
2. Mechanics of Materials

REFERENCES

1. Wight, J. K., and MacGregor, J. G. (2008). ReinfoCODESed concrete:mechanics and design. 5th edition, Prentice Hall.
2. Jack C McCormac, Ruseel H Brown (2008). Design of ReinfoCODESedConcrete. Ninth Edition,
3. Badan Standar Nasional (2013). SNI 2847 2013 Tata Cara Perencanaan Struktur Beton Bertulang
4. American Concrete Institute (2014). Building Code Requirements for ReinfoCODESed Concrete. Farmington Hills, MI 48331 USA
5. American Concrete Institute (2015). The ReinfoCODESed Concrete DesignHandbook (Part 1 and Part 2). Farmington Hills, MI 48331 USA

COURSES	CODES	: DESIGN OF STEEL ELEMENTS-CS234407
	CREDITS	: 3 CREDITS
	SEMESTER	: IV (EVEN)

COURSE DESCRIPTION

This course is about the design and analysis of steel structures based on tension, compression, bending, compression-bending combinations, and the design of bolted and welded connections.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to plan and design infrastructure based on engineering principles, applying methods, skills, and modern technical tools while considering technical standards, performance, reliability, and ease of implementation.
2. Capable of assessing and utilizing knowledge and technology to apply them to specific fields of expertise and make precise decisions from individual or group work through logical, critical, systematic, and innovative thinking.
3. Proficient in self-directed learning and personal development as a lifelong learner to compete at the national and international levels, contributing effectively to problem-solving while adhering to sustainability principles.
4. Mastery of natural science concepts, mathematical principles, theoretical science, and engineering principles in the field of civil engineering.
5. Able to plan and design infrastructure based on engineering principles, applying methods, skills, and modern technical tools while considering technical standards, performance, reliability, and ease of implementation.
6. Capable of effective communication, both orally and in writing.

COURSE LEARNING OUTCOMES

1. Able to understand basic concepts.
2. Capable of designing structural steel elements.

MAIN SUBJECT

1. Mechanical Properties of Steel Material
2. Tension Members
3. Compression Members
4. Flexural Members
5. Axial and Flexural Combinations
6. Bolted Connections
7. Welded ConnectionsSifat Mekanis

PREREQUSITES
Design of Steel Elements
REFERENCES
1. BSN (2020). Spesifikasi Untuk Bangunan Gedung Baja Struktural. SNI 1729:2020, BSN 2. Salmon C.G. and Johnson J.E., “Steel Structures: Design and Behavior, LRFD”, Pearson International Edition 3. Jack C. McCormac dan Stephen F. Csernak, Structural Steel Design, Prentice Hall 4. William T. Segui, Steel Design, Thomson 5. J. C. Smith, Structural Steel Design: LRFD Approach, John Wiley & Sons 6. Marwan Ibrahim, Isdarmanu, R. Soewardojo, "Elemen Struktur Baja”, Buku Ajar

COURSES	CODES	: HIGHWAY PAVEMENT-CS234406
	CREDITS	: 2 CREDITS
	SEMESTER	: IV (EVEN)

COURSE DESCRIPTION

This course provides knowledge about various road pavement structures, pavement material testing, road pavement construction, and equips students with the process of soil bearing capacity calculation, flexible pavement mix design, flexible pavement thickness, and rigid pavement thickness design.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Proficient in mastering the concepts of natural science, mathematical principles, theoretical engineering science, and engineering principles in civil engineering.
2. Capable of planning and designing infrastructure based on engineering principles, applying modern technical methods, skills, and tools while considering technical standards, performance, reliability, and ease of implementation.
3. Able to design and conduct experiments in the laboratory and/or in the field, as well as analyze and interpret data to strengthen engineering decisions in the field of civil engineering.
4. Proficient in understanding methods for supervising and controlling construction execution resulting from planning or engineering design in civil engineering, in accordance with applicable regulations, norms, standards, guidelines, and manuals.
5. Capable of effective oral and written communication.
6. Able to work effectively in a multidisciplinary and multicultural team.

COURSE LEARNING OUTCOMES

1. Proficient in understanding various types of road pavement structures.
2. Capable of calculating the bearing capacity of road pavements.
3. Proficient in understanding pavement material testing.
4. Able to plan road pavement mixtures.
5. Capable of calculating the thickness of flexible road pavements.
6. Capable of calculating the thickness of rigid road pavements.
7. Proficient in understanding the execution of road pavement work.

MAIN SUBJECT

1. Introduction to Road Pavement.
2. Types of Asphalt and Aggregate Testing.
3. Various Types of Road Pavement Structure Layers and Bearing Capacity Calculation (CBR) of Road Foundations.
4. Design of Asphalt Concrete Pavement Mixtures.
5. Production Process of Asphalt Concrete Materials at the Asphalt Mixing Plant and Field Spreading Execution.
6. Calculation of Flexible Road Pavement Structure Thickness.

7. Calculation of Rigid Road Pavement Structure Thickness

PREREQUSITES

Railway Geometric

REFERENCES

1. Undang-undang No. 2 Tahun 2022 tentang Perubahan Kedua UU No. 38 Tahun 2004 tentang Jalan
2. Peraturan Pemerintah No. 34 Tahun 2006 tentang Jalan
3. Bina Marga, "Perencanaan Tebal Perkerasan Lentur Jalan Raya dengan Metode Analisa Komponen", 1989
4. Bina Marga, "Cara Uji Lendutan Perkerasan Lentur Dengan Alat Benkelman Beam (SNI 2416:2011)", Departemen Pekerjaan Umum (2005)
5. Bina Marga, "Pedoman Perencanaan Tebal Lapis Tambah Perkerasan Lentur Dengan Metode Lendutan Lendutan (Pd T-05-2005-B)", Departemen Pekerjaan Umum (2005)
6. Bina Marga, "Penyampaian Manual Desain Perkerasan Jalan Revisi 2017 di Lingkungan Direktorat Jenderal Bina Marga", SE No/ 04/SE/Db/2017, Direktorat Jenderal Bina Marga, Kemeterian Pekerjaan Umum dan Perumahan Rakyat (2017)
7. AASHTO, "Guide for Design of Pavement Structures", 1993
8. Asphalt Institute, "Asphalt technology and Construction Practices", 1983
9. Yoder and Witzchak, "Pavement Design"
10. Bina Marga, "Metode Pemeliharaan Jalan"

COURSES	CODES	: AIRPORT PLANNING-CS234405
	CREDITS	: 2 CREDITS
	SEMESTER	: IV (EVEN)

COURSE DESCRIPTION

This course provides knowledge of aviation regulations to determine airport development plans. In addition, it equips students with the calculation processes to plan the airside (runway, taxiway, and apron), landside, and airport pavement.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to master the concepts of natural sciences, mathematical principles, theoretical engineering sciences, and engineering principles in the field of civil engineering.
2. Capable of planning and designing infrastructure based on engineering principles, applying modern methods, skills, and technical tools while considering technical standards, performance, reliability, and ease of implementation.
3. Competent in designing and conducting experiments in the laboratory and/or field, as well as analyzing and interpreting data to reinforce engineering decisions in the field of civil engineering.
4. Proficient in effective oral and written communication.
5. Able to work in a multidisciplinary and multicultural team.

COURSE LEARNING OUTCOMES

1. Able to understand regulations related to airport planning.
2. Capable of planning airport runways.
3. Competent in planning airport taxiways.
4. Proficient in planning airport aprons.
5. Able to plan airport landside facilities.
6. Capable of designing airport pavements.

MAIN SUBJECT

1. Overview.
2. Runway Planning.
3. Taxiway Planning.
4. Apron Planning.
5. Airport Terminal.
6. Airport Pavement Planning.

PREREQUSITES

None.

REFERENCES

1. Keputusan Menteri No. 11 Tahun 2010 tentang Tatanan Kebandarudaraan Nasional, Kementerian Perhubungan RI, 2010.
2. Peraturan Menteri Perhubungan No. 39 Tahun 2019 tentang Tatanan Kebandarudaraan Nasional, Kementerian Perhubungan RI, 2019.
3. Surat Keputusan Dirjen Perhubungan Udara (SKEP 77/VI/2005) tentang Persyaratan Teknik Pengoperasian Fasilitas Teknik Bandar Udara, Dirjen Perhubungan Udara, 2005.
4. SNI 03-7095-2005 tentang Marka & Rambu, Badan Sertifikasi Nasional (BSN), 2005.
5. Annex ICAO Annex 14 Sixth Edition, ICAO, 2013.
6. Airport Pavement Design and Evaluation, FAA, 1995.
7. Norman Ashford dan Paul H. Wright., "Airport Engineering", John Wiley &Sons, Cetakan ke 2, 1984.
8. Robert Horonjeff dan Francis X. McKelvey., "Planning &Design of Ariports", McGraw-Hill, Inc, Cetakan ke 4, 1994.
9. "Airport Terminal Reference Manual", IATA, 1989.
10. Sartono, W.,Dewanti, Taqia, R., “Bandar Udara (Pengenalandan Perancangan Geometrik Runway, Taxiway dan Apron”, Gadjah Mada University Press, Edisi Pertama, 2017

COURSES	**CODES**	**: CONSTRUCTION PROJECT PLANNING AND CONTROL-CS234502**
	CREDITS	**: 2 CREDITS**
	SEMESTER	**: V (ODD)**

COURSE DESCRIPTION

The course of Construction Project Planning and Control covers an introduction, project scope planning, volume calculations, productivity calculations, cost budgeting, project scheduling, Earned Value Analysis method, and the concepts of time and cost optimization for construction projects.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to master the concepts of natural science, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.
2. Capable of planning and designing infrastructure based on engineering principles, utilizing modern methods, skills, and technical tools, while considering technical standards, performance, reliability, and ease of implementation.
3. Proficient in understanding methods for supervising and controlling construction execution based on engineering design or planning in the field of civil engineering, adhering to applicable regulations, norms, standards, guidelines, and manuals.
4. Effective in communicating both orally and in writing.
5. Able to work in multidisciplinary and multicultural teams.

COURSE LEARNING OUTCOMES

1. Mastering the concepts of scope, time, cost, and quality planning.
2. Mastering the concepts of time, cost, and quality control in construction projects and their optimization.

MAIN SUBJECT

1. Introduction to Project Planning and Control.
2. Project Scope Planning.
3. Volume Calculation.
4. Productivity Calculation.
5. Cost Budgeting.
6. Project Scheduling.
7. Earned Value Analysis Method.
8. Concepts of Time and Cost Optimization.

PREREQUSITES

Construction Operation

REFERENCES

1. Erik W Larson & Clifford F Gray, **Project Management: The Managerial Process - 7th Edition**, Mc-Graw Hill Education, 2018
2. Jack R Meredith, Samuel J Mantel Jr., Scott M Shafer, **Project Management: A Managerial Approach - 9th Edition**, Wiley, 2016
3. Harold Kerzner, **Project Management: A Systems Approach to Planning, Scheduling, and Controlling - 12th Edition**, Wiley, 2017
4. Fewings and Henjewel, **Construction project management : an integrated approach**, Taylor and Francis, 2019
5. Kerzner, **Project management:** case studies/Harold Kerzner, Wiley. 2017

COURSES	**CODES**	**: DESIGN OF COASTAL STRUCTURES-CS234504**
	CREDITS	**: 2 CREDITS**
	SEMESTER	**: V (ODD)**

COURSE DESCRIPTION

This course covers the basics of coastal processes and the planning of breakwater structures with a rubble mound design.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Capable of demonstrating attitudes and characteristics that reflect: devotion to the One Almighty God, noble moral values, sensitivity and concern for social and environmental issues, appreciation of cultural diversity and multiculturalism, upholding the rule of law, prioritizing the interests of the nation and the wider community, through innovation, creativity, and other potential talents.
2. Capable of examining and utilizing knowledge and technology to apply them to specific fields of expertise, as well as making accurate decisions based on individual or group work through logical, critical, systematic, and innovative thinking.
3. Capable of managing one's own learning and developing oneself as a lifelong learner to compete at the national and international levels, with the aim of making a real contribution to solving problems while considering sustainability principles.
4. Capable of mastering the concepts of natural science, mathematical principles, theoretical science and engineering principles in the field of civil engineering.
5. Capable of planning and designing infrastructure based on engineering principles, utilizing modern technical skills and tools while considering technical standards, performance, reliability, and ease of implementation.
6. Capable of effective communication both orally and in writing.
7. Capable of working in a multidisciplinary and multicultural team.

COURSE LEARNING OUTCOMES

1. Capable of understanding the coastal system and the processes that occur on the coast.
2. Capable of calculating design waves used in coastal structure planning.
3. Capable of designing rubble mound breakwaters and calculating wave forces on vertical wall structures.

MAIN SUBJECT

1. Introduction to Coast and Coastal Structures.
2. Wave Transformation, including Refraction, Shoaling, Diffraction, Reflection, and Wave Breaking.
3. Design Waves with Various Return Periods Obtained from Statistical Calculations and Representative Waves Used in Planning.

4. Planned Sea Level Elevation, Considering Tides, Storm Surges, and Wave Runup.
5. Coastal Processes and Calculations of Sediment Transport, both Perpendicular and Parallel to the Coast.
6. Planning of Rubble Mound Type Breakwater Structures and Calculation of Wave Forces on Vertical Walls.Pengertian Pantai dan Pengenalan Bangunan Pantai.

PREREQUSITES

Fluid Mechanics and Hydraulics

REFERENCES

1. US ARMY Corp of Engineers, **Coastal Engineering Manual**, Coastal Engineering ReseaCODESh Center, Misissipi, 2003.
2. British Standard (BS 6349) **Maritime structures – Part 7: Guide to the design and construction of breakwaters**
3. Triatmodjo, Bambang, **Teknik Pantai**, Beta Offset, Yogyakarta, 1999
4. Triatmodjo, Bambang, **Perencanaan Pantai, Beta Offset**, Yogyakarta, 1999
5. Dean, R. G., & Dalrymple, R. A. (1991). ***Water wave mechanics for engineers and scientists*** **(Vol. 2).** world scientific publishing company.
6. **Center for Civil Engineering ReseaCODESh and Codes. Manual on the useof Rock in Coastal and shoreline Engineering, CIRIA** - CUR, London,2003
7. Goda, Yoshimi, **Random Seas and Design of Maritime Structures**' University of Tokyo Press, 1985
8. Kamphuis, J.William, **Introduction to Coastal Engineering and Management,** World Scientific Singapore, 2000
9. Silvester, Richard, CODES Hsu, John, **Coastal Stabilization**, WorldScientific, Singapore 1997
10. van Rijn, Leo C, **Principles of Sediment Transport in Rivers**, Estuaries and Coastal Area, Aqua Publication, Amsterdam, 1993

COURSES	**CODES**	**: IRRIGATION PLANNING AND DESIGN-CS234503**
	CREDITS	**: 3 CREDITS**
	SEMESTER	**: V (ODD)**

COURSE DESCRIPTION

This course studies the theory of how to plan technical irrigation systems in Indonesia, as well as how to plan main and supporting irrigation structures to support the distribution of water to tertiary fields.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to demonstrate attitudes and character that reflect: devotion to the One Almighty God, noble ethics, sensitivity and concern for social and environmental issues, appreciation of cultural diversity, and upholding the law, prioritizing the interests of the nation and the wider community, through innovation, creativity, and other potentials.
2. Capable of assessing and utilizing scientific knowledge and technology to apply them in specific fields of expertise, as well as making accurate decisions based on individual or group work, using logical, critical, systematic, and innovative thinking.
3. Proficient in self-directed learning and self-development as a lifelong learner to compete at the national and international levels, with a focus on making real contributions to solving problems while considering sustainability principles.
4. Mastering the concepts of natural science, mathematical principles, theoretical science and engineering principles in the field of civil engineering.
5. Able to plan and design infrastructure based on engineering principles that apply modern methods, skills, and technical tools while considering technical standards, performance, reliability, and ease of implementation.
6. Capable of designing and conducting experiments in the laboratory and/or in the field, as well as analyzing and interpreting data to strengthen engineering decisions in the field of civil engineering.
7. Able to understand methods for supervising and controlling construction implementation resulting from civil engineering planning and design, in accordance with relevant regulations, norms, standards, guidelines, and manuals.
8. Proficient in effective communication, both verbally and in writing.
9. Capable of working collaboratively in multidisciplinary and multicultural teams.ara lisan, dan tertulis.

COURSE LEARNING OUTCOMES

1. Students are able to explain the technical irrigation system and network in Indonesia (maximum area of 3000 Ha).
2. Students can plan sustainable dimensions for irrigation channels, plan for diversion structures, and design flow measurement devices.
3. Students can plan cross structures or auxiliary buildings.
4. Students can plan major structures (fixed dams with a maximum height of 10 meters) and calculate dam stability.
5. Students can plan tertiary plots.

MAIN SUBJECT

1. Technical Irrigation Systems and Networks in Indonesia (Maximum Area of 3000 ha).
2. Planning Sustainable Dimensions for Irrigation Channels.
3. Planning Diversion or Intake Structures.
4. Planning Flow Measurement Devices.
5. Planning Cross Structures or Auxiliary Buildings.
6. Planning Major Structures (Fixed Dams with a Maximum Height of 10 meters).
7. Calculating Dam Stability, Able to Plan Tertiary Plots.
8. Translating the Planning Calculations of the Irrigation Network System into Planning Drawings that can be Estimated in the Bill of Quantities (RAB).

PREREQUSITES

1. Fluid Mechanics and Hydraulics
2. Hydrology

REFERENCES

1. Chow, Ven Te, **Open Channel Hydraulics**, versi Bahasa Indonesia, Penerbit Erlangga, Jakarta 1985.
2. Standard Perencanaan Irigasi Kriteria Perencanaan (KP) 01 bagian jaringan irigasi
3. Standard Perencanaan Irigasi Kriteria Perencanaan (KP) 02 bagian bangunan utama
4. Standard Perencanaan Irigasi Kriteria Perencanaan (KP) 03 bagian saluran
5. Standard Perencanaan Irigasi Kriteria Perencanaan (KP) 04 bagian bangunan
6. Standard Perencanaan Irigasi Kriteria Perencanaan (KP) 05 bagian petak tersier
7. Standard Perencanaan Irigasi Kriteria Perencanaan (KP) 06 bagian parameter bangunan
8. Standard Perencanaan Irigasi Kriteria Perencanaan (KP) 07 bagian standar penggambaran

9. Petunjuk Perencanaan Irigasi
10. Eman Mawardi & Moch. Memed "**Desain Hidraulik Bendung Tetap**", ALFA BETA, Bandung
11. **USBR Design of Small Dam**, US Government Printing Office.
12. Ansori M. B., Edijatno., Soesanto, Soekibat Rendy, Modul Irigasi 2018

COURSES	**CODES**	**: EMBANKMENT AND RETAINING WALL CONSTRUCTION-CS434501**
	CREDITS	**: 5 CREDITS**
	SEMESTER	**: V (ODD)**

COURSE DESCRIPTION

This course covers topics related to groundwater seepage, soil compaction, slope stability, horizontal earth pressure, retaining walls, and sheet piles, geotextiles for soil reinforcement, geotextile walls, and software programs for Geotechnical Engineering.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Proficient in mastering the concepts of natural science, mathematical principles, theoretical science, and engineering principles in the field of civil engineering.
2. Capable of planning and designing infrastructure based on engineering principles, utilizing modern methods, skills, and technical tools, while considering technical standards, performance, reliability, and ease of implementation.
3. Competent in designing and conducting experiments in the laboratory and/or field, along with analyzing and interpreting data to reinforce engineering decisions in the field of civil engineering.
4. Able to communicate effectively, both orally and in writing.
5. Capable of working in a multidisciplinary and multicultural team.

COURSE LEARNING OUTCOMES

1. Proficient in calculating the water volume entering an excavation/earth opening in the field and determining the safety of retaining walls and sheet piles against buoyant forces and HEAVE due to seepage of groundwater below the structure.
2. Capable of specifying soil compaction requirements for field embankments based on laboratory data and calculating slope stability for these embankments.
3. Able to plan the construction of retaining structures using three construction alternatives: retaining walls, sheet piles, and geotextiles, and capable of presenting the planning results.
4. Competent in using auxiliary software for the design of civil engineering foundations and analyzing the stability of other geotechnical structures.

MAIN SUBJECT

1. Seepage;
2. Effective Stress Due to Seepage;
3. Soil Compaction;
4. Slope Stability;
5. Horizontal Earth Pressure;

6. Retaining Wall;
7. Sheet Piling and Anchoring;
8. Geosynthetics for Embankment Reinforcement;
9. Geosynthetics for Vertical Wall Reinforcement;
10. Supplementary Programs for Geotechnics.

PREREQUSITES

Soil Mechanics and Foundations

REFERENCES

1. Das, Braja M. (2013). **Principles of Geotechnical Engineering**.
2. Al-Khafaji, A.W. and Andersland, O.B. (1995). **Getechnical Engineering and Soil Tesing**.
3. Wesley, L. D. (1981). **Fundamentals of Soil Mechanics for Sedimentary and Residual Soils**.
4. Bowles, J.E. (1997). **Foundation Analysis and Design**.

COURSES	**CODES**	**: CONCRETE AND STEEL BRIDGE ENGINEERING-CS234506**
	CREDITS	**: 3 CREDITS**
	SEMESTER	**: V (ODD)**

COURSE DESCRIPTION

Bridge Engineering is one of the Civil Engineering courses that covers the development of bridges, types and elements of short-span bridges, bridge location determination, bridge materials, data and procedures in bridge dimension design, structural element strength calculations, and drawing the calculation results.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. ble to demonstrate attitudes and characteristics that reflect: devotion to God Almighty, noble manners, sensitivity and concern for social and environmental issues, appreciation for cultural diversity, upholding the law, prioritizing the interests of the nation and the wider community, through innovation, creativity, and other potential qualities.
2. Capable of assessing and utilizing knowledge and technology in order to apply them to specific fields of expertise, and capable of making accurate decisions based on individual or group work through logical, critical, systematic, and innovative thinking.
3. Capable of managing one's own learning and developing oneself as a lifelong learner to compete at the national and international levels, with a focus on contributing effectively to solving problems while considering sustainability principles.
4. Proficient in the concepts of natural science, principles of mathematics, theoretical science, engineering principles in the field of civil engineering.
5. Able to plan and design infrastructure based on engineering principles, applying methods, skills, and modern technical tools while considering technical standards, performance, reliability, and ease of implementation.
6. Capable of effective communication, both orally and in writing

COURSE LEARNING OUTCOMES

1. Able to understand the concepts of bridge engineering and the types of bridges.
2. Capable of applying loads to bridges.
3. Capable of designing steel frame and prestressed concrete bridges.

MAIN SUBJECT

1. Bridge Definition.
2. Bridge Components.
3. Bridge Loads on the Superstructure.
4. Bridge Structure Calculations (Vehicle Deck, Longitudinal Beams, Transverse Beams, Main Load-Bearing Elements).
5. Bridge Loads on the Substructure.
6. Bridge Materials.
7. Knowledge of Various Types of Short-Span Bridges (Girder Bridges, Composite Bridges, Plate Girder Bridges, Hybrid Bridges, Orthotropic Bridges, Concrete Girder Bridges, and Prestressed Concrete Girder Bridges).
8. Bridge Location Determination.
9. Bridge Type Selection.
10. Economic Span.

PREREQUSITES

1. Design of Steel Elements
2. Design of Reinforced Concrete Elements
3. Soil Mechanics and Foundations

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. Wai - Fah Chen, " **Bridge Engineering Handbook** "
5. Xanthakos, P.P. (1995), **Bridges Sub Structure and Foundation Design**, Prentice-Hall, New Jersey.
6. SNI 1725:2016 (Pembebanan untuk Jembatan)
7. SNI 2833:2016 (Perancangan Jembatan terhadap Beban Gempa)

COURSES	**CODES**	**: DESIGN OF REINFORCED CONCRETE STRUCTURES-CS234508**
	CREDITS	**: 2 CREDITS**
	SEMESTER	**: V (ODD)**

COURSE DESCRIPTION

This course covers the concept of designing the seismic force-resisting system of reinforced concrete structures, earthquake loads on the seismic force-resisting system of building structures, the special moment-resisting frame system (SMRF), intermediate moment-resisting frame system (IMRF), ordinary moment-resisting frame system (OMRF), and designing the structural elements of SMRF in building structures.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to demonstrate attitudes and characteristics that reflect: devotion to the One Almighty God, noble ethical values, sensitivity and care towards social and environmental issues, respect for cultural diversity, upholding the rule of law, prioritizing the interests of the nation and the wider society, through innovation, creativity, and other potential qualities.
2. Capable of evaluating and utilizing knowledge and technology to apply them in a specific field of expertise, and making accurate decisions based on individual or group work through logical, critical, systematic, and innovative thinking.
3. Able to manage self-directed learning and develop oneself as a lifelong learner to compete at the national and international levels, with the aim of making a real contribution to solving problems while considering sustainability principles.
4. Proficient in the concepts of natural science, principles of mathematics, theoretical science-engineering, and engineering principles in the field of civil engineering.
5. Capable of planning and designing infrastructure based on engineering principles that apply modern methods, skills, and technical tools while considering technical standards, performance, reliability, and ease of implementation.
6. Able to communicate effectively both orally and in writing.

COURSE LEARNING OUTCOMES

1. Able to understand the design of reinforced concrete structures.
2. Able to comprehend the moment resisting system.
3. Capable of designing buildings with special moment resisting systems.

MAIN SUBJECT

1. Able to Design Buildings with Special Moment Resisting System.
2. Earthquake Loads on the Seismic Force Resisting System of Building Structures.
3. Special Moment Resisting Frame System (SMRFS).
4. Intermediate Moment Resisting Frame System (IMRFS).
5. Ordinary Moment Resisting Frame System (OMRFS).
6. Designing Structural Elements of SMRFS in Buildings.

PREREQUSITES

Design of Reinforced Concrete Elements

REFERENCES

1. SNI 03-2847-2013 Persyaratan Beton Struktural untuk Bangunan Gedung.
2. SNI 03-1726-2012 Tata Cara Perencanaan Ketahanan Gempa untuk Struktur Bangunan Gedung dan Non Gedung
3. SNI 1727-2013 Beban Minimum untuk Perancangan Bangunan Gedung dan Struktur Lain
4. Project Management : The Managerial Process 7th Edition, Erik Walrson and Clifford F.Gray, Mc Graw-Hill Education.2017
5. A Guide to The Project Management Body of Knowledge (PMBOK Guide), 2017. Project Management Institute
   Project Management : A Systems Approach to Planning, Schedulling, and Controlling Twelfth Edition. Harold Kerzner. John Willey & Sons, 2017.

COURSES	**CODES**	**: DESIGN OF STEEL STRUCTURES-CS234507**
	CREDITS	**: 2 CREDITS**
	SEMESTER	**: V (ODD)**

COURSE DESCRIPTION

Mata kuliah ini tentang desain dan analisa struktur bangunan baja, sambungan baja, *base plate*, elemen struktur komposit dan pelat girder.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to demonstrate attitudes and character that reflect: devotion to the One Almighty God, having noble ethics, being sensitive and caring about social and environmental issues, respecting cultural differences and diversity, upholding the rule of law, prioritizing the interests of the nation and the broader community, through innovation, creativity, and other potential skills.
2. Able to evaluate and utilize knowledge and technology to apply them in specific fields of expertise, and capable of making well-founded decisions based on individual or group work through logical, critical, systematic, and innovative thinking.
3. Able to manage one's own learning and develop oneself as a lifelong learner to compete at national and international levels, with the aim of making a tangible contribution to solving problems while considering sustainability principles.
4. Proficient in the concepts of natural science, mathematical principles, theoretical science, and engineering principles in the field of civil engineering.
5. Able to plan and design infrastructure based on engineering principles that apply modern technical methods, skills, and tools, considering technical standards, performance, reliability, and ease of implementation.
6. Able to communicate effectively, both orally and in writing.

COURSE LEARNING OUTCOMES

1. Students understand the concept of seismic load-resisting systems.
2. Capable of applying seismic loads to load-resisting systems.
3. Able to design moment-resisting frame systems in accordance with applicable standards.

MAIN SUBJECT

1. Seismic Resistant Structure System.
2. Building Structural Loading.
3. Connections.
4. Base Plate.
5. Composite Structures.
6. Plate Girder.

PREREQUSITES
Design of Steel Elements
REFERENCES
1. BSN (2020). Spesifikasi Untuk Bangunan Gedung Baja Struktural. SNI 1729:2020, BSN 2. Salmon C.G. and Johnson J.E., “Steel Structures: Design and Behavior, LRFD”, Pearson International Edition 3. Jack C. McCormac dan Stephen F. Csernak, Structural Steel Design, Prentice Hall 4. William T. Segui, Steel Design, Thomson 5. J. C. Smith, Structural Steel Design: LRFD Approach, John Wiley & Sons 6. Marwan Ibrahim, Isdarmanu, R. Soewardojo, "Elemen Struktur Baja”, Buku Ajar

COURSES	**CODES**	**: PORT PLANNING-CS234505**
	CREDITS	**: 2 CREDITS**
	SEMESTER	**: V (ODD)**

COURSE DESCRIPTION

This course covers regulations related to ports in Indonesia; the basics of special terminal and port masterplans; cargo handling at ports; ship handling at ports; prediction of cargo and ship traffic volume; surveys for port layout planning; port waters areas; planning for general cargo, container, and dry bulk terminals.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to master the concepts of natural sciences, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.
2. Capable of planning and designing infrastructure based on engineering principles that apply modern methods, skills, and technical tools while considering technical standards, performance, reliability, and ease of implementation.
3. Competent in designing and conducting experiments in the laboratory and/or field, while also analyzing and interpreting data to strengthen engineering decisions in the field of civil engineering.
4. Proficient in effective communication both orally and in writing.
5. Able to work in a multidisciplinary and multicultural team.

COURSE LEARNING OUTCOMES

1. Able to understand the legal regulations related to port planning.
2. Capable of understanding the fundamentals of special terminal and port masterplans.
3. Competent in predicting cargo and vessel traffic volume.
4. Proficient in planning port layouts.
5. Able to plan cargo terminal facilities at the port.

MAIN SUBJECT

1. Overview and Regulations;
2. History and Terminology at Ports;
3. Fundamentals of Special Terminal and Port Masterplans;
4. Cargo Handling at Ports;
5. Ship Handling at Ports;
6. Predicting Cargo and Vessel Traffic Volume;
7. Surveys for Port Layout Planning;
8. Port Water Areas;
9. Planning General Cargo Terminals;
10. Planning Container Terminals;
11. Planning Dry Bulk Terminals.

PREREQUSITES
None.
REFERENCES
1. Center for Civil Engineering ReseaCODESh and Codes. Manual on the use of Rock in Coastal and shoreline Engineering, CIRIA - CUR, London,2003 2. Goda, Yoshimi, Random Seas and Design of Maritime Structures' University of Tokyo Press, 1985 3. Kampguis, J.William, Introduction to Coastal Engineering and Management, World Scientific Singapore, 2000 4. Silvester, Richard, CODES Hsu, John, Coastal Stabilization, World Scientific,Singapore 1997 5. Triatmodjo, Bambang, Teknik Pantai, Beta Offset, Yogyakarta , 1999 6. Triatmodjo, Bambang, Perencanaan Pantai, Beta Offset, Yogyakarta , 1999 7. US ARMY Corp of Engineers, Coastal Engineering Manual, Coastal Engineering ReseaCODESh Center, Misissipi, 2003. 8. van Rijn, Leo C, Principles of Sediment Transport in Rivers, Estuaries and Coastal Area, Aqua Publication, Amsterdam, 1993 9. Peraturan Pemerintah No. 61 Tahun 2009 Tentang Kepelabuhanan 10. Technical Standards and Commentaries For Port and Harbour Faciilties in Japan, OCDI Dokumen Kurikulum – 14 11. Port Desingners Handbook, Carl A. Thoresen

COURSES	**CODES**	**: DESIGN, PROCUREMENT, AND SONSTRUCTION CONTRACT-CS234603**
	CREDITS	**: 2 CREDITS**
	SEMESTER	**: VI (EVEN)**

COURSE DESCRIPTION

Project development begins with the stages of idea generation, planning, design, construction, and operation. In the design to construction phase, there is a procurement and contract process between the parties providing services and the service recipient. Civil engineering projects come in various types with specific design systems, each having different specifications. To materialize the design into a tangible form, execution is needed, including design execution, engineering, construction, and others. The procurement process is required to obtain the parties who will carry out the project, and its legal binding in the form of contracts. There are various procurement methods and different types of construction contracts. This course studies the entire process and the relationship between design, procurement, and contracts.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to understand and utilize scientific and technological knowledge to apply it to a specific field of expertise, and capable of making accurate decisions from individual or group work through logical, critical, systematic, and innovative thinking.
2. Able to self-manage learning and develop oneself as a lifelong learner to compete at the national and international levels, with the aim of making a tangible contribution to problem-solving while considering sustainability principles.
3. Capable of planning and designing infrastructure based on engineering principles that employ modern methods, skills, and technical tools, while considering technical standards, performance, reliability, and ease of implementation.
4. Able to comprehend methods for supervising and controlling the execution of construction based on engineering planning and design in the field of civil engineering, while adhering to relevant regulations, norms, standards, guidelines, and manuals.
5. Proficient in effective oral and written communication.
6. Capable of working in multidisciplinary and multicultural teams.

COURSE LEARNING OUTCOMES

1. Able to understand the concept of design in construction and its relationship with procurement and contracts.
2. Able to comprehend the concept and process of procurement.
3. Able to understand the types and clauses of construction contracts.

MAIN SUBJECT
1. Construction Project Design. 2. Construction Project Procurement. 3. Construction Contracts.
PREREQUSITES
1. Decision Making Techniques 2. Construction Project Planning and Control
REFERENCES
1. Merritt, F.S. dan Ambrose, J (1990) Building Engineering and System Design, New York: Van Nostrand Reinhold 2. Peraturan Presiden Nomor 16 Tahun 2018 tentang Pengadaan Barang/Jasa Pemerintah 3. Peraturan Presiden Nomor 12Tahun 2021 tentang Perubahan Atas Peraturan Presiden Nomor 16 Tahun 2018 tentang Pengadaan Barang/Jasa Pemerintah 4. Hughes, W., Champion, R., and Murdoch, J. (2015) Construction Contract: Law and Management, 5th Ed, Routledge, Oxon and New York 5. Best, R. dan de Valance, G. (2002) Design and Construction: Building in Value. London: Routledge 6. Leite, FL (2019) BIM for Design Coordination. NY: Wiley 7. Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Nomor 14 Tahun 2020 tentang Standar dan Pedoman Pengadaan Jasa Konstruksi Melalui Penyedia 8. Project Management Institute (2017) A Guide to the Project Management Body of Knowledge 6ed 9. FIDIC (2017) Condition of Contract for Construction

COURSES	CODES	: DESIGN OF RIVER STRUCTURES-CS234602
	CREDITS	: 3 CREDITS
	SEMESTER	: VI (EVEN)

COURSE DESCRIPTION

This course provides an understanding of river characteristics and issues, watershed characteristics and hydrological principles in the watershed, river hydraulics, characteristics of sediment transport parameters, sediment initiation mechanisms, river equilibrium, changes in river morphology, and river structure planning.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to demonstrate an attitude and character that reflects: devotion to the One Almighty God, noble ethical values, sensitivity and concern for social and environmental issues, respect for cultural diversity and multiculturalism, upholding the rule of law, prioritizing the interests of the nation and the wider community, through innovation, creativity, and other potential qualities.
2. Capable of evaluating and utilizing knowledge and technology to apply them to specific fields of expertise, and making sound decisions based on individual or group work through logical, critical, systematic, and innovative thinking.
3. Capable of self-directed learning and personal development as a lifelong learner to compete at the national and international levels, with a genuine commitment to solving problems while considering sustainability principles.
4. Proficient in understanding the concepts of natural sciences, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.
5. Able to plan and design infrastructure based on engineering principles that apply modern methods, skills, and technical tools while considering technical standards, performance, reliability, and ease of implementation.
6. Capable of effective communication, both verbally and in writing.
7. Able to work in a multidisciplinary and multicultural team.

COURSE LEARNING OUTCOMES

1. Students are capable of analyzing river hydrology and hydraulics.
2. Students are able to estimate the amount of sediment transport.
3. Students can plan river hydraulic structures.

MAIN SUBJECT

1. Characteristics of Rivers and Their Issues.
2. Characteristics of Watersheds and Hydrological Principles in Watersheds.
3. River Hydraulics.
4. Characteristics of Sediment Transport Parameters and Sediment Movement Mechanisms.
5. River Equilibrium and Changes in River Morphology.
6. River Structure Planning.

PREREQUSITES

1. Fluid Mechanics and Hydraulics
2. Hydrology

REFERENCES

1. Julien, P.Y., River Mechanics, Cambridge University Press, 2002
2. Dingman, S.L., Fluvial Hydraulics, Oxford University Press., 2009
3. SNI 2415:2016, Tata Cara Perhitungan Debit Banjir Rencana
4. SNI 2400:2016, Tata Cara Perencanaan Krib Di Sungai
5. SNI 2851:2015, Desain Bangunan Penahan Sedimen
6. SNI 6738:2015, Perhitungan Debit Andalan Sungai dengan Kurva Durasi Debit

COURSES	CODES	: STRUCTURAL DESIGN OF BUILDING-CS234601
	CREDITS	: 3 CREDITS
	SEMESTER	: VI (EVEN)

COURSE DESCRIPTION

This course covers the concepts of structural design philosophy, open frames, the concept of strong column weak beam, preliminary design of SRPMK building structures, design of structural elements such as slabs, secondary beams, and stairs, structural analysis, including modeling, loading, checking the accuracy of the analysis and modeling output, reinforcement design of the main structural elements of the open frame, which are beams, columns, and beam-column connections, project scope planning and calculation of work volumes, productivity calculations and estimation of the duration of each activity, the relationship between activities, project scheduling, calculating unit prices for each activity, and project cost planning, cost-time curve for the project, and project planning report.

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to demonstrate attitudes and characteristics that reflect: piety to the Almighty, noble ethics, sensitivity and concern for social and environmental issues, appreciation for cultural diversity and multiculturalism, upholding the rule of law, prioritizing the interests of the nation and the wider community, through innovation, creativity, and other potential qualities.
2. Capable of evaluating and utilizing knowledge and technology to apply them in a specific field of expertise, and able to make precise decisions from individual or group work through logical, critical, systematic, and innovative thinking.
3. Capable of managing self-directed learning and developing oneself as a lifelong learner to compete at the national and international levels, with a genuine contribution to solving problems while considering sustainability principles.
4. Proficient in the concepts of natural science, mathematical principles, theoretical science-engineering, and engineering principles in the field of civil engineering.
5. Able to plan and design infrastructure based on engineering principles, applying modern methods, skills, and tools, while considering technical standards, performance, reliability, and ease of implementation.
6. Capable of effective oral and written communication.
7. Able to work in a multidisciplinary and multicultural team.

COURSE LEARNING OUTCOMES
Able to design concrete and steel building structures in accordance with applicable standards.
MAIN SUBJECT
1. Concepts of Structural Design Philosophy, Open Frame, and Strong Column Weak Beam. 2. Preliminary Design of SRPMK Building Structure. 3. Design of Structural Elements: Slabs, Secondary Beams, and Stairs. 4. Structural Analysis, including Modeling, Loading, Checking Analysis Accuracy, and Model Outputs. 5. Reinforcement Design for the Main Open Frame Structure, including Beams, Columns, and Column-Beam Joints (CBJ). 6. Project Scope Planning and Work Volume Calculation. 7. Productivity Calculation and Estimation of Activity Durations. 8. Interrelationship of Activities and Project Scheduling. 9. Calculating Unit Prices for Each Activity and Preparing Project Cost Planning. 10. Project Cost-Time Curve. 11. Project Planning Report.
PREREQUSITES
1. Design of Reinforced Concrete Elements 2. Design od Reinforced Concrete Structures 3. Construction Management 4. Construction Operation
REFERENCES
1. SNI 03-2847-2013 Persyaratan Beton Struktural untuk Bangunan Gedung. 2. SNI 03-1726-2012 Tata Cara Perencanaan Ketahanan Gempa untuk Struktur Bangunan Gedung dan Non Gedung. 3. SNI 1727-2013 Beban Minimum untuk Perancangan Bangunan Gedung dan Struktur Lain. 4. Project Management : The Managerial Process 7th Edition, Erik Walrson and Clifford F.Gray, Mc Graw-Hill Education.2017. 5. A Guide to The Project Management Body of Knowledge (PMBOK Guide), 2017. Project Management Institute. 6. Project Management : A Systems Approach to Planning, Schedulling, and Controlling Twelfth Edition. Harold Kerzner. John Willey & Sons, 2017.

COURSES	CODES	: BRIDGE AND HIGHWAY DESIGN-CS234701
	CREDITS	: 3 CREDITS
	SEMESTER	: VII (ODD)

COURSE DESCRIPTION

This course covers river morphology and topography at the bridge location, determining floodwater levels, and predicting scouring depth. It includes designing the vertical alignment of highways, planning pavement slabs and longitudinal girders, analyzing pre-stressed concrete beam cross-sections, designing cable-stayed layouts, and planning substructure foundations. The course is divided into different segments: hydrotechnical work for 0.2 (1 week), transportation for 0.4 (2 weeks), structural aspects for 1.5 (8 weeks), and geotechnical work for 0.9 (5 weeks).

GRADUATE LEARNING OUTCOMES-PROGRAM SPECIFIC TO THE COURSE

1. Able to demonstrate attitudes and character that reflect: devotion to the One Almighty God, noble ethics, sensitivity and concern for social and environmental issues, appreciation of cultural diversity and pluralism, upholding the rule of law, prioritizing the interests of the nation and the broader society, through innovation, creativity, and other potential skills.
2. Capable of evaluating and utilizing knowledge and technology to apply them to specific areas of expertise, as well as making precise decisions based on individual or group work through logical, critical, systematic, and innovative thinking.
3. Able to manage self-directed learning and develop oneself as a lifelong learner to compete at the national and international levels, with a focus on contributing effectively to solving problems while considering sustainability principles.
4. Proficient in the concepts of natural sciences, principles of mathematics, theoretical sciences, and engineering principles in the field of civil engineering.
5. Capable of planning and designing infrastructure based on engineering principles that apply modern methods, skills, and technical tools, while considering technical standards, performance, reliability, and ease of implementation.
6. Proficient in effective communication, both verbally and in writing.

COURSE LEARNING OUTCOMES

1. Able to understand river morphology and topography at the bridge location.
2. Capable of designing the vertical alignment of a highway.
3. Able to plan the anchorages, end portals, connections, and placement on the structure.
4. Capable of planning the substructure foundation.

MAIN SUBJECT
1. Morfologi Sungai dan Topografi di Lokasi Jembatan. *2.* Menentukan Muka Air Banjir dan Memprediksi Kedalaman *Scouring*. 3. Desain Alinemen Vertikal Jalan Raya. 4. Merencanakan Pelat Lantai Kendaraan dan Gelagar Memanjang. 5. Menganalisis Penampang Balok Beton Pratekan. 6. Desain Layout Kabel Prategang dan Perencanaan Pondasi Bangunan Bawah.
PREREQUSITES
1. Design of Steel Structures 2. Design of Reinforced Concrete Structures 3. Soil Mechanics an Foundations
REFERENCES
1. SNI 1725:2016 (Pembebanan untuk Jembatan) 2. SNI 2833:2016 (Perancangan Jembatan terhadap Beban Gempa) 3. Bina Marga, “Pedoman Desain Geometrik Jalan”, SE No/ 20/SE/Db/2021, Direktorat Jenderal Bina Marga, Kemeterian Pekerjaan Umum dan Perumahan Rakyat (2021). Dokumen Kurikulum - 9 4. Johnson Victor, " Essenstials of Bridge Engineering " 5. M.S.Troitsky, " Planning and Design of Bridges " 6. Hool and Kinne, Movable and Longspan Steel Bridge " 7. Wai - Fah Chen, " Bridge Engineering Handbook " 8. Xanthakos, P.P. (1995), Bridges Sub Structure and Foundation Design, Prentice-Hall, New Jersey