AQAS

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QUALITÄTSSICHERUNG DURCH
AKKREDITIERUNG VON
STUDIENGÄNGEN E.V.

COURSE DESCRIPTIONS

BACHELOR DEGREE IN INFORMATICS EDUCATION

DEPARTMENT OF INFORMATICS
FACULTY OF ENGINEERING AND VOCATIONAL
UNIVERSITAS PENDIDIKAN GANESHA

2023

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1. Educational Insight of Informatics Education

A. Criteria for Participation

This course is taken in the first semester so there are no special requirements for participants. However, participants should have a general understanding of education.

B. Objectives

Educational Insight of Informatics Education Courses examine the concepts of education, the spectrum of education, educational theory, education system in Indonesia and the teaching profession. The purpose of this course is that students are able to find out the basic insights of education and implementation in the education system. Throughout the course, students understand the concepts of educational theory. Student also develop their problem solving skills through homework assignments, quizzes, and exam. By the end of the course, students will have a solid understanding of the learner education and how to apply them to Information education problems. By the end of this module, participants should be able to critically examine a variety of
problems about the form and function of language in different contexts.

The program study learning outcomes of this course are:

- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- Able to create informatics education instructional by utilizing various science and technology-based learning resources
- Able to design technology-based learning media products and oriented to innovative informatics education learning models

The course learning outcome of this course are:

- Mastering theoretical concepts in the field of pedagogy
- Mastering learning theory and practicing scientific content supporting the teaching profession in learning
- Integrate and apply learning skills and mastery of information technology in learning
- Planning, designing, producing, implementing, controlling, and evaluating information technology learning using information technology
- Mastering, implementing, evaluating and analyzing the development of instruments (Test and Non-Test), the concept of assessment, measurement, and evaluation.

C. Ways of Studying:

Students are expected to play very active roles throughout the module. For each topic they will be given tasks to perform *before* the topic is discussed in class. For example, they will be asked to collect calculus landscape data (written language in public places) before the relevant lecture; the data which students bring with them will then be discussed during the lecture. All students will be given reading tasks *before* each lecture. Then, during the lecture, everyone will be expected to contribute to a discussion of what they have read. Where appropriate, video evidence of language in use will be presented and discussed during lectures.

D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of test questions, performance tests, rubrics, observation.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Triwiyanto, T. (2014). Pengantar Pendidikan. Jakarta: Bumi Aksara
- Sheila G. Dunn. Philosophical Foundations of Education: Connecting Philosophy to Theory and Practice
- Ali, M. (2017). Paradigma Pendidikan Berkemajuan: Teori dan Praktis Progresif Religius KH. Ahmad Dahlan. Yogyakarta: Suara Muhammadiyah
- Majir, A. (2020). Paradigma Baru Manajemen Pendidikan Abad 21. Yogyakarta: Deepublish (CV Budi Utama)
- Naim, N. & Syauqi, A. (2018). Pendidikan Multikultural: Konsep dan Aplikasi. Yogyakarta: Ar-Ruz Media.
- Neolaka, A. (2019). Isu-isu Kritis Pendidikan: Utama dan Tetap Penting Namun Terabaikan. Jakarta: Prenadamedia Group.
- Gough, A. (1997). Education and the environment: Policy, trends, and the problems of marginalization. Melbourne: ACER

F. Time

16 weekly meetings @100 minutes

2. Learners Development

A. Criteria for Participation

There are no requirements as such, but previous experience in learner development subjects (for example, should understand basic education) will be useful, as will previous participation in courses on education.

B. Objectives

Learner development is a fundamental course that teaches students the concepts and applications of education in the context of information education. This course provides an overview of leaner development and aspects of individual differences, as well as aspects of intellectual development, childhood, adolescence, and adulthood. The course is designed to help students understand the learner development of Information education and to apply concept of development task to solve real-world problems in the field.

The course begins with an introduction to learner development. Students learn how to evaluate aspect of individual differences, and analyze the aspects of intellectual development childhood, adolescence, and adulthood. The course then moves on to the topic of concept of development task, which is an essential concept in learner development. Students learn how to find aspects of emotional social development childhood, adolescence, and adulthood.

The course also covers multiple intelegency, which is the process of finding the area childhood, adolescence, and adulthood. Students learn how to evaluate development method of multiple intelegency in childhood, adolescence, and adulthood. The course also covers reward and punishment in childhood, adolescence, and adulthood. Students learn how to concept of reward and punishment.

Throughout the course, students understand the concept of development theory. Students also develop their problem-solving skills through homework assignments, quizzes, and exams. By the end of the course, students will have a solid understanding of learner development and how to apply them to Information education problems.

By the end of this module, participants should be able to critically examine a range of issues concerning language form and function in different contexts. Examples include:

- Demonstrate scientific, educative, and religious attitudes and behaviors that contribute to improving the quality of life in society, nation and state based on academic norms and ethics based on THK values
- Able to apply logical, critical, systematic, and innovative thinking in the context of the development or implementation of science and technology that pays attention to and applies humanities values in accordance with their field of expertise
- Able to apply the basic concepts of logic, discrete structures, statistics, and various programming language models to solve various computational problems

- Able to integrate algorithmic concepts and computational mathematics into various programming languages to develop information systems according to organizational/business needs.

C. Ways of Studying:

Students are expected to play very active roles throughout the module. For each topic they will be given tasks to perform *before* the topic is discussed in class. For example, they will be asked to collect learner develoment (written learner development in public places) before the relevant lecture; the data which students bring with them will then be discussed during the lecture.

All students will be given reading tasks *before* each lecture. Then, during the lecture, everyone will be expected to contribute to a discussion of what they have read.

Where appropriate, video evidence of learner development in use will be presented and discussed during lectures.

D. Assessment

Assessment will be through one written assignment of 2,500 words. Students will be expected to analyse and discuss learner development of their own choice found in any context in Indonesia. The data must be original. Students will be expected to relate their analysis to their reading. Where appropriate, they should make recommendations for further action.

The assignment is to be completed no later than three weeks after the end of the modules. The criteria used in evaluating assignments are: the extent to which the student successfully gathers data (i.e. method), whether the student analyses their data convincingly, and whether the student is able to relate their discussion to the literature.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Boeree, G.C. 2007. *General Psychology*. Modinan Sambilegi.
- Butcher, H.J & D. E. Lomax. 1972. *Readings in Human Intelligence.* London. Methuen & Co LTD
- Davis Keith. 1982. *Human Behavior At Work: Organization Behavior,* Metro Manila : Mc. Graw Hill.
- Daniel Goleman. 1998. *Multiple Intellegent*.
- E Berk Laura. 1989. *Children Development.* Boston: Allyn and Bacon.
- K Crowl Thomas, Sally Kaminsky and David M.Podell. 1997. *Educational Psychology Windows on Teaching*. London: Brown & Benchmark Publisher.
- L. Good Thomas and Jere E Brophy. 1990. *Educational Pshycologi A Realistic Approach*. New York: Longman.
- Tillman, D. and Diana Hsu. 2000. *Living Values: An Educational Program. Living Values Aktivities for Children Age 3-7. Health Communication. Inc. Kuwait.*

- Prayitno, Elida. 1992. *Psikologi Perkembangan.* Jakarta : Departemen Pendidikan Dan Kebudayaan Direktorat Jenderal Pendidikan Tinggi, Proyek Pembinaan Tenaga Kependidikan.
- Sarlito, Wirawan. 2000. *Pengantar Umum Psikologi*. Jakarta : PT. Bulan Bintang.
- Suarni, Ni Ketut. 2009. *Modul Perkembangan Peserta Didik.* Singaraja: Jurusan Bimbingan Konseling Fakultas Ilmu Pendidikan Universitas Pendidikan Ganesha.
- _____. 2013. *Modul Perkembangan Individu.* Singaraja: Jurusan Bimbingan Konseling Fakultas Ilmu Pendidikan Universitas Pendidikan Ganesha.

F. Time

16 weekly meetings @100 minutes

3. Discrete Mathematics

A. Criteria for Participation

This course is taken in the first semester so there are no special requirements for participants.

B. Objectives

The Discrete Mathematics course examines the logic of propositions, sets, relations, functions, number theory, counting, graph theory, and tree theory. The aim of this course is that students are able to analyse and implement basic mathematical concepts and theories in various areas by modelling, and overcoming these various problems with the help of related mathematics and computation. Learning activities use the problem based learning model, with lecture methods, simulations, presentations and group discussions. Evaluation in this course consists of attitudes and student participation, assignments, middle term exam, and final term exam.

The program study learning outcomes of this course are:

- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- Able to design research and development theories to improve the quality of informatics education
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- Able to construct innovative solutions as a problem solving in the context of informatics education learning

The course learning outcome of this course are:

- Able to explain theoretical concepts in the field of informatics
- Able to apply innovative learning with informatics scientific content
- Able to apply research theory to improve the quality of informatics education learning in schools
- Able to integrate learning skills and using technology that can help the learning process
- Able to create instructional designs to solve learning problems in informatics education

- Able to implement basic mathematical concepts and theories in various areas by modelling, and solving these problems with the help of related mathematics and computation.

C. Ways of Studying:

Lectures usually with synchronous-asynchronous mode of inquiry approach (cooperative interaction via small group discussion; working in pairs or in groups; performance evaluation; making analysis products in the form of presentation slides). For the synchronous will use the zoom meeting and asynchronous will conducted by the group assignments. Here is the link of the Teaching Resources which used as learning resources: https://go.undiksha.ac.id/NfQFc.

D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of test questions, performance tests, rubrics, observation sheets etc: https://go.undiksha.ac.id/t4FDj

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Wicaksono, S. (20180. Matematika Diskrit. Yogyakarta: Graha Ilmu
- Rofiqoh, A., & Hidayat, R. (2018). Matematika Diskrit dan Logika. Yogyakarta: UGM Press
- Susanto, H., & Susanto, B. (2017). Matematika Diskrit untuk Ilmu Komputer. Salemba Teknika.
- Rosen, K. H. (2012). Discrete mathematics and its applications. McGraw-Hill Education.

F. Time

16 weekly meetings @150 minutes

4. Linear Algebra

A. Criteria for Participation

This course is taken in the first semester so there are no special requirements for participants

B. Objectives

Linear Algebra Courses examine the system of linear equations, matrix concepts, matrix determinants, vectors in 2-dimensional space and 3-dimensional space, vector spaces, linear transformation, eigen values and eigen vectors, diagonalization concepts. The purpose of this course is that students are able to describe and analyze the concept of linear algebra. Learning activities use learning, exploring, and applying the basic concepts of linear algebra to solve a mathematical case related to linear algebra. Evaluation in this course consists of looking at the activeness, completeness of portfolio tasks, Middle Test with problem based and Final Test with project based or problem based.

C. Ways of Studying:

Lectures usually with synchronous-asynchronous mode of inquiry approach (cooperative interaction via small group discussion; working in pairs or in groups; performance evaluation; making analysis products in the form of presentation slides). For the synchronous will use the zoom meeting and asynchronous will conducted by the group assignments. Here are the links of the Teaching Resources which used as learning resources:

- https://joshua.smcvt.edu/linearalgebra/book.pdf
- https://industri.fatek.unpatti.ac.id/wp-content/uploads/2019/03/037-Elementary-Linear-Algebra-Applications-Version-Howard-Anton-Chris-Rorres-Edisi-1-2013.pdf

D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of the Assignments, Quiz, Midterm Exam, and Final Exam Questions: https://drive.google.com/file/d/1B1LeFmo8ptodaiOLG4ghmBADkcz3V-Pp/view?usp=share_link

E. Reading:

This is a general reading list as a guidelines and references of students including: book, e-book and article.

- Jim Hefferon, J. (2020). Linear Algebra Fourth Edition. Vermont USA: Mathematics and Statistics, Saint Michael's College Colchester.
- Anton, H., & Rorres, C. (2014). Elementary Linear Algebra Eleventh Edition. USA: Wiley.
- https://www.sciencedirect.com/journal/linear-algebra-and-its-applications/vol/656/suppl/C

- https://math.mit.edu/~gs/linearalgebra/ila6/indexila6.html

F. Time

16 weekly meetings @100 minutes

5. Basic Computer System

A. Criteria for Participation

This course is taken in the second semester so there are no special requirements for participants. But participants must already understand the material of mathematical logic

B. Objectives

The basic course of the computer system examines the types of hardware from mechanical devices to electronic devices, computer systems, computer capabilities, how to master computers, computers today, future computers, software development, how to install computer software, programming definitions, algorithms Programming, K3LH. The purpose of this course is that students are able to understand the general picture of computers and information technology along with software and hardware. Learning activities use tutorials, practicums, and synchronous discussions (in the class/lab/teleconference) and asynchronous (through e-learning media). Evaluation of this course consists of independent tasks, group assignments, and product presentations produced. Evaluation in this course consists of attitudes and student participation in lectures, assignments, middle term exam, and final term exam.

The program study learning outcomes of this course are:

- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- Able to design research and development theories to improve the quality of informatics education
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- Able to construct innovative solutions as a problem solving in the context of informatics education learning

The course learning outcome of this course are:

- Able to explain theoretical concepts in the field of informatics
- Able to apply innovative learning with informatics scientific content
- Able to apply research theory to improve the quality of informatics education learning in schools
- Able to integrate learning skills and using technology that can help the learning process
- Able to create instructional designs to solve learning problems in informatics education

C. Ways of Studying:

Lectures usually with synchronous-asynchronous mode of inquiry approach (cooperative interaction via small group discussion; working in pairs or in groups; performance evaluation; making analysis products in the form of presentation slides). For the synchronous will use the zoom meeting and asynchronous will conducted by the group assignments. Here is the link of the Teaching Resources which used as learning resources: https://drive.google.com/drive/folders/1PdPueo5B7jUPLdY1Hh0WZTg4XE3pmRG6?usp=sharing

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D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of test questions, performance tests, rubrics, observation sheets etc:

https://drive.google.com/drive/folders/1PdPueo5B7jUPLdY1Hh0WZTg4XE3pmRG6?usp=sharing.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- M, Jogiyanto H, 1992, Pengenalan Komputer, Andi Offset, Yogyakarta
- Kadir, Abdul, 2003, Pengenalan Sistem Informasi. Andi Offset. Yogyakarta
- Quentin docter, dkk. 2007. CompTIA A + Complete Study Guide, Wiley Publishing, Indiana.
- Wahyono Teguh, 2004, Sistem Informasi Konsep Dasar, Analisis Desain dan Implementasi, Graha Ilmu, Yogyakarta
- Pranata Antony, 2003, Pemrograman Borland Delphi 6, Edisi IV, Andi Offset, Yogyakarta
- Munir Rinaldi, Algoritma & Pemrograman dalam Bahasa Pascal dan C, Informatika, Bandung

F. Time

16 weekly meetings @150 minutes

6. Introduction to Computer Organization and Architecture

A. Criteria for Participation

This course is taken in the first semester so there are no special requirements for participants. However, participants must have a general understanding of computer components.

B. Objectives

Introduction to Organizational and Computer Architecture Courses examine the evolution and performance of computers, the interconnection structure of computer components known as the bus system, memory, especially cache, internal and external memory, I/O modules and CPUs as part of computer components, operating systems support, computers Arithmetic, understand more about instructions sets such as function, characteristics, format and addressing techniques. The purpose of this course is that students are able to find out more about how the architecture and organization of a computer. Learning activities use an expository approach in the form of lectures, discussions, questions and answers, and independent learning using various media. Evaluation in this course consists of through several quiz, individual home assignments and direct group assignments are delivered in class or by e-mail, discussion, student activity, midterm and semester exams.

The program study learning outcomes of this course are:

- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- Able to design research and development theories to improve the quality of informatics education
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- Able to construct innovative solutions as a problem solving in the context of informatics education learning

The course learning outcome of this course are:

- Able to explain theoretical concepts in the field of informatics
- Able to apply innovative learning with informatics scientific content
- Able to apply research theory to improve the quality of informatics education learning in schools
- Able to integrate learning skills and using technology that can help the learning process

- Able to create instructional designs to solve learning problems in informatics education

C. Ways of Studying:

Lectures usually with synchronous-asynchronous mode of inquiry approach (cooperative interaction via small group discussion; working in pairs or in groups; performance evaluation; making analysis products in the form of presentation slides). For the synchronous will use the zoom meeting and asynchronous will conducted by the group assignments. Here is the link of the Teaching Resources which used as learning resources: https://drive.google.com/drive/folders/1dOZkGZhDsEiWevzC5yvNeKhE8sUYow9F?usp=sharing

D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of test questions, performance tests, rubrics, observation sheets etc: https://drive.google.com/drive/folders/10ULz3dkqgl0A9KMfgoe63u5bim1HIHIY?usp=sharing

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Jogiyanto Hartono, MBA, Ph.D, (1999), "Pengenalan Komputer", Edisi kedua, Yogyakarta: Penerbit ANDI.
- V. C. Hamacher, Z.G.Vranesic, dan S.G.Zaky, (2001), Computer Organization, McGraw-Hill
- Annisa Puspa Kirana, (2020), "Perangkat Lunak Komputer (Software)".
- Samsudin, dkk, (2019), "Pengenalan Komputer" dan Teknologi Informasi, Cetakan Pertama, Medan: Penerbit PERDANA PUBLISHING.
- Sutarman. 2012. "*Buku Pengantar Teknologi Informasi*". Jakarta: Bumi Aksara.

F. Time

16 weekly meetings @150 minutes

7. Learning and Instructions of Informatics Education

A. Criteria for Participation

There are no requirements as such, but previous experience in learning and instructions subjects (for example, should understand learning concepts) will be useful, as will previous participation in courses on Educational Insight.

B. Objectives

Learning and Instructions for Informatics Education is a fundamental course that teaches students the concepts and applications of learning and learning theory in the context of Informatics Education. This course provides an overview of the nature of learning, the nature of learning outcomes, factors that affect learning outcomes, learning theories, learning models, learning methods, and lesson plans.

By the end of this module, participants should be able to critically examine a range of issues concerning learning and instruction for Informatics Education in different contexts, include:

- Demonstrate scientific, educative and religious attitudes and behavior which contribute to improve the quality of life in society, nation and state based on academic norms and ethics based on the values of Tri Hita Karana.
- Analyze the theoretical concepts of informatics education and informatics engineering.
- Evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- Demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners.
- Create informatics education instructional by utilizing various science and technology-based learning resources.
- Design technology-based learning media products and oriented to innovative informatics education learning models.
- Construct innovative solutions as a problem solving in the context of informatics education learning.

C. Ways of Studying:

Students are expected to play very active roles throughout the module. For each topic they will be given tasks to perform *before* the topic is discussed in class. Activities in this course include listening to modules or references related to learning and learning concepts, compiling papers on learning models and methods, presenting learning models and methods.

D. Assessment

The assessments used are participation in discussions, assignments, presentations, Middle Term Exam, and Final Term Exam.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Aunurrahman. (2010). Belajar dan Pembelajaran. Bandung: Alfabeta
- Marno dan M. Idris. (2014). Strategi,Metode, dan Teknik Mengajar. Yogyakarta: AR-RUZZ MEDIA
- M. Sobry Sutikno. (2014). Metode dan Model-model Pembelajaran. Lombok: Holistica
- M. Sukarjo dan Ukim Komarudin. (2010). Landasan Pendidikan. Jakarta: Rajawali Pers
- M. Thobroni. (2015). Belajar dan Pembelajaran. Yogyakarta: AR-RUZZ MEDIA
- R. Ibrahim dan Syaodin S. (2010). Perencanaan Pengajaran. Jakarta: Rineka Cipta.
- Slameto. (2013). Belajar dan Faktor-faktor yang Mempengaruhi.Jakarta: Rineka Cipta.

F. Time

16 weekly meetings @100 minutes

8. Curriculum Study of Informatics Education

A. Criteria for Participation

There are no specific requirements, but previous experience in instructional and study in informatics education courses will be useful, as well as other experiences related to pedagogy.

B. Objectives

The course "Curriculum Study of Informatics Education" provides students with a comprehensive understanding of curriculum development and implementation in the field of informatics education. Students will explore various concepts, principles, and approaches related to curriculum design, evaluation, and improvement. Through engaging lectures, discussions, and practical activities, students will gain insights into the key components and processes involved in developing an effective curriculum for informatics education.

In the initial stage, students will delve into the fundamentals of curriculum development. They will explore the meaning of curriculum, its relevance in the context of informatics education, and its role in shaping the learning experiences of students. Students will examine the historical development of curriculum models and theories, allowing them to grasp the evolution of curriculum design and its impact on informatics education. Through critical analysis and reflective discussions, students will develop a solid foundation in understanding curriculum concepts and their significance.

In the next stage, students will focus on the practical aspects of curriculum design and implementation. They will learn how to identify the learning objectives, content, and assessment strategies that align with the goals of informatics education. Students will explore different approaches to curriculum development, such as competency-based education and project-based learning, considering their applicability and effectiveness in the informatics context. Through hands-on activities, group projects, and case studies, students will gain practical skills in designing and implementing curriculum plans for informatics education.

The third stage of the course will involve curriculum evaluation and improvement. Students will learn various models and techniques for assessing the effectiveness and relevance of a curriculum. They will understand the importance of ongoing evaluation to ensure the curriculum meets the changing needs and demands of the informatics field. Through analyzing real-world examples and engaging in evaluative discussions, students will develop the ability to critically evaluate curriculum components, identify areas for improvement, and propose modifications to enhance the quality of informatics education.

In the final stage of the course, students will synthesize their knowledge and skills acquired throughout the curriculum study. They will engage in project-based learning, where they will design a comprehensive curriculum plan for informatics education, considering the diverse needs of learners and the evolving trends in the field. Students will apply their understanding of curriculum principles, design strategies, and evaluation techniques to create a coherent and effective curriculum framework. Through this culminating project, students will demonstrate their ability to integrate theoretical knowledge with practical

application, preparing them to become competent curriculum developers and educators in the field of informatics education.

By completing the course "Curriculum Study of Informatics Education," students will have achieved the objectives of gaining a comprehensive understanding of curriculum development, design, implementation, evaluation, and improvement in the context of informatics education. They will be equipped with the knowledge, skills, and critical thinking abilities needed to contribute to the advancement and enhancement of informatics education through effective curriculum planning and development.

C. Ways of Studying:

In this lecture, students are expected to play an active role in the learning activities, particularly in conducting a study of the curriculum for informatics education. For each topic, students will be provided with an introduction to relevant reading materials regarding curriculum analysis. This lecture emphasizes critical and analytical thinking processes, requiring student engagement through questioning and the development of research papers.

D. Assessment

Assessment will be conducted using formative and summative assessments. Formative assessment will be based on the active participation of students during discussions and their adherence to scientific attitudes throughout the learning process. Formative assessment will be conducted through observation. Summative assessment will be carried out by evaluating the curriculum analysis project related to curriculum development, design, implementation, evaluation, and improvement in the context of informatics education. Summative assessment will be done through a project output in the form of a research paper, with a requirement of 7 pages, referencing books and journals, and free from plagiarism, which will be verified through a plagiarism detection tool with a maximum threshold of 10%.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Badan Standar Nasional Pendidikan. 2006. Panduan Penyusunan Kurikulum Tingkat Satuan Pendidikan Jenjang Pendidikan Dasar dan Menengah. Jakarta: Depdiknas.
- Badan Standar, Kurikulum, dan Asesmen Pendidikan. 2021. Kurikulum untuk Pemulihan Pembelajaran. Jakarta: Kemdikbudristek
- Depdiknas. Pedoman Umum Pengembangan Kurikulum. Jakarta: Pusat Kurikulum
- Glatthorn, Allan A., 1924-2007. Curriculum Leadership : Strategies for Development and Implementation. Thousand Oaks, California :SAGE Publications, Inc., 2016.
- Hamalik, Oemar, Prof. Dr. 2006. Manajemen Pengembangan Kurikulum. Bandung: PT Remaja Rosdakarya
- Hamalik, Oemar. 2008. Dasar-Dasar Pengembangan Kurikulum. Bandung: PT Remaja Rosdakarya
- Idi, Abdullah, Dr. Med. 2007. Pengembangan kurikulum: Teori dan Praktik. Jogjakarta: Ar-Ruzz Media.

- Mulyasa, E. 2006. Kurikulum Tingkat Satuan Pendidikan. Bandung: Remaja Rosdakarya.
- Mulyasa.2006. Implementasi Kurikulum 2004. Bandung: PT Remadja Rosdakarya
- Nasution, S. 2008. Sejarah pendidikan Indonesia.Cet.3. Jakarta: Bumi Aksara
- Reinholz, D.L., Andrews, T.C. 2020. Change theory and theory of change: what's the difference anyway?. IJ STEM Ed 7, 2 (2020). https://doi.org/10.1186/s40594-020-0202-3
- Sukmadinata, N.S. 2006. Pengembangan Kurikulum Teori dan Praktek. Bandung: PT Remaja Rosdakarya.
- Sanjaya Wina. 2008. Kurikulum dan Pembelajaran. Jakarta: Kencana.

F. Time

16 weekly meetings @100 minutes

9. Vocational Education

A. Criteria for Participation

There are no requirements as such, but previous experience in Educational Insight course and Learners Development course (for example, should understand basic education regulation in Indonesia including academic/general track and vocational track, theory of education, teaching profession especially in informatics education subject matter, theory learners' development, concept of students needs for learner, student's interesting, passion etc) will be useful, as will previous participation in courses on Instructional strategy and design of informatics education.

B. Objectives

The Vocational Education course as fundamentals course, will deliver several material including basic material such as: (1) the principles, characteristics and functions or role of vocational education implementation in Indonesia; (2) competency-based learning; (3) 21st-century vocational teacher competencies; and essential supported material such as: (4) link and match strategies with the world of work and industry needs; (5) work-oriented learning (WBL/work-based learning) such as teaching factory in practice (TeFa); (6) the concept of occupational Health and Safety in vocational education; (7) jobs and career identity in Informatics Education

The purpose of this course is that students can analyse the planning and implementation of teaching and learning at the vocational school level (SMK) specifically of WBL in practice for example Teaching Factory (TeFa), including: the form, approach, tactics, methods and strategy mutual partnership with industry and the world of work. Learning model use problem-based learning with lecture, presentation, school observation and group discussion methods. Evaluation for this course consists of looking at activity, completeness of portfolio assignments, middle test with problem based and final test with project based or problem based.

By the end of this course the students have to be able analyse and criticize the implementation of WBL in practice, such as teaching factory. Students can identify the mutual partnership between vocational school and industry or the world of work. Students can analyse the teaching strategy, methods and tactics in teaching factory practice.

In this course will be delivery using Project-based learning (PjBL) and Problem-based learning (PbL) learning model. The teaching methods using presentation, group discussion, and observation. Evaluation for this course consists of an assessment by looking at activity, completeness of assignments, problem-based midterms and project-based final exams.

The program learning outcomes of this course are:

- Able to demonstrate scientific, educative, and religious attitudes and behaviour which contribute to improve the quality of life in society, nation and state based on academic norms and ethics based on the values of Tri Hita Karana.
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners.

The course learning outcome of this course are:

- Able to demonstrate scientific attitude and behavior based on norms and ethics based on Tri Hita Karana.
- Able to Implement the principles of Tri Hita Karana in everyday life.
- Able to Integrate THK's attitude of innovation by optimizing ICT skills in career development in the field of Informatics Education.

C. Ways of Studying:

Lectures usually with online and onsite activity learning. Online learning via synchronous-asynchronous mode of inquiry approach (cooperative interaction via small group discussion; working in pairs or in groups; performance evaluation; making analysis products in the form of presentation slides). For the synchronous will use the zoom meeting and asynchronous will conducted by the group assignments. For onsite activity learning conducted by outside activity (visiting school) as learning activity in this course by the observation.

Students are expected to play very active roles during the observation assignment. Observation will be conducted in several vocational high school (SMK) to conduct observation regarding the implementation of WBL. Through the observation activity, students able to capture the situation and conditions analysis using (SWOT) formula of TeFa in each school. Students able to arrange the steps of TeFa in practice, able to analyse the student's learning activity in TeFa regarding with the curriculum which implemented by schools, able to identify the student's competency by the TeFa in practice.

Here is the of observation sheet of students as guidelines for conducting observation in school: https://drive.google.com/file/d/1MSPpExMJN1FJ1jxUaWC-FwuZ3doDWWhn/view?usp=sharing

D. Assessment

Assessment will be through the middle and final test. For the middle and final test given by the problem based.

Here the assignment for the middle test: https://drive.google.com/file/d/17qGuJm2vDooguyrxfBToie8vGw-Gpw49/view?usp=sharing. Here the assignment of the final test: https://drive.google.com/file/d/1eCAmT9R0S48eDxlFqTjz6kw2XLgRUG-I/view?usp=sharing

The assignment is to be completed no later than in a week after the end of the modules. The criteria used in evaluating assignments are logicality, normativity, and objectivity. The

analysis should be logical in relevance to the instructional problem and should be objective based on the right way of reasoning that is given by the students.

E. Reading:

This is a general reading list as a guidelines and references of students including: book, e-book and article.

- Grollmann, P. (2008). *The Quality of Vocational Teachers: Teacher Education, Institutional Roles and Professional Reality*. European Educational Research Journal. https://doi.org/10.2304/eerj.2008.7.4.535
- Billet, S. (2011). *Vocational Education. Purposes, Traditions and Prospects.* Springer.
- Finlay, I., Niven, S., Young, S. (1998). *Changing Vocational Education and Training*. An International Comparative Perspective.
- Lauglo, J., Maclean, R. (2005). *Vocationalisation of Secondary Education Revisited.* Springer.
- Guo, Z., Lamb, S. (2010). *International Comparisons of China's Technical and Vocational Education and Training System.* Springer.
- Pavlova, M. (2009). *Technology and Vocational Education for Sustainable Development.* Springer. UNESCO-UNEVOC
- Thompson, John F. (1973). *Foundations of Vocational Education: Social and Philosophical Concepts*. New Jersey: Prentice-Hall, Inc.
- Tun, U., Onn, H., & Pahat, B. (2017). *The Skill and Competency of Technical and Vocational Education and Training (TVET) Personnel for The Development and Implementation of a National Teacher Standard in TVET in Malaysia*. Social Sciences & Humanities, *25*, 109–120.
- Dedi Supriyadi (Ed.). (2002). *Sejarah Pendidikan Teknik dan Kejuruan Indonesia: Membangun Manusia produktif*. Jakarta: Direktorat Pendidikan Menengah Kejuruan, Direktorat Jenderal Pendidikan Dasar dan Menengah, Departemen Pendidikan Nasional.
- Depdikbud. (1997). *Keterampilan Menjelang 2020*. Jakarta: Departemen Pendidikan dan Kebudayaan
- Depdiknas. (2002). *Pendidikan Berorientasi Kecakapan Hidup (Life Skills) melalui Pendekatan Pendidikan Berbasis Luas (Broad Based Education)*. Jakarta: Departemen Pendidikan Nasional.
- Dikmendikbud. (2013). *Tantangan Guru SMK Abad 21*. Jakarta: Direktorat Pembinaan Pendidik dan Tenaga Kependidikan Pendidikan Menengah. Direktorat Jenderal Pendidikan Menengah Kementerian Pendidikan dan Kebudayaan.
- Sofyan, H (2015). Metodologi Pembelajaran Kejuruan. Yogyakarta: UNY Press.
- Subdit Kurikulum Direktorat Pembinaan SMK (2015). Panduan Pelaksanaan Teaching Factory

F. Time

16 weekly meetings @150 minutes

10. Formal Language And Automata Theory

A. Criteria for Participation

The Formal Language and Automata Theory take in first semester with three credit semester. The Formal Language and Automata Theory course as fundamentals course, this course centres around three essential concepts: Languages, grammars, and automata. This course will examines Finite State Automata (FSA), Deterministic Finite State Automata (DFSA), Non-Deterministic Finite State Automata (NFSA), normal form of Chomsky (Chomsky Normal Form/CNF), Push Down Automata (PDA). The purpose of this course is that students are able to understand the concepts of algorithms and complexity, including the central concepts and skills needed to design, apply and analyze algorithms to solve problems. Learning activities use Problem Based Learning, Inquiry Learning. Evaluation in this course consists of student activity, completeness of assignments, middle, and final test.

B. Objectives

Certain objectives have been set out to ensure the course learning outcome. Upon completing this course, the students should be able to: (1) discover computational thinking; (2) understand the fundamental models of computation that underlie modern computer hardware, software, and programming languages; (3) understand the foundations of automata theory, computability theory, and complexity theory.

The aims of this course First, students will learn the key techniques in modern compiler construction, getting prepared for industry demands for compiler engineers. Second, students will understand the rationale of various computational methods and analysis. The third goal is to build the foundation for students to pursue the research in the areas of automata theory, formal languages, and computational power of machines.

In this course will be delivery using Problem-based learning (PbL) learning model. The teaching methods using presentation, group discussion. Evaluation for this course consists of an assessment by looking at activity, completeness of assignments, midterms and final exams.

The program learning outcomes of this course are:

- Able to analyse the theoretical concepts of informatics education and informatics engineering.
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media, and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education.
- Able to design research and development theories to improve the quality of informatics education.
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners.

- Able to reorganize logical, critical, systematic, and innovative thinking in the context of science and technology development and implementation focusing humanities values on accordance with their areas of expertise.
- Able to construct innovative solutions as a problem solving in the context of informatics education learning.

The course learning outcome of this course are:
- Able to define the theoretical concepts of informatics
- Able to apply problems solving in informatics engineering education

C. Ways of Studying

Lectures usually with synchronous-asynchronous mode of inquiry approach (cooperative interaction via small group discussion; working in pairs or in groups; performance evaluation; making analysis products in the form of presentation slides). For the synchronous will use the zoom meeting and asynchronous will conducted by the group assignments. Here is the link of the Teaching Resources which used as learning resources: https://drive.google.com/drive/folders/1TRq0pHloswrCcIpeL6byYTLoQaRoE2p0?usp=sharing

- E-books: https://drive.google.com/file/d/1dvsWQyquWkJ23beeNmG1bEm5CU6rQajr/view?usp=sharing
- Module: https://drive.google.com/file/d/1RCjaymYzTsYjgZ8ehGn2YMXKQo2s36XX/view?usp=sharing

D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of test questions, performance tests, rubrics, observation sheets etc.

- Assignment: https://drive.google.com/file/d/1_FDrw3tvrEtm334zxoBlwcO4ACCec9de/view?usp=sharing
- Quiz: https://drive.google.com/file/d/1syEmjcGWGFQp3Zg7QH4PGV3KUvUi9eGh/view?usp=sharing
- Middle Test: https://drive.google.com/file/d/1ljx3RzC14U_uYODAEsRBnXZ9XFcNVCx0/view?usp=sharing
- Final Test: https://drive.google.com/file/d/1hBj9Ml_ZrFuVlDtnQnYjQ_3YlYF9VZH5/view?usp=sharing

E. Reading

This is a general reading list as a guidelines and references of students including: book, e-book, and article.

- Tedy Setiadi, Diktat Teori Bahasa dan Otomata, Teknik Informatika UAD, 2005
- Hopcroft John E., Rajeev Motwani, Jeffrey D. Ullman, *Introduction to Automata Theory, Languages, and Computation,* 2nd, Addison-Wesley,2000
- Martin C. John, *Introduction to Languages and Theory of Computation,* McGraw-Hill Internatioanal edition,1991
- Linz Peter,*Introduction to Formal Languages & Automata,* DC Heath and Company, 1990
- Dulimarta Hans, Sudiana, *Catatan Kuliah Matematika Informatika, Magister Teknik Informatika ITB, 1998*
- Hinrich Schütze, IMS, Uni Stuttgart, WS 2006/07, Slides based on RPI CSCI 2400

F. Time

16 weekly meetings @150 minutes

11. Algorithms and Programming

F. Criteria for Participation

This course is taken in the second semester so there are no special requirements for participants. But participants must already understand the material of mathematical logic

G. Objectives

The Algorithm and Programming course examines the basic concepts of algorithms, programming paradigms, schemes/basic program structures including sequential schemes, conditional schemes, looping schemes, basic data structures in programming. The purpose of this course is that students are able to describe algorithmic problems systematically, analyze solutions of an algorithmic problem, and design the structure of the implementation program code of an algorithmic solution. Learning models use a case-based learning model using lecture, simulation, presentation and group discussion methods. Evaluation in this course consists of attitudes and student participation in lectures, assignments, middle term exam, and final term exam.

The program study learning outcomes of this course are:

- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- Able to design research and development theories to improve the quality of informatics education
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganise logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- Able to construct innovative solutions as a problem solving in the context of informatics education learning

The course learning outcome of this course are:

- Able to explain theoretical concepts in the field of informatics
- Able to apply innovative learning with informatics scientific content
- Able to apply research theory to improve the quality of informatics education learning in schools
- Able to integrate learning skills and using technology that can help the learning process
- Able to create instructional designs to solve learning problems in informatics education

H. Ways of Studying:

Lectures usually have a synchronous-asynchronous mode of inquiry approach (cooperative interaction via small group discussion; working in pairs or in groups; performance evaluation; making analysis products in the form of presentation slides). For the synchronous will use the zoom meeting and asynchronous will conducted by the group assignments. Here is the link of the Teaching Resources which are used as learning resources: https://go.undiksha.ac.id/wP5wl.

I. Assessment

Assessment will be through assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of test questions, performance tests, rubrics, observation sheets etc: https://www.hackerrank.com/ptiundiksha-alprocontest.

J. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Stone, John David. 2020. “Algorithm for Functional Programming”. Grinnel: Springer
- Mueller, John P., et al. 2017. “Algorithms for Dummies". New Jersey: John Willey & Sons, Inc.
- Harumy, T H F., et al. 2016. “Belajar Dasar Algoritma & Pemrograman C++”. Yogyakarta: Deepublish
- Bjarne Stroustrup. 2014. “Programming: Principles and Practice Using C++”. Boston: Bjarne Stroustrup
- Cay S. Horstmann. 2019. “C++ for Everyone”. New Jersey: Wiley

K. Time

16 weekly meetings @150 minutes

12. Information Systems

A. Criteria for Participation

This course is taken in the second semester so there are no special requirements for participants

B. Objectives

The Information Systems course examines the basic concepts of information systems, information systems management, information system applications and networks, electronic information systems, supply chain management. The purpose of this course is that students are able to analyze basic knowledge of information system concepts in computer-based organizations/companies, accounting, marketing, human resources and executive information systems. Learning models use problem-based learning models using lecture, simulation, presentation and group discussion methods. Evaluation in this course consists of attitudes and student participation in lectures, assignments, middle term exam, and final term exam.

The program study learning outcomes of this course are:

- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- Able to design research and development theories to improve the quality of informatics education
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- Able to construct innovative solutions as a problem solving in the context of informatics education learning

The course learning outcome of this course are:

- Able to explain theoretical concepts in the field of informatics
- Able to apply innovative learning with informatics scientific content
- Able to apply research theory to improve the quality of informatics education learning in schools
- Able to integrate learning skills and using technology that can help the learning process
- Able to create instructional designs to solve learning problems in informatics education

C. Ways of Studying:

Lectures usually with synchronous-asynchronous mode of inquiry approach (cooperative interaction via small group discussion; working in pairs or in groups; performance evaluation; making analysis products in the form of presentation slides). For the synchronous will use the zoom meeting and asynchronous will conducted by the group assignments. Here is the link of the Teaching Resources which used as learning resources: https://go.undiksha.ac.id/Y0Vzv.

D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of test questions, performance tests, rubrics, observation sheets etc: https://go.undiksha.ac.id/QjBBu

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Rainer, R. K., Prince, B. 2014. Introduction to Information Systems. Singapura: Wiley.
- Sutabri, T. 2021. Konsep Sistem Informasi. Jakarta: CV Andi Offset ANDI
- Anggraeni, R Y., Irviani, R. 2017. Pengantar Sistem Informasi. Jakarta: CV Andi Offset
- Anggraeni, E Y., et.al. 2022. Buku Ajar E-Business & E-Commerce. (n.d.). Indramayu: Penerbit Adab.
- Utama, D N. 2017. Sistem Penunjang Keputusan: Filosofi Teori dan Implementasi. Yogyakarta: Garudhawaca.

F. Time

16 weekly meetings @150 minutes

13. Operating Systems

A. Criteria for Participation

This course is taken in the second semester so there are no special requirements for participants

B. Objectives

The operating system course examines the introduction of computer systems, computer operating system structures, processes and threads, cpu scheduling, synchronization, deadlock, memory management and storage media, as well as protection and security systems, and ends with case studies on DOS operating systems (disk operating System). The purpose of this course is that students are able to describe and analyze the basic concepts in understanding the computer operating system. Learning activities use the inquiry approach model with lecture and discussion. Evaluation in this course consists of looking at the activeness, completeness of portfolio tasks, Middle Test with problem based and Final Test with project based or problem based.

C. Ways of Studying:

Lectures usually with synchronous-asynchronous mode of inquiry approach (cooperative interaction via small group discussion; working in pairs or in groups; performance evaluation; making analysis products in the form of presentation slides). For the synchronous will use the zoom meeting and asynchronous will conducted by the group assignments. Here are the links of the Teaching Resources which used as learning resources:

[1]https://csc-knu.github.io/sys-prog/books/Andrew%20S.%20Tanenbaum%20-%20Modern%20Operating%20Systems.pdf

[2] https://drive.google.com/file/d/1VhOahgqEx8ohyAKTmuhLOyTfYQYFqi3R/view?usp=share_link

D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of the Assignments, Quiz, Midterm Exam, and Final Exam Questions: https://drive.google.com/file/d/1Cjrt_BPXUYmWYKgk6CJDpve2ZQcKw_xz/view?usp=share_link

E. Reading:

This is a general reading list as a guidelines and references of students including: book, e-book and article.

- Divayana, Suyasa, Widiartini. (2021). *An innovative model as evaluation model for information technology-based learning at ICT vocational schools . Heliyon, (), –* .doi:10.1016/j.heliyon.2021.e06347
- Hariyanto Bambang, 2014, “Sistem Operasi Revisi Kelima”, Informatika: Bandung.
- Sri Kusumadewi, Sistem Operasi, 2016, PT. Graha Ilmu: Yogyakarta.

- Stalling,William, 2012, Operating System Internals and Design Principles, Prentice Hall
- Tanenbaum, A. S. (2015). Modern Operating Systems Fourth Edition. Englewood Cliffs, New Jersey: Prentice-Hall International Editions.
- Watrianthos, R., & Purnama, I. (2018). Buku Ajar Sistem Operasi. Sidoarjo: Uwais Inspirasi Indonesia.

F. Time

Weekly meetings @150 minutes

14. Database

A. Criteria for Participation

This course is taken in the second semester, so there are no specific requirements for participants. However, participants must already have an understanding of mathematical logic material.

B. Objectives

This course aims to introduce students to the stages of database development, from database design to producing normalized databases. The learning model is conducted through tutorials, practical exercises, and synchronous (in-class/lab/teleconference) and asynchronous (via e-learning media) discussions. In addition to individual learning, students are also directed to collaborate in groups. The assessment of learning outcomes is based on attitudes, student participation in lectures, individual assignments, group assignments, presentation of the produced products, midterm exams, and final exams.

The program study learning outcomes of this course are:

- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- Able to design research and development theories to improve the quality of informatics education
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- Able to construct innovative solutions as a problem solving in the context of informatics education learning

The course learning outcome of this course are:

- Able to explain theoretical concepts in the field of informatics
- Able to apply innovative learning with informatics scientific content
- Able to apply research theory to improve the quality of informatics education learning in schools
- Able to integrate learning skills and using technology that can help the learning process
- Able to create instructional designs to solve learning problems in informatics education

C. Ways of Studying:

Lectures are typically conducted using synchronous approaches (in-class/lab/teleconference) and asynchronous approaches (via e-learning media) using the Project-Based, Problem-Based, and Case Method methods. Project-Based and Case Method are used for assignments and practical exercises, while Project-Based is used for the final exam. Here is the link to the Learning Resources used as a source of learning: https://go.undiksha.ac.id/basis-data_sumber-ajar

D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of test questions, performance tests, rubrics, observation sheets etc: https://go.undiksha.ac.id/basis-data_soal

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- *Abdul, Kadir*. 2003. Konsep dan Tuntunan Praktis *Basis Data*, Yogyakarta: Penerbit Andi.
- *Hernandez, Michael J*. 2013. Database Design for Mere Mortal: A Hands-on Guide to Relational Database Design, New Jersey: Addison Wesley
- Hoffer, A Jeffrey, et al, 2005.*Modern Database Management 7th edition.*New Jersey: Pearson Education, Inc
- Sayeed MM. Tahaghoghi & Hugh E. Williams. 2007. *Learning MySQL*. California: O'Reilly Media, Inc.

Recommended Texts & Other Readings

- Mana Takayashi. 2009. The Manga Guide to Databases. California: O'Reilly Media, Inc.

F. Time

16 weekly meetings @150 minutes

15. Instructional Strategy and Design of Informatics Education

A. Criteria for Participation

There are no requirements as such, but previous experience in Educational Insight course and Learners Development course (for example, should understand basic education regulation in Indonesia, theory of education, teaching profession especially in informatics education subject matter, theory learners' development, concept of students needs for learner, etc) will be useful, as will previous participation in courses on Instructional strategy and design of informatics education.

B. Objectives

Instructional strategy and design of informatics education is fundamental course in educational science group courses that delivery students the basic assumptions of learning design, determine the learning outcome using SMART (specific, measurable, attainable, relevance and time-bound) formula, innovative learning design and strategies, competency-based learning concepts, identification of learning design needs, the concept of formulating general and specific learning objectives, instructional approaches, innovative learning models such as problem-based learning (PbL), Project-based learning (PjBL) and case-based learning (CbL), analysis of learning outcomes in cognitive, affective and psychomotor area. The aim of this course are students are able to analyse innovative learning designs with components (HOTs, TPACK, and 4C) and select the proper design model based on students and courses characteristic.

By the end of this course the students have to be able develop or create a lesson plan of one courses which can be implemented in vocational high school especially in informatics education courses, such as multimedia, software engineering and computer network security specific subject course, integrate innovative learning elements (HOTs, TPACK and 4C) into lesson plans, create and design innovative learning including: lesson plans, learning media, teaching materials, and learning evaluation tools.

In this course will be delivery using Project Based Learning (PjBL) with lecture, presentation, group discussion, and observation methods. Evaluation for this course consists of an assessment by looking at activity, completeness of assignments, problem-based midterms and project-based final exams.

The program learning outcomes of this course are:

- Able to analyse the theoretical concepts of informatics education and informatics engineering.
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media, and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education.

- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners.
- Able to reorganize logical, critical, systematic, and innovative thinking in the context of science and technology development and implementation focusing humanities values on accordance with their areas of expertise.
- Able to create informatics education instructional by utilizing various science and technology-based learning resources.
- Able to design technology-based learning media products and oriented to innovative informatics education learning models.

The course learning outcome of this course are:

- Able to explain theoretical concepts in the field of pedagogy.
- Able to relate learning theory and practicing scientific content to support educator professionalism in learning.
- Able to integrate information technology in teaching and learning.
- Able to plan, design, implement, and evaluating informatics engineering learning by utilizing information technology as tools for instructional.

C. Ways of Studying:

Lectures usually with synchronous-asynchronous mode of inquiry approach (cooperative interaction via small group discussion; observation, working in pairs or in groups; performance evaluation; making analysis products in the form of presentation slides). For the synchronous will use the zoom meeting and asynchronous will conducted by the group assignments. There is also collaboration space after conduct meeting. Before conduct lecturing meeting, the students will be given the material or content for learn individually. Here sample of collaboration space of students: https://docs.google.com/document/d/1x6fvpWCAx3-ZmltaMKk76RQ2kS68BhcxM0hNEd4ON4U/edit?usp=sharing

Students are expected to play very active roles during the observation assignment. Observation will be conducted in each school (junior high school or vocational high school) to conduct observation regarding the teaching strategy of educator. Students capture the root problem of the teaching strategy based on condition and situation of the instructional at school and the students ask to analyse the solution to create the innovative instructional approach. Here is the sample of observation format of students: https://drive.google.com/drive/folders/1EOrtMtDymRdMX_aVKiWtqB3L1GZNEsRE?usp=sharing

D. Assessment

Assessment will be through by middle and final test. For the middle and final test given by the project based. The students will be finishing their project in two weeks. After they finish the project, they must present in front of the class.

Here the project for the middle test: https://drive.google.com/file/d/1ZXHGYAJZFoh5GIbN_vSQhx7gECbRdU_N/view?usp=sharing
Here the project of the final test: https://drive.google.com/file/d/1meOX-wkvLoEkqcO8XTosAQJhPwhy8Tmb/view?usp=sharing

The assignment is to be completed no later than two weeks after the end of the modules. The criteria used in evaluating assignments are logicality, normativity, and objectivity. The analysis should be logic in relevance the instructional problem and should be objective based on the right way reasoning that given by the students.

E. Reading:

This is a general reading list as a guidelines and references of students including: book, e-book and article.

- Arikunto,Suharsimi,*Dasar-Dasar Evaluasi Pendidikan*, Bumi aksara : Jakarta,2009.
- Barbara Seels, Zita Glasgow, *Making Instructional Design Decisions*, Merrill Publishing Company , Columbus OH,1998
- Capraro, R. M., Capraro, M. M., & Morgan, J. R. (2013). STEM Project-Based Learning: An Integrated Science, Technology, Engineering, and Mathematics (STEM) Approach, Second Edition. In *STEM Project-Based Learning: An Integrated Science, Technology, Engineering, and Mathematics (STEM) Approach, Second Edition*. https://doi.org/10.1007/978-94-6209-143-6
- Filloy, E., Puig, L., & Rojano, T. (2008). Teaching Models. In *Educational Algebra*. https://doi.org/10.1007/978-0-387-71254-3_5
- Integration, T., Classrooms, H. P., Integration, T., & Classrooms, H. P. (2015). *Technology Integration and High Possibility Classrooms: Building from TPACK*. https://www.taylorfrancis.com/books/9781315769950
- Bela Banathy, *Instructional System*, Fearon Publisher, Belmont,CA : 1968.
- Voogt, J., & Roblin, N. P. (2010). 21st century skills. *Discussienota. Zoetermeer: The Netherlands: Kennisnet*, *23*(03), 2000.
- Dick, Walter, Lou Carey, James O.Carey. *The Systematic Design Of Instruction*, Pearson Education Inc , New Jersey, 2009.
- Gustafson,Kent L.&Robert Maribe Branch. *Survey of Instructional Development Models*, Educational Resource Information Center, New York, 2002
- Gredler, Margaret E.,*Learning and Instruction Theory into Practice*, sixth Edition, Pearson Ltd, New Jersey, 2009.
- Jhonson Elaine B., *Contextual Teaching and Learning*, terj. Ibnu Setiawan Bandung: MLC, 2007.
- Kemp, Ross andMorrison, *Designing Effective Instruction*, United State of America:John Wiley & Sons, 2007.
- Richey C., Rita, James D. Klein and Monica W.Tracey, *The Instructional Design Knowledge Base, Theory, Research, and Practice*. New York & London : 2011.
- Reigeluth, M., Charles, Alison A. Carr-Chellman, *Instructional-Design Theories and Models Volume III Building a common Knowledge Base*, NY & London: 2009.
- Forehand, M. (2005). Bloom's taxonomy: Original and revised. *Emerging perspectives on learning, teaching, and technology*, *8*, 41-44.

F. Time

16 weekly meetings @150 minutes

16. Instructional Assessment and Evaluation of Informatics Education

A. Criteria for Participation

There are no requirements as such, but previous experience in learning assessment and evaluation informatics education subjects (for example, should understand basic education) will be useful, as will previous participation in courses on education.

B. Objectives

Learning assessment and evaluation informatics education is a fundamental course that teaches students the concepts and applications of education in the context of information education. This course provides an overview of instrument both test and non test type. The course is designed to help students understand the basic concepts of assessment and evaluation of Information education and to apply concept of development task to solve real-world problems in the field.

The course begins with an introduction to assessment and evaluation. Students learn how to evaluate assessment, and analyze the basic concept of assessment, compiling instruments. The course then moves on to the topic of concept of conducting instrument testing, which is an essential concept in learning assessment and evaluation. Students learn how to conducting instrument testing (validity, reliability, discriminatory test, effectiveness of distractors).

The course also covers test and non test instruments, which is including validity test, reliability test, test difficulty level test. Students learn how to evaluate development method of discriminatory power test. The course also covers distractor effectiveness test. Students learn how to analysing tested instruments.

Throughout the course, students understand the concept of assessment and evaluation. Students also develop their problem-solving skills through homework assignments, quizzes, and exams. By the end of the course, students will have a solid understanding of assessment and evaluation and how to apply them to Information education problems.

By the end of this module, participants should be able to critically examine a range of issues concerning assessment and evaluation in different contexts. Examples include:

Demonstrate scientific, educative, and religious attitudes and behaviors that contribute to improving the quality of life in society, nation and state based on academic norms and ethics based on THK values

Able to apply logical, critical, systematic, and innovative thinking in the context of the development or implementation of science and technology that pays attention to and applies humanities values in accordance with their field of expertise

Able to apply the basic concepts of logic, discrete structures, statistics, and various programming language models to solve various computational problems

Able to integrate algorithmic concepts and computational mathematics into various programming languages to develop information systems according to organizational/business needs.

C. Ways of Studying:

Students are expected to play very active roles throughout the module. For each topic they will be given tasks to perform *before* the topic is discussed in class. For example, they will be asked to collect assessment and evaluation (written assessment and evaluation in public places) before the relevant lecture; the data which students bring with them will then be discussed during the lecture.

All students will be given reading tasks *before* each lecture. Then, during the lecture, everyone will be expected to contribute to a discussion of what they have read.

Where appropriate, video evidence of learner development in use will be presented and discussed during lectures.

D. Assessment

Assessment will be through one written assignment of 2,500 words. Students will be expected to analyse and discuss assessment and evaluation of their own choice found in any context in Indonesia. The data must be original. Students will be expected to relate their analysis to their reading. Where appropriate, they should make recommendations for further action.

The assignment is to be completed no later than three weeks after the end of the modules. The criteria used in evaluating assignments are: the extent to which the student successfully gathers data (i.e. method), whether the student analyses their data convincingly, and whether the student is able to relate their discussion to the literature.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Anderson, Larin W. & David R. Krathwohl. A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives. Terjemahan oleh : Agung Prihantoro. 2010. Yogyakarta: Pustaka Pelajar.
- Allen, M.J. & Yen, W.M. 1979. Introduction to measurement theory. Monterey, CA: Brooks/Cole Publishing Company
- Arifin, Zaenal. Evaluasi Pembelajaran (Prinsip, Teknik, Prosedur). 2009. Bandung: PT Remaja Rosdakarya.
- Arikunto, Suharsimi dan Cepi Safruddin Abdul Jabar. 2009. Evaluasi Program Pendidikan. Jakarta: PT Bumi Aksara
- [Marhaeni, A.A., Istri. 2007. Pembelajaran Inovatif dan Asesmen Otentik dalam Rangka Menciptakan Pembelajaran yang Efektif Dan Produktif. http://pasca.undiksha.ac.id/e-learning/staff/images/img_info/4/lt_10-282.pdf (Diakses tanggal 2 Januari 2017)
- Popham, W.J.(1995). Classroom Assessment, What Teachers Need to Know. Boston : Allyn and Bacon.

- Purwanto, Ngalim. 2010. Prinsip-Prinsip dan Teknik Evaluasi Pengajaran. Jakarta: PT Remaja Rosdakarya.
- Arikunto, Suharsimi. 2006. Dasar-dasar Evaluasi Pendidikan (Edisi Revisi). Jakarta: Bumi Aksara.

F. Time

16 weekly meetings @100 minutes

17. Statistics

A. Criteria for Participation

There are no requirements as such, but previous experience in statistic subjects (for example, should understand basic integral, as well as descriptive statistics content that has been obtained at the high school/vocational level) will be useful, as will previous participation in courses on Discrete Mathematics

B. Objectives

Statistics for prospective teacher students is a compulsory course that aims to equip students with basic knowledge about statistics, especially those that can be used in the field of informatics education, and apply it to describe simple data and be able to make decisions in hypothesis testing.

This course begins by introducing the basic concepts of statistics, distinguishing descriptive statistics and inferential statistics, repeating set theory, and probability theory as the basis of inferential statistics. It then provides a solid basis for discrete and continuous theoretical probability distributions and their implementation on binomial distributions, Poisson distributions, and normal distributions which also form the basis of the concept of hypothesis testing. Furthermore, it is also given how to determine sampling and sampling distribution, statistical estimation and the final content of this statistical material is how to perform calculations in hypothesis testing and decision making for that problem

Activities in this course also provide practicum on how to process and analyze data using SPSS tools and the use of statistical tables in z-test, t-test, F-test, data normality table, binomial table, and Poisson table in each provision of appropriate material. The assessment given in this course is through activities in the learning process with the skills to ask and answer existing problems, how to complete tasks given at several meetings that trigger students' creative and critical thinking, quizzes are given unscheduled to measure student understanding, and readiness, and middle tests and final tests through problem-based.

- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media, and technology, as well as evaluation of learning following the scientific content (content knowledge) of informatics education.
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganize logical, critical, systematic, and innovative thinking in the context of science and technology development and implementation focusing on humanities values following their areas of expertise
- Able to create informatics education instructional by utilizing various science and technology-based learning resources.
- Able to construct innovative solutions as a problem-solving in the context of informatics education learning.

C. Ways of Studying:

Students are expected to play very active roles throughout the module **https://go.undiksha.ac.id/ModAjar_Statistika** . For each topic, they will be given tasks to perform *before* the topic is discussed in class and all topics are related. The tasks they have worked on, discussed together, and received feedback from the teacher to strengthen the level of understanding of students. Students will be randomly appointed to convey what they have done. In the SPSS Practicum module **https://go.undiksha.ac.id/Modul_Praktikum** , students are guided to process data on a problem and how to analyze it. In the end, they are asked to practice processing and analyzing the data of a case and present it **https://go.undiksha.ac.id/Kasus_Eksperimen** . All students will be given reading tasks before each lecture. Then, during the lecture, everyone will be expected to contribute to a discussion of what they have read.

D. Assessment

Assessment is given through two domains, namely (i) process appraisal, and (ii) Product appraisal. The process assessment consists of attitude assessment with a weight of 20% and task completion with a weight of 40%; (ii) product assessment consisting of midterm exam scores with a weight of 15% and final semester grades with a weight of 25%. Students will try to fulfill all the tasks given because they have the highest weight, while for attitude assessment, their participation during lectures becomes an important point, openly conveying their lack of understanding of a topic so that learning becomes active and meaningful through mutual discussions between students and teachers. In the middle and end of semester exams, students are tested in writing on their level of ability to solve statistical problems in the community by using SPSS tools in processing and analyzing these problems.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Walpole & Raymond, 1998, *Ilmu Peluang dan Statistika untuk Insinyur dan Ilmuwan*, terbitan ke-2 ITB Bandung
- Mendenhall W.,Sincich T.,1988. *Statistics for the Engineering and Computer Sciences*., Second Edition, Dellen Publishing Company
- Santoso S., 2001. *SPSS versi 10 Mengolah Data Statistik Secara Profesional*, Elex Media Komputindo
- Ketut Agustini, 2017, Modul Ajar *Statistik Inferensial*, Fakultas Teknik dan Kejuruan, Undiksha
- D.C. Montgonery & D.C. Runger, 2003, Applied Statistics and Probability for Engineers, Thirds Edition, John Wiley & Sons, Inc.

https://drive.google.com/file/d/1seSGmc1V9ft17lyIIYCeLJe3Kg-KufpL/view?usp=share_link

- Schuyler W. Huck, 2012, Reading Statistics and Research, Pearson Education Inc.
- https://drive.google.com/file/d/1TLDANrPKauKG9DX5QjIzH_IeMdoxpuY6/view?usp=share_link

F. Time

16 weekly meetings @100 minutes

18. Learning Multimedia

A. Criteria for Participation

This course is taken in the second semester so there are no special requirements for participants. But participants must already understand the material of mathematical logic

B. Objectives

Multimedia Learning courses examine the basic concepts of multimedia, text and multimedia, sound and audio, image/image, video, 2D animation that supports the learning process. The purpose of this course is that students are able to implement the basic concepts of multimedia, text and multimedia, sound and audio, images/images, video, 2D animation that support the learning process. Learning activities use group discussions, case studies, project-based learning, problem-based learning. Evaluation in this course consists of attitudes and student participation in lectures, assignments, middle term exam, and final term exam.

The program study learning outcomes of this course are:

- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- Able to design research and development theories to improve the quality of informatics education
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- Able to construct innovative solutions as a problem solving in the context of informatics education learning

The course learning outcome of this course are:

- Able to explain theoretical concepts in the field of informatics
- Able to apply innovative learning with informatics scientific content
- Able to apply research theory to improve the quality of informatics education learning in schools
- Able to integrate learning skills and using technology that can help the learning process
- Able to create instructional designs to solve learning problems in informatics education

C. Ways of Studying:

Lectures usually with synchronous-asynchronous mode of inquiry approach (cooperative interaction via small group discussion; working in pairs or in groups; performance evaluation; making analysis products in the form of presentation slides). For the synchronous will use the zoom meeting and asynchronous will conducted by the group assignments. Here is the link of the Teaching Resources which used as learning resources: https://drive.google.com/drive/folders/1llXf6AXx3ntjWFUPgMDRpekjysqPQZ4j?usp=sharin

D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of test questions, performance tests, rubrics, observation sheets etc:
https://drive.google.com/drive/folders/1llXf6AXx3ntjWFUPgMDRpekjysqPQZ4j?usp=sharing

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Multimedia Digital (Dasar Teori dan Pengembangannya), Iwan Binanto, Andi, 2010
- Fundamentals of Multimedia, Mark S. Drew, Ze-Nan Li, Prentice Hall, 2004
- Digital Multimedia, Nigel Chapman, Jenny Chapman, Wiley, 2004
- Multimedia Alat untuk Meningkatkan Kebutuhan Bersaing, M. Suyanto, Penerbit Andi Yogyakarta, 2003
- Multimedia Communications: Applications, Networks, and Standards, Fred Halsall, Addison-Wesley, 2001
- Sistem Multimedia dan Aplikasinya, Tri Daryanto, Penerbit Graha Ilmu, 2005

F. Time

16 weekly meetings @150 minutes

19. Software Engineering

A. Criteria for Participation

There are no requirements as such, but previous experience in software engineering subjects (for example, should understand systems, data, and information concepts) will be useful, as will previous participation in courses on Information Systems.

B. Objectives

Software Engineering is a fundamental course that teaches students the concepts and applications of software development. This course generally studies the Software Development Life Cycle, Software Requirements Analysis, Functional and Non-functional Software Requirements, Documentation Standards and Components in Software Requirements Specification, Object-oriented System Modeling using UML, Software Interfaces, Software Testing and Software Maintenance. By attending this course, students are expected to be able to analyze software requirements and describe software modeling with an object-oriented approach such as use case diagram, activity diagram, sequence diagram and class diagram. Students are also expected to be able to make software requirements specification documents according to standards and contain complete components needed in designing a software.

By the end of this module, participants should be able to critically examine a range of issues concerning software engineering in different contexts, include:

- Demonstrate scientific, educative and religious attitudes and behavior which contribute to improve the quality of life in society, nation and state based on academic norms and ethics based on the values of Tri Hita Karana.
- Demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners.
- Reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise.

C. Ways of Studying:

Students are expected to play very active roles throughout the module. For each topic they will be given tasks to perform *before* the topic is discussed in class. Activities in this course include listening to modules or references related to software engineering concepts, create SRS documents, and presenting SRS documents.

D. Assessment

The assessments used are participation in discussions, assignments, presentations, Middle Term Exam, and Final Term Exam.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Alan Dennis. 2012. *Systems Analysis and Design, 5th Edition*. New Jersey: John Wiley & Sons
- Bernard Homès. 2012. *Fundamentals of Software Testing*. New Jersey: John Wiley & Sons
- Kenneth E. Kendall, Julie E. Kendall. 2010. Systems Analysis and Design, 8th Edition. New Jersey: Prentice Hall
- Roger S. Pressman. 2010. Software Engineering A Practitioner's Approach 7th Edition. New York: McGraw-Hill, Ed.
- Rosa A.S dan M. Shalahuddin. (2011). Modul Pembelajaran Rekayasa Perangkat Lunak. Bandung: Modula
- Sommerville, Ian. 2011. Software Engineering, 9th Edition. Boston: Pearson.

F. Time

16 weekly meetings @150 minutes

20. Web Programming

A. Criteria for Participation

This course is taken in the fourth semester and there are no specific requirements for participants. However, participants must already have an understanding of mathematical logic and basic programming concepts.

B. Objectives

Web programming courses examine web technology, web frontend development, backend web, web server side programming language, pure javascript, pure css, javascript framework, css framework, modular programming paradigm, mvc programming paradigm, designing web -based applications database. The purpose of this course is that students are able to design web applications using the MVC or Modular paradigm, master the basis of web programming as a full stack developer, and be able to choose the right web technology. Learning activities using the Project Based Learning (PJBL) learning model, Problem Based Learning (PBL) with lecture methods, presentations, group discussions, observations and real case studies. Evaluation of this course consists of assessments by looking at the originality of ideas, creativity, completeness and the level of complexity of the task, UTS, and UAS with problem based.

The program study learning outcomes of this course are:

- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- Able to design research and development theories to improve the quality of informatics education
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- Able to construct innovative solutions as a problem solving in the context of informatics education learning

The course learning outcome of this course are:

- Able to explain theoretical concepts in the field of informatics
- Able to apply innovative learning with informatics scientific content
- Able to apply research theory to improve the quality of informatics education learning in schools
- Able to integrate learning skills and using technology that can help the learning process

- Able to create instructional designs to solve learning problems in informatics education

C. Ways of Studying:

Lectures are typically conducted using synchronous approaches (in-class/lab/teleconference) and asynchronous approaches (via e-learning media) using the Project-Based, Problem-Based, and Case Method methods. Project-Based and Case Method are used for assignments and practical exercises, while Project-Based will be used for the final exam. Here is the link to the Learning Resources used as a source of learning: https://go.undiksha.ac.id/pemrograman_web-sumber_ajar

D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of test questions, performance tests, rubrics, observation sheets etc: https://go.undiksha.ac.id/pemrograman_web-soal

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- W. Jason Gillmore, 2008. Beginning PHP and Mysql: From Novice to Profesional, Third Edition. Apress.
- Elizabet Naramore, et. al. Beginning PHP5, Apache, and MySql Web Development. Wiley Publishing, Inc.
- Lynn Beighley & Michael Morrison. 2009. Head First PHP and MySql. O'Reilly.
- Stendy B. Sakur. 2010. PHP 5 Pemrograman Berorientasi Objek – Konsep & Implementasi. Penerbit Andi.
- www.php.net
- www.w3schools.com

F. Time

16 weekly meetings @150 minutes

21. Data Structures and Algorithm Analysis

A. Criteria for Participation

Students should understand the basic algorithms and basic programming concept, especially the basic sequential, conditional and looping scheme in programming.

B. Objectives

Data Structure Course and Algorithm Analysis examines the basic concepts of modular programming, the basic concepts of tranversal algorithms in 1-dimensional array, basic concepts of searching, basic concepts of array 2 and n dimensions, basic concepts of stack and queue. The purpose of this course is that students are able to design programs using data structures and algorithms that are more effective and efficient.

By the end of this module, participants should be able to critically examine a range of issues concerning data structure and algorithm analysis in different contexts, include:

- describe the Concept of Algorithms, Programming and Programming Languages
- describe the Concept of Program Structure, Data Structure, Data Types, Mathematical Operators
- describe and implement the Concept of Sequential Schema
- describe and implement the Concept of Conditional Schema
- describe and implement the Concept of Looping Schema
- describe and implement the Concept of 1-Dimensional Array Data Structure
- describe and implement the Concept of Composite Type : Record
- describe and implement the Concept of Modular Programming with Functions and Procedures
- describe and implement the Concept of the Traversal Algorithm in 1-Dimensional Array Data Structure
- describe and implement the Concept of Searching without Boolean Algorithm
- describe and implement the Concept of the Searching with Boolean Algorithm
- describe and implement the Concept of 2 and N Dimensional Array Data Structure
- describe and implement the Concept of Stack Data Structure
- describe and implement the Concept of Queue Data Structure Concept

C. Ways of Studying:

Students are expected to play very active roles throughout the module. For each topic they will be given tasks to perform *before* the topic is discussed in class. Learning activities use Problem Based Learning learning models, with lecture methods, assignments, discussions and questions and answers.

D. Assessment

Evaluation in this course consists of presentations of the proposed algorithm scheme, individual programming practicum, group programming practicum, program demo.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Algorithms and Data Structures, Niklaus Wirth
- Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein.
- Data Structures and Algorithms Made Easy, Narsimha Karumanchi
- Algorithms, Robert Sedgewick and Kevin Wayne
- Problem-Solving with Algorithms and Data Structures using Python, Bradley N. Miller and David L. Ranum

F. Time

16 weekly meetings @150 minutes

22. Microprocessors and Basic Robotics

A. Criteria for Participation

There are no requirements as such, but previous experience in basic programming and algorithm subjects.

B. Objectives

Microprocessor and Basic Robotics is a course that teaches students introductions of microcontrollers, and simulate the use of simple leds, buttons, sensors. Microprocessor and Basic Robotics discusses the concept of a microcontroller, the concept of a led circuit, the concept of a button circuit, simulation with sensors. Activities in this course include explaining the type of microcontroller, explaining and simulating the use of LEDs, explaining and simulating the use of buttons, explaining and simulating the use of simple sensors.

The program study learning outcomes of this course are:

- Able to explain the concept of a microcontroller
- Able toexplain the types of microcontrollers
- Able to microcontroller development
- Able to analyze the application of the microcontroller
- Able to simulate basic circuit using led
- Able to simulate several variations of led animation
- Able to simulate several variations of led animation with cases
- Able to simulate basic circuit using button
- Able to simulate several variations of the button circuit with led
- Able to simulating the use of simple sensors
- Able to simulate multiple circuit variations with sensors

C. Ways of Studying:

Students are given material in each lecture in accordance with the order of the material, namely the concept of a microcontroller, the concept of a led circuit, the concept of a button circuit, simulation with sensors.In lectures, students work on the final project in groups. Students will work on a project in the form of applying the sensor to simulate the real problems. Here is the link of the Teaching Resources which used as learning resources: https://drive.google.com/drive/folders/1BYmlYw-j5BHSXinpXeiK4o2qGiTqbeip?usp=share_link

D. Assessment

The assessments used are student activity, completeness of assignments, Midterm Exam, and project-based Final Term Exam. Here is the link of test questions, performance tests, rubrics, observation sheets etc: https://drive.google.com/drive/folders/1d7Bh0aeylG4EmAFiH7ZiEMChyWKohy71?usp=share_link

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Abdul Kadir. 2013. Panduan Praktis Mempelajari Aplikasi Mikrokontroler dan Pemrogramannya Menggunakan Arduino. Yogyakarta: Andi Offset.
- Abdul Kadir. 2017. Pemrograman Arduino Menggunakan ArduBlock. Yogyakarta: Andi Offset.
- Muhammad Syahwil. 2014. Panduan Mudah Simulasi & Praktek Mikrokontroler Arduino. Yogyakarta: Andi Offset.
- Abdul Kadir, 2018, Arduino dan Sensor, BukuId
- Budhiarto, W., 2020 Menguasai Pemrograman Arduino dan Robotik, Yogyakarta: Penerbit Andi
- Adrianto, H, Darmawan, A., 2021, Arduino: Belajar Cepat Dan Pemrograman, Bandung: Informatika.
- icaksono, M.F., 2019, Aplikasi Arduino Dan Sensor, Bandung: Informatika

F. Time

16 weekly meetings @150 minutes

23. Object-Oriented Programming

A. Criteria for Participation

This course is taken in the third semester so there are no special requirements for participants. But participants must already understand the material of mathematical logic and algorithms.

B. Objectives

The Object Oriented Programming course examines the concept of Object Oriented, Java, Java Classes. The aim of this course is that students are able to understand the concept of object oriented, object oriented programming in the Java language. Learning activities use the project based learning model with lecture methods, simulations, presentations and group discussions. Evaluation in this course consists of attitudes and student participation in lectures, assignments, middle term exam, and final term exam.

The program study learning outcomes of this course are:

- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- Able to design research and development theories to improve the quality of informatics education
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- Able to construct innovative solutions as a problem solving in the context of informatics education learning

The course learning outcome of this course are:

- Able to explain theoretical concepts in the field of informatics
- Able to apply innovative learning with informatics scientific content
- Able to apply research theory to improve the quality of informatics education learning in schools
- Able to integrate learning skills and using technology that can help the learning process
- Able to create instructional designs to solve learning problems in informatics education

C. Ways of Studying:

Lectures usually with synchronous-asynchronous mode of inquiry approach (cooperative interaction via small group discussion; working in pairs or in groups; performance evaluation; making analysis products in the form of presentation slides). For the synchronous will use the zoom meeting and asynchronous will conducted by the group assignments. Here is the link of the Teaching Resources which used as learning resources:

1. https://drive.google.com/drive/folders/1XovfG_4EdOsuufY8Bbr310EPEP4BBq-3?usp=sharing
2. https://drive.google.com/drive/folders/15DZCjnKASuHA72XZVxjuLBAFpPVUsvgD?usp=sharing

D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of test questions, performance tests, rubrics, observation sheets etc: https://drive.google.com/drive/folders/1Z2K8_w9nK-CI4K53TBfh4RvL3heu4EGy?usp=sharing

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Indrasen Pilankar. 2018. Hands-On Object Oriented Programming with Java 11. O'really (Packt).
- Ade Rahmat Iskandar. 2018. Menguasai Pemrograman Berorientasi Obyek. Bandung: Informatika
- Budi Rahardjo dkk. (2012). "Mudah Belajar Java". Penerbit Informatika Bandung.
- Wanda P. Dann, Stephen Cooper, dan Randy Pausch. (2015). Learning to Program with ALICE.Boston: Pearson
- Joel Adams., Ralph Morelli (2021). Alice 3 in Action: Computing Through Animation. Boston: Cengage Learning.

F. Time

16 weekly meetings @150 minutes

24. Microteaching

A. Criteria for Participation

There are no requirements as such, but previous experience in microteaching subjects (for example, should understand basic education) will be useful, as will previous participation in courses on education.

B. Objectives

Microteaching is a fundamental course that teaches students the concepts and applications of education in the context of information education. This course provides an overview of basic teaching skills. The course is designed to help students understand the basic teaching skills and to implementation in learning informatics engineering to solve real-world problems in the field.

The course begins with an introduction to microteaching facts. Students learn how to analyse the component of questioning skills to provide reinforcement and implementation. The course then moves on to the topic of questioning skills, which is an essential concept in microteaching. Students are able to analyse skills using variations and skills in giving explanations and implementation.

The course also covers skills using variations in informatics engineering education learning. Students learn how to explaining skills in learning informatics engineering education. The course also covers skills in opening and closing lessons.. Students learn how to skills in managing classes.

Throughout the course, students understand the concept of microteaching. Students also develop their problem-solving skills through homework assignments, quizzes, and exams. By the end of the course, students will have a solid understanding of microteacing and how to apply them to Information education problems.

By the end of this module, participants should be able to critically examine a range of issues concerning microteaching in different contexts. Examples include:

- Demonstrate scientific, educative, and religious attitudes and behaviors that contribute to improving the quality of life in society, nation and state based on academic norms and ethics based on THK values
- Able to apply logical, critical, systematic, and innovative thinking in the context of the development or implementation of science and technology that pays attention to and applies humanities values in accordance with their field of expertise
- Able to apply the basic concepts of logic, discrete structures, statistics, and various programming language models to solve various computational problems
- Able to integrate algorithmic concepts and computational mathematics into various programming languages to develop information systems according to organizational/business needs.

C. Ways of Studying:

Students are expected to play very active roles throughout the module. For each topic they will be given tasks to perform *before* the topic is discussed in class. For example, they will be asked to collect microteaching (written microteaching in public places)

before the relevant lecture; the data which students bring with them will then be discussed during the lecture.

All students will be given reading tasks *before* each lecture. Then, during the lecture, everyone will be expected to contribute to a discussion of what they have read.

Where appropriate, video evidence of microteaching in use will be presented and discussed during lectures.

D. Assessment

Assessment will be through one written assignment of 2,500 words. Students will be expected to analyse and discuss microteacing of their own choice found in any context in Indonesia. The data must be original. Students will be expected to relate their analysis to their reading. Where appropriate, they should make recommendations for further action. The assignment is to be completed no later than three weeks after the end of the modules. The criteria used in evaluating assignments are: the extent to which the student successfully gathers data (i.e. method), whether the student analyses their data convincingly, and whether the student is able to relate their discussion to the literature.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Arends, R. I. (2007). Learning to Teach. New York: McGraw Hill.
- Arends, R. I., Winitzky, N.E., and Tannenbaum, M.D. (2001). Exploring Teaching: an introduction to education. Boston: McGraw Hill. Callahan, J.F., Clark, L.H. and Kellough, R.D. (1992). Teaching in The Middle and Secondary Schools. New York: Macmillan.
- Cooper, J.M. (1967). Developing Specific Teaching Skills through Micro-Teaching. The High School Journal, 51 (2), 80-85.
- Eggen, P.D. and Kauchak, D.P. (1996). Strategies for Teachers : Teaching Conten and Thinking Skills. Boston: Allyn and Bacon. Hasibuan, J.J. dan Moedjiono (1999) Proses Belajar Mengajar. Bandung: Remaja Rosdakarya.
- Haston, W. (2007). Teacher Modelling as an Effective Teaching Strategy. Music Educators Journal, 93(4), 26-30
- Kriyachou, C. (2007). Essential Teaching Skills. United Kingdom: Nelson Tornes
- Kumar, S.S. (2016). Microteaching--"An Efficient Technique for Learning Effective Teaching". International Journal of Research in IT and Management (IJRIM), 1(Issue 8), 51-61.
- Muijs, D, and Reynolds, D. (2008). Effective Teaching: Evidence and Practice. London: SAGE.

- Passy, B.K. (1976). Becoming Better Teacher: Microteaching Approach, Developed at the Centre of Advanced Study in
Education, the M.S. University of Baroda, Baroda. India: Sahitya Mudranalaya.

- Peker, M. (2009). The use of expanded microteaching for reducing pre- service teachers' teaching anxiety about mathematics. Scientific
Research and Essay, 4 (9), 872-880.

- Remesh, A. (2013). Microteaching, an efficient technique for learning effective teaching. Journal Research in Medical Sciences, 18(2),
158–163.

- SEN, A.I. (2010). Effects of Peer Teaching and Microteaching on Teaching Skills of Pre-Service Physics Teachers. Education and Science
, 35(155), 78-88.

- Turney, C., dkk. (1973). Sydney Micro Skills Handbook Series 1-4. Sydney: Sydney University.

- Wragg, E.C. (2005). The Art and Science of Teaching and Learning: The Selected Works of Ted Wraggg. London: Routledge Falmer.

F. Time

16 weekly meetings @100 minutes

25. Entrepreneurship

A. Criteria for Participation

In this course there are no special requirements for students who will take it, but students already have initial experience related to entrepreneurship

B. Objectives

Entrepreneurship courses examine character competencies, communication and interpersonal competencies, creativity and innovation competencies, competencies in selling products or services, business management competencies. The purpose of this course is that students are able to explain, apply and make an entrepreneurial lifestyle with the ability to communicate, lead and implement business management in managing business. Learning activities use the Problem Base Learning model, with lecture methods, simulations, group presentations and discussions so that they can design a business plan, and design businesses. Evaluation of this course consists of project assessments.

The program study learning outcomes of this course are:

- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- Able to design research and development theories to improve the quality of informatics education
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- Able to construct innovative solutions as a problem solving in the context of informatics education learning

The course learning outcome of this course are:

- Able to explain theoretical concepts in the field of informatics
- Able to apply innovative learning with informatics scientific content
- Able to apply research theory to improve the quality of informatics education learning in schools
- Able to integrate learning skills and using technology that can help the learning process
- Able to create instructional designs to solve learning problems in informatics education

C. Ways of Studying:

Lectures usually with synchronous-asynchronous mode of inquiry approach (cooperative interaction via small group discussion; working in pairs or in groups; performance evaluation; making analysis products in the form of presentation slides). For the synchronous will use the zoom meeting and asynchronous will conducted by the group assignments. Here is the link of the Teaching Resources which used as learning resources: https://drive.google.com/drive/folders/1Xe7rzhu5g8OR_eS6L-KbD1kHpNftL7xl?usp=sharing

D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of test questions, performance tests, rubrics, observation sheets etc: https://go.undiksha.ac.id/PanduanKWU

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Suryana (2013), Kewirausahaan, Kiat dan Proses Menuju Sukses, Edisi 4, Salemba Empat, Jakarta 2.
- Modul Kewirausahaan , oleh: Tim Direktorat Jendral Pembelajaran dan Kemahasiswaan Ditjen Pendidikan Tinggi, Kementriaan Pendidikan dan Kebudayaan. 2013.
- Panduan penyusunan Proposal PKM-K, Belmawa, Kemristek Dikti, 2015, Jakarta
- Kasmir. (2018). Kewirausahaan. Depok: Rajawali Pers.
- Praag, C. M. and Cramer, J.S. 2002. The Roots of Entrepreneurship and Labour Demand: Individual Ability and Low Risk. Economica. Vol. 68, No. 259, pp. 45-62.

F. Time

16 weekly meetings @150 minutes

26. Human Computer Interaction

A. Criteria for participation:

There are no specific requirements for this course, but knowledge gained from previous learning experience on the basic concepts of interface design and how to design interfaces will be useful.

B. Objectives:

Human Computer Interaction course focuses on the principles, methods, and techniques for designing digital interfaces and systems that provide optimal user experiences. It aims to equip students with the knowledge and skills necessary to create intuitive, engaging, and user-centered designs. Students have opportunities to analyze and critique existing user interfaces and systems. Designing an interface of a system requires innovation skills and understanding related to technology and information. Logical, critical, systematic and innovative thinking is also crucial in designing a system interface according to the concept of usability and user experience design. In addition, project management concepts are needed in interface design to support the system design process that meets the user requirements and can provide a good user experience. By the end of the course, students should have a solid understanding of the UX design process and be able to create effective user-centered designs for digital systems within the context of system information. Academic and ethical standards based on THK values are also considered in all learning on this course.

The course begins by studying the topic of basic concepts of human-computer interaction, paradigms and usability principles, user-centered design (UCD), user experience (UX), and user interface (UI).

After learning this topic, students are expected to be able to analyze a system based on usability and user experience principles properly. Then, study the topics of user requirement analysis. After learning this topic, students are expected to be able to analyze the users requirement of a system appropriately. Next, study the topics of persona. After learning this topic, students are expected to be able to describe user personas based on the results of user requirement analysis clearly. After that, study the topics of task analysis and prototyping. After learning this topic, students are expected to be able to apply the concept of user-centered design in designing a prototype and describe the task of the system clearly. And the last one is studying the topic of evaluation techniques. After learning this topic, students are expected to be able to implement evaluation techniques to test the system prototype design properly.

C. Ways of studying:

First, students will study basic concepts of human-computer interaction, paradigms and usability principles, user-centered design (UCD), user experience (UX), and user interface (UI). In this study, students will be asked to conduct an analysis of existing systems based on usability principles. Then, students are asked to design the interface of a new system by analyzing the user needs first. Next, students design user personas based on the results of user requirement analysis. The result will be depicted into a high fidelity prototype system design. At the end of the study, students are asked to conduct an evaluation of the design of the system interface that has been made to potential users. Throughout this course, students typically engage in hands-on projects, individual or group assignments, and design exercises to apply the concepts and techniques they learn.

D. Assessment:

The evaluation process is carried out through the evaluation of student attitudes and participation during the learning process. In addition, assessments are carried out during mid-term exams, final semester exams and assignments. A mid-term test is performed by analyzing an application based on the usability principle. The final test is conducted with the project design of an application based on the principles of usability and the concept of user experience design. The assessment methods used are observation, participation, individual tasks, group tasks and project presentation.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

1. Dix, Alan et.al. 2004. Human-Computer Interaction 3nd Edition. USA: Prentice Hall.
2. Stone, Debbie. at.al. 2005. User Interface Design and Evaluation. San Francisco : Elsevier
3. Garrett, Jesse. 2010. The Elements of User Experience: User-Centered Design for the Web and Beyond (2nd Edition). Barkeley : New Riders
4. Moggridge, Bill. 2007. Designing Interactions. Cambridge :The MIT Press
5. Anderson, Stephen P. 2011. Seductive Interaction Design: Creating Playful, Fun, and Effective User Experiences, Berkeley: New Riders
6. MacKenzie, I. Scott. 2013. Human-Computer Interaction An Empirical Research Perspective, USA: Elsevier.

F. Time:

16 weekly meeting @ 150 minutes

27. Research Methodology of Informatics Education

A. Criteria for Participation

In this course, there are no special requirements for students who will take it, but students already have initial experience related to statistics, learning, instructional, Instructional design, and programming courses.

B. Objectives

This course is a compulsory course given in the second year (semester 4) to encourage students to think creatively, critically, and think scientifically in exploring problems in the field and offering solutions according to their interests, and compiling them in scientific reports according to current writing rules.

- Able to demonstrate scientific, educative, and religious attitudes and behavior which contribute to improving the quality of life in society, nation, and state based on academic norms and ethics based on the values of Tri Hita Karana
- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media, and technology, as well as evaluation of learning following the scientific content (content knowledge) of informatics education.
- Able to design research and development theories to improve the quality of informatics education
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganize logical, critical, systematic, and innovative thinking in the context of science and technology development and implementation focusing on humanities values following their areas of expertise
- Able to create informatics education instructional by utilizing various science and technology-based learning resources
- Able to design technology-based learning media products and oriented to innovative informatics education learning models
- Able to construct innovative solutions as a problem-solving in the context of informatics education learning

C. Ways of Studying:

Students are expected to play very active roles throughout the module **https://go.undiksha.ac.id/Modul_Metopen**. For each topic, they will be given tasks to perform *before* the topic is discussed in class and all topics are related. The tasks they have worked on, discussed together, and received feedback from the teacher to strengthen the level of understanding of students. Students will be randomly appointed to convey what they have done.

This course begins by providing students with an understanding of research methodology perspectives, various types of existing research, being able to distinguish quantitative-qualitative-mixed research paradigms (mix-method) according to the modules that have

been given Reviewing various types of articles according to existing research types and being able to distinguish them through research stage videos. The video is given at the following youtube link, (i) Video Classroom Action Research Stages: https://www.youtube.com/watch?v=8zW2x6PAxfg&t=7s ; (ii) Video Stages of Quasi-Experimental Research: https://www.youtube.com/watch?v=Z2zdnWJI3R0&t=347s ; (iii) Video of Educational Engineering Research Stages: https://www.youtube.com/watch?v=b8w7wVSMjuM&t=82s ; (iv) Informatics Engineering Research Stages Video https://www.youtube.com/watch?v=1hKmsp0_BLs&t=7s .
Following the dean's policy of focusing on development research, students are directed to further explore various development models both for the field of education and the development of the field of informatics. At the end of the lecture, students are directed to complete a small project related to making proposals following their interest in development research, referring to the Research and Development (R & D) method under the rules of proposal writing applicable at the Institution.

D. Assessment

Assessment is given through two domains, namely (i) process appraisal, and (ii) Product appraisal. The process assessment consists of attitude assessment with a weight of 20% and task completion with a weight of 40%; (ii) product assessment consisting of midterm exam scores with a weight of 15% and final semester grades with a weight of 25%. Students will try to fulfill all the tasks given because they have the highest weight, while for attitude assessment, their participation during lectures becomes an important point, openly conveying their lack of understanding of a topic so that learning becomes active and meaningful through mutual discussions between students and teachers. In the middle exams, students have tested their level of understanding of methodology research concepts, and in the end-of-semester exams, Students are assigned to compile small projects in the form of proposals according to the results of identifying problems that have been done in the field.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Gall, D., Meredith, Joyce P.Gall, Walter R borg, 2007., *Educational Research, An Introduction, eight edition*, Pearson Education,Inc., United State
- Agarwal,B.B,S.P.Tayal, M Gupta. 2010. *Software Engineering & Testing, an Introduction*, Jones and Bartlett Pub.
- Sugiyono, 2008, *Metode Penelitian Pendidikan, Pendekatan Kuantitatif, Kualitatif dan R&D,* Alfabeta,Bandung
- Arikunto,Suharsimi, 2009. *Dasar-Dasar Evaluasi Pendidikan*, Bumi aksara : Jakarta
- Arikunto, S. 2006. *Prosedur Penelitian Suatu Pendekatan Praktik (Edisi Revisi VI).* Jakarta: PT Rineka Cipta
- Jazi Eko Istiyanto & Aris Puji Widodo. 2009. *Karakteristik Metode Penelitian Bidang Ilmu Komputer Berlandaskan Pendekatan Positivistik*. Jurnal Sains & Matematika (JSM), Vol. 17 No. 2 April 2009. ISSN: 0854-0675

- Nyoman Sugihartini, **Ketut Agustini**, 2018, Cara Cepat Mengembangkan Instrumen dan Teknik Analisisnya, ISBN : 978-602-425-3677, Rajagrafindo
- James E. Purcell, 2014, Comparison of Software Development Lifecycle Methodologies
- https://drive.google.com/file/d/1_L85AF8boCvufHXcrEh4UdF8Ew0Jl1-w/view?usp=share_link
- Kinji Mori, 2014, Concept Oriented Research nd Development in Information Technology, Copyright © 2014 by John Wiley & Sons, Inc. All rights reserved Published by John Wiley & Sons, Inc., Hoboken, New Jersey Published simultaneously in Canada https://drive.google.com/file/d/1W0pXdY7K1zm3KoiCmVJS3nIcUh1iKSLS/view?usp=share_link
- Dick, Carey & Carey, 2015, The Systematic Design of Instruction, Pearson Education, Inc., https://drive.google.com/file/d/1kclk12oUl_Z2llFdAbuW_Mty2uljQEkA/view?usp=share_link
- Robert Branch. Maribe, Instructional Design : The ADDIE Approach**,** Springer Science ISBN 978-0-387-09505-9 e-ISBN 978-0-387-09506-6; DOI 10.1007/978-0-387-09506-6. https://drive.google.com/file/d/1znv6ZtgTc1dAsOC03olT_hW0hZQ9AN6p/view?usp=share_link
- K. Agustini, 2014, Pengembangan Media Pembelajaran Berbasis Hypertext Untuk Perkuliahan Komunikasi Data Dan Jaringan Komputer Berorientasi Kearifan Lokal Konsep Subak, Disertasi, Universitas Negeri Jakarta
- https://drive.google.com/file/d/1J3tW8OqbneoR7NQpW9YHduSmuGpLjqif/view?usp=share_link

F. Time

16 weekly meetings @150 minutes

28. Digital Image Processing

A. Criteria for Participation

Students should understand the basic algorithms and data structure, especially the 2-dimensional matrix data structure.

B. Objectives

Digital Image Processing discusses the concept of natural imagery, sampling & quantization, point operations, filtering, color space, morphology. After following this course, students can implement various models of basic image processing algorithms into a digital image. Activities in this course include understanding the concept of natural images, sampling & quantization processes, applying point operation algorithms, filtering, converting color space, and applying morphological operations to digital images.

By the end of this module, participants should be able to critically examine a range of issues concerning digital image processing in different contexts, include:

- describe and explain the concept of natural images and color
- describe and explain the concept of digital images
- implement the creation of a GUI Project
- describe and implement the concept of arithmetic operations
- describe and implement the concept of geometric operations
- describe and implement the concept of resampling and scaling
- describe and implement the concept of statistical filtering operations
- describe and implement the concept of linear filtering operation
- describe and implement the concept of edge detector operation
- describe and implement the concept of low and high pass filter operation
- describe and implement the concept of erosion and dilation operations
- describe and implement the concept of opening and closing operations
- describe and implement the concept of color spaces
- describe and implement the concept of color segmentation

C. Ways of Studying:

Students are expected to play very active roles throughout the module. For each topic they will be given tasks to perform *before* the topic is discussed in class. Learning activities use the Project Based Learning model, with lecture methods, assignments, discussions and questions and answers. Activities in this course include understanding the concept of natural images, sampling & quantization processes, applying point operation algorithms, filtering, converting color space, and applying morphological operations to digital images.

D. Assessment

The assessments used are student activity, completeness of assignments, problem-based Middle Semester Test, and project-based Final Semester Test.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Gonzales, R.C., and Woods, R.E. 2008. Digital Image Processing. USA: Prentice Hall
- Jain, A.K. 1989. Fundamentals of Digital Image Processing. USA: Prentice Hall
- Putra, D. 2010. Pengolahan Citra Digital. Yogyakarta: Andi Publisher
- Kadir, A. dan Susanto, A. 2013. Teori dan Aplikasi Pengolahan Citra. Yogyakarta: Andi Publisher
- Image Processing with Python, Ranjita Nair, Jaimin Maniyar

F. Time

16 weekly meetings @150 minutes

29. Artificial Intelligence

A. Criteria for Participation

There are no requirements as such, but previous experience in basic programming and algorithm subjects.

B. Objectives

Artificial Intelligence is a course that teaches students the techniques and methods of artificial intelligence, and their applications that can be used to solve problems in the real world. Topics discussed in this course consist of the concept of artificial intelligence, introduction to fuzzy logic concepts, genetic algorithms, data science, machine learning, artificial neural networks, deep learning, convolutional neural networks Artificial Intelligence discusses techniques and methods of artificial intelligence, and applications that can be used to solve real-world problems. The topics discussed in this course consist of artificial intelligence concepts, introduction to fuzzy logic concepts, genetic algorithms, data science, machine learning, artificial neural networks, deep learning, convolutional neural networks. Activities in this course include understanding the concepts of artificial intelligence and being able to implement artificial intelligence coding in a case

C. Ways of Studying:

Students are given material in each lecture in accordance with the order of the material, namely the concept of artificial intelligence, introduction to fuzzy logic concepts, genetic algorithms, data science, machine learning, artificial neural networks, deep learning, convolutional neural networks. Artificial Intelligence discusses techniques and methods of artificial intelligence , and applications that can be used to solve real-world problems.

In lectures, students work on the final project in groups. Students will work on a project in the form of applying the AI method in solving real problems. Here is the link of the Teaching Resources which used as learning resources: https://drive.google.com/drive/folders/112mAQpnvxC8puMta1_MwGQME01dGxzT4?usp=share_link

D. Assessment

The assessments used are student activity, completeness of assignments, Midterm Exam, and project-based Final Term Exam. Here is the link of test questions, performance tests, rubrics, observation sheets etc: https://drive.google.com/drive/folders/1ZWqFTPxX8osC06AkQ4TtgLNRzNwu4TeM?usp=share_link

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Naba,A., 2009, Belajar Cepat Fuzzy Logic menggunakan Matlab, Penerbit Andi, Yogyakarta
- Sing J.J., 2005, Jaringan Syaraf Tiruan dan Pemrogramannya Menggunakan Matlab, Penerbit Andi, Yogyakarta
- Sutojo,T., Mulyanto,E.,Suhartono,V., 2011, Kecerdasan Buatan, Penerbit Andi, Yogyakarta
- Suyanto,2007, Artificial Intelligence (Searching, Reasoning, Planning and Learning), Informatika, Bandung
- Setyaningsih, Emy, 2022, Machine Learning Untuk Pemula, Informatika, Bandung
- Suyanto, Ramadhani K.N,, Mandala, S., 2019, Deep learning : modernisasi machine learning untuk big data, Informatika, Bandung
- Chand, S, Getting Started with Machine Learning, 2021, https://www.edureka.co/blog/ebook/machine-learning-ebook
- Patrick. D. Smith, 2018, An introduction to AI concepts, algorithms, and their implementation, Packt, https://www.perlego.com/book/835400/handson-artificial-intelligence-for-beginners-an-introduction-to-ai-concepts-algorithms-and-their-implementation-pdf

F. Time

16 weekly meetings @150 minutes

30. Computer Network

A. Criteria for Participation

There are no requirements as such, but previous experience in operating system (for example, should understand basic windows and linux file system, virtualization) will be useful.

B. Objectives

After taking this course, students can explain the basic concepts of computer networks and demonstrate computer network configuration skills. Computer Networks discusses the basic concepts of data communication, computer networks, communication protocol architecture, communication protocols that are in the OSI layer model, especially the physical, data link and network layers, UTP cabling practices, server administration practices using Virtual Machines, and analysis practices such as capturing packets using Wireshark.

Learning Outcomes of the Referred by Study Program:

- PLO2-Able to analyze the theoretical concepts of informatics education and informatics engineering
- PLO3-Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- PLO5-Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- PLO6-Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- PLO9-Able to construct innovative solutions as a problem solving in the context of informatics education learning.

C. Ways of Studying:

Group Discussion: Form study groups with fellow classmates and schedule regular discussions to tackle data communication concepts. For example, participants can discuss OSI Layer and TCP/IP Layer, explore network design considerations for large-scale deployments, or analyze the challenges of implementing network virtualization technologies. Engaging in group discussions allows for the exchange of ideas, collaborative problem-solving, and gaining different perspectives on the subject matter.

Project-Based Learning: Undertake a project that involves designing a network infrastructure using topology. For instance, the project could entail communication OSI/TCP IP protocol such as ICMP, HTTP, etc, Implementing the Network protocol such as a IP Address, create the network architecture using wired or wireless, and Implemented the Application Protocol using virtualization.. This hands-on approach helps apply theoretical knowledge in a practical context, enhances problem-solving skills, and deepens understanding of network design and implementation principles.

D. Assessment

Performance-Based Assessment: As part of the course assessment, students can be tasked with troubleshooting real-world network scenarios or performing network simulations using tools like Cisco Packet Tracer or GNS3. For example, they may be given a network topology with simulated issues like network congestion or misconfigurations of Routing Protocol, IP Address and Application Protocol, and they would need to identify and resolve these problems. Performance-based assessments evaluate the ability to apply theoretical concepts in practical scenarios, assess troubleshooting skills, and demonstrate proficiency in network management.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Sofana, 2014, Cisco CCNA & Jaringan Komputer (edisi revisi), Informatika, Bandung
- Glen E. Clarke, 2014,CCNA Routing and Switching Practice Questions For Dummies, For Dummies
- Jesin A, 2014, Packet Tracer Network Simulator-PACKT
- Silviu Angelescu, 2010, CCNA Certification All-In-One For Dummies
- Cisco Academy, 2009, CCNA Exploration 4.0, Cisco System.Inc
- Jason C. Neumann, 2009,Cisco Routers for the Small Business, Practical Guide for IT Professionals-Apress
- Allan Johnson, 2007, Routing Protocols and Concepts, CCNA Exploration Labs and Study Guide-Cisco Press.
- Agustini, K, Indrawan, G, 2018. Instructional Design for the Computer Network Subject: A Balinese Culture-Based Learning Using Subak, ETWC.
- Agustini, K. 2015. Pengembangan Media Pembelajaran Berbasis Hypertext pada Komunikasi Data Jaringan komputer Berorientasi Konsep Subak.
- Agustini, K, Santyadiputra, G S, Sugihartini, N, 2018. Komunikasi Data dan Jaringan Komputer Serta Implementasinya dalam Konsep Subak, Jakarta. PT. Rajagrafindo

F. Time

16 weekly meetings @150 minutes

31. Mobile Programming

A. Criteria for Participation

This course is taken in the fourth semester, so there are no specific requirements for participants. However, participants must already have an understanding of basic programming concepts..

B. Objectives

Mobile programming courses examine mobile application technology, layout, widget, mobile programming language, designing mobile -based applications, mobile services, mobile networks, sqlite. The purpose of this course is that students are able to master the basis of mobile programming and provide Mobile computing services that are effective and productive. Learning activities using the Project Based Learning (PJBL) learning model, Problem Based Learning (PBL) with lecture methods, presentations, group discussions, observations and real case studies. Evaluation of this course consists of assessments by looking at the originality of ideas, creativity, completeness and the level of complexity of the task, Mid Exam, and Final Exam with problem based.

The program study learning outcomes of this course are:

- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- Able to design research and development theories to improve the quality of informatics education
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- Able to construct innovative solutions as a problem solving in the context of informatics education learning

The course learning outcome of this course are:

- Able to explain theoretical concepts in the field of informatics
- Able to apply innovative learning with informatics scientific content
- Able to apply research theory to improve the quality of informatics education learning in schools
- Able to integrate learning skills and using technology that can help the learning process
- Able to create instructional designs to solve learning problems in informatics education

C. Ways of Studying:

Lectures are typically conducted using synchronous approaches (in-class/lab/teleconference) and asynchronous approaches (via e-learning media) using the Project-Based, Problem-Based, and Case Method methods. Project-Based and Case Method are used for assignments and practical exercises, while Project-Based will be used for the final exam. Here is the link to the Learning Resources used as a source of learning: https://go.undiksha.ac.id/pemrograman-mobile_sumber-ajar

D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of test questions, performance tests, rubrics, observation sheets etc: https://go.undiksha.ac.id/pemrograman-mobile_soal

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Rap Payne (2019). Beginning App Development with Flutter Create Cross-Platform Mobile Apps. Dallas. Apress .
- H., Nazruddin Safaat , Radinal Dwiki Novendra (2021). Building Apps with Android Flutter . Bandung. Informatics .
- Flutter; Tutorials point team (1) Pvt. Ltd.; www.tutorialspoint.com .
- https://youtube.com/playlist?list=PL7jdfftn7HKsfTtv8FOaTbLIIf7feiQTRu
- https://docs.flutter.dev/

F. Time

16 weekly meetings @150 minutes

32. Basic of 2D Animation

A. Criteria for Participation

The basic knowledge that students must have is storyboarding, and basic multimedia

B. Objectives

Basic Animation 2 Dimensional course reviews the basic theories of pre -production, production and post -production, as well as practicum techniques motion, tweening, stop motion, keyframes and frames by frame. The purpose of this course is that students are able to master hard skills in the form of the basic concept of 2D animation, as well as soft skills in the form of solving various problems using the concept of 2D animated film production. Learning activities use the Project Based Learning (PJBL) learning model with lecture methods, presentations, group discussions and real case studies. Evaluation of this course consists of an assessment project.

By the end of this module, participants should be able to critically examine a range of issues concerning language form and function in different contexts. Examples include:

Demonstrate scientific, educative, and religious attitudes and behaviors that contribute to improving the quality of life in society, nation and state based on academic norms and ethics based on THK values

Able to analyze the theoretical concepts of informatics education and informatics engineering.

Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education.

Able to design research and development theories to improve the quality of informatics education.

C. Ways of Studying:

Students are expected to master various techniques in product 2D-animation video. Students determine the project to be carried out during the lecture process. Students are given to look for various references in determining 2D-animation video ideas to be made. Students are given an overview of 2D-animation video, various information about basic 2D-animation techniques such as character design, story, appearance, and other assets.

Students work on projects on groups by 3 until 4 members, starting from preparing the materials and assets needed to create 2D-animation video. At the end of the meeting, students presented the results of the project that had been done.

D. Assessment

The assessment is carried out by assessing the results of the final project in the form of a 2D-animation video. Through the presentation of the final project results, students are expected to be able to meet the criteria for attitude assessment and participation in presentations.

Attitude assessment and participation are carried out during the presentation of the final project results. For the assessment of prototype products, performance assessments are carried out at each stage of project work ranging from character design, story design, 2D-animation techniques and so on.

The assessment rubric is arranged based on product quality and completeness of the final product.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Blain, J. M. (2021). Blender 2D Animation: The Complete Guide to the Grease Pencil. London, New York. CRC Press.
- Williams, R. (2019). The Animator's Survival Kit: A Manual of Methods, Principles, and Formulas for Classical, Computer, Games, Stop Motion, and Internet Animators. London. (ISBN 0-5712-0228-4)
- Cinemags. (2004). The Making of Animation:homeland. Bandung: PT Megindo Tunggal Sejahtera Indonesia.
- Wahyu Purnama & Wahyu Andreas. (2013), Animasi 2D. Malang: Kementrian Pendidikan & Kebudayaan.
- Munir. (2012). Multimedia Konsep dan Aplikasi dalam Pembelajaran. Bandung: Alfabeta.

F. Time

16 weekly meetings @150 minutes

33. Network Security

A. Criteria for Participation

To participate in the Network Security course, applicants must meet several criteria. These include a strong foundation in networking concept, a comprehensive understanding of TCP/IP Protocol, familiarity with routing and switching technologies, and basic programming skills.

B. Objectives

After taking this course, students can understand security issues in building a network or information system. Network Security discusses Cybercrime Classification, Security Principles, cryptography, Footprinting, Reconnaissance, Enumeration, Vulnerability Analysis, System Hacking.

Learning Outcomes of the Referred by Study Program:

- PLO2-Able to analyze the theoretical concepts of informatics education and informatics engineering
- PLO3-Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- PLO5-Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- PLO6-Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- PLO9-Able to construct innovative solutions as a problem solving in the context of informatics education learning.

C. Ways of Studying:

Group Discussion: Form a group with several students and according to the schedule discuss several material discussions on Network Security such as cybercrime classification, security principles, cryptography, and stages of hacking. In discussion groups students exchange ideas, solve problems by collaboration, and get different perspectives on the material.

Project-Based Learning: students complete a project in the form of doing penetration testing of a vulnerable website with stages according to the material, namely from searching for information about a website (Footprint/Reconnaissance), scanning, vulnerability testing until to compiling a report on the findings obtained. This hands-on approach helps apply theoretical knowledge in a practical context, enhances problem-solving skills, and deepens understanding of network security.

D. Assessment

Attidute: Attidute assessment is an assessment by looking at how students behave during class such as being active and polite, attitude assessments are monitored while doing lectures.

Another assessment, Performance-Based Assessment in conducting discussions, presenting group assignments to the final project. The performance of conducting discussions is seen based on the suitability of the answers with the material provided. and the performance of carrying out the final assignment can be seen from the suitability of the report and also the accuracy of the implementation of the testing stages besides that it also looks at how students present the results of the group assignments and the final project.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Raharjo, B. 2005. Keamanan Sistem Informasi, PT Insan Infonesia. Jakarta
- Stallings, W. 2005. Cryptography and Network Security. Amerika
- Certified Ethical Hacker V10, EC-Council
- Munir, R. 2004. Kriptografi. Informatika. Bandung
- McClure, S, etc. 2012. Hacking Exposed: Network Security Secrets & Solutions.

F. Time

16 weekly meetings @150 minutes

34. Network Administration

A. Criteria for Participation

To participate in the Network Administration course, individuals should possess a foundational understanding of computer networks, including concepts such as TCP/IP protocols, network topologies, subnetting, and network troubleshooting. Proficiency in network operating systems like Cisco IOS, Windows Server, or Linux is beneficial. Familiarity with network devices such as routers, switches, firewalls, and their configurations is essential. Basic knowledge of network security, including access control, VPNs, and intrusion detection systems, is recommended. Additionally, having experience in administering network services like DNS, DHCP, and Active Directory is advantageous. Overall, participants should demonstrate a strong technical background and a desire to gain practical skills in network administration for successful participation in the course.

B. Objectives

After taking this course, students will be able to explain the theoretical concepts of infrastructure and network system administration, practice learning with infrastructure and network system administration content, integrate learning skills and the use of technology in the application of infrastructure and network system administration, as well as apply, study, and create designs. to solve problems within the scope of network infrastructure and system administration. Network Administration discusses Network Operating Systems and Virtual Machines, Server Administration, VLAN Administration, Firewall Administration and NAT.

Learning Outcomes of the Referred by Study Program:

- PLO2-Able to analyze the theoretical concepts of informatics education and informatics engineering.
- PLO3-Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education.
- PLO4-Able to design research and development theories to improve the quality of informatics education.
- PLO5-Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners.
- PLO6-Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise.
- PLO9-Able to construct innovative solutions as a problem solving in the context of informatics education learning.

C. Ways of Studying:

Group Discussion: Organize study groups with fellow students to discuss and analyze network administration scenarios. For instance, participants can discuss best practices for configuring network devices, share experiences in troubleshooting network issues, or

explore strategies for implementing network security measures. Engaging in group discussions allows for the exchange of ideas, problem-solving collaboration, and the opportunity to learn from different perspectives and experiences.

Project-Based Learning: Undertake hands-on projects that simulate real-world network administration tasks. For example, students can work on setting up and configuring a network infrastructure, including routers, switches, firewalls, and servers. They can design and implement network security measures, such as access control lists (ACLs) or virtual private networks (VPNs). Additionally, projects can involve setting up network services like DNS, DHCP, or implementing network monitoring and management tools. These projects provide practical experience in network administration, reinforce theoretical concepts, and develop crucial skills for managing and maintaining network environments..

D. Assessment

Performance-Based Assessment: Assessments can include performance-based tasks that require students to demonstrate their network administration skills. For instance, students may be tasked with troubleshooting network connectivity issues, designing network architectures, or implementing security measures in a simulated environment. These assessments allow for the application of knowledge and skills in practical scenarios, evaluating problem-solving abilities, critical thinking, and proficiency in network administration tasks.

E. Reading:

- Mike Meyers (2018),"CompTIA Network+ Certification All-in-One Exam Guide, Seventh Edition (Exam N10-007)"
- Jason Edelman, Scott S. Lowe, and Matt Oswalt (2018), "Network Programmability and Automation: Skills for the Next- Generation Network Engineer"
- Todd Lammle (2019), "CCNA Routing and Switching Complete Study Guide: Exam 100-105, Exam 200-105, Exam 200-125"
- Bradley Edgeworth, Ramiro Garza Rios, David Hucaby, Jason Gooley (2020), "CCNP Enterprise Core ENCOR 350-401 Official Cert Guide"
- Jason Gooley and Ryan Tischer (2019), "Cisco Software-Defined Wide Area Networks: Designing, Deploying, and Securing Your Next Generation WAN with Cisco SD-WAN"
- Jeff T. Parker (2020), "Networking Essentials: A CompTIA Network+ N10-007 Textbook"
- Chris Sanders (2018), "Practical Packet Analysis, 3rd Edition: Using Wireshark to Solve Real-World Network Problems"

F. Time

16 weekly meetings @150 minutes

35. Advanced Computer Network

A. Criteria for Participation

To participate in the Advanced Computer Network course, applicants must meet several criteria. These include a strong foundation in networking concepts, a comprehensive understanding of TCP/IP protocols, familiarity with routing and switching technologies, knowledge of network security principles and practices, and basic programming skills. These prerequisites ensure that participants have the necessary knowledge and skills to delve into advanced topics such as network design, virtualization, cloud computing, software-defined networking (SDN), network automation, and emerging networking technologies. By fulfilling these requirements, individuals can maximize their learning experience and actively engage in the course material, enabling them to acquire the expertise needed to excel in the field of computer networking.

B. Objectives

After taking this course, students can analyze and perform troubleshooting appropriately related to problems that arise in the world of computer networks. Advanced Computer Network covers basic concepts of application layer, presentation, session, and transport concepts, quality of service, VLAN practices, NAT practices, and dynamic routing practices.

Learning Outcomes of the Referred by Study Program:

- PLO2-Able to analyze the theoretical concepts of informatics education and informatics engineering
- PLO3-Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- PLO5-Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- PLO6-Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- PLO9-Able to construct innovative solutions as a problem solving in the context of informatics education learning.

C. Ways of Studying:

Group Discussion: Form study groups with fellow classmates and schedule regular discussions to tackle complex networking concepts. For example, participants can discuss advanced routing protocols like OSPF or BGP, explore network design considerations for large-scale deployments, or analyze the challenges of implementing network virtualization technologies. Engaging in group discussions allows for the

exchange of ideas, collaborative problem-solving, and gaining different perspectives on the subject matter.

Project-Based Learning: Undertake a project that involves designing and implementing a network infrastructure. For instance, the project could entail setting up a multi-site network with VLANs, implementing network security measures such as firewalls and intrusion detection systems, and configuring Quality of Service (QoS) for optimizing network performance. This hands-on approach helps apply theoretical knowledge in a practical context, enhances problem-solving skills, and deepens understanding of network design and implementation principles.

D. Assessment

Performance-Based Assessment: As part of the course assessment, students can be tasked with troubleshooting real-world network scenarios or performing network simulations using tools like Cisco Packet Tracer or GNS3. For example, they may be given a network topology with simulated issues like network congestion or misconfigurations, and they would need to identify and resolve these problems. Performance-based assessments evaluate the ability to apply theoretical concepts in practical scenarios, assess troubleshooting skills, and demonstrate proficiency in network management.

E. Reading:

- Kurose, J. F., & Ross, K. W. (2020). Computer networking: a top-down approach (8th ed.). Pearson Education.
- Peterson, L. L., & Davie, B. S. (2021). Computer networks: a systems approach (6th ed.). Morgan Kaufmann Publishers.
- Tanenbaum, A. S., Wetherall, D., & Van Steen, M. (2020). Computer Networks (6th ed.). Pearson Education.
- Stallings, W. (2021). Computer networking with internet protocols and technology (2nd ed.). Pearson Education.
- Mao, W., & Anderson, T. (2018). Computer Networking: A Top-Down Approach Featuring the Internet of Things. McGraw Hill Education.
- Keshav, S. (2020). An Engineering Approach to Computer Networking. Addison Wesley.
- Forouzan, B. A., & Fegan, S. C. (2018). Data communications and networking (5th ed.). McGraw Hill Education.
- Comer, D. E. (2019). Computer Networks and Internets (6th ed.). Pearson Education.

F. Time

16 weekly meetings @150 minutes

36. Interactive Multimedia

A. Criteria for Participation

This course is taken in the second semester so there are no special requirements for participants. But participants must already understand the material of mathematical logic

B. Objectives

Interactive multimedia courses examine the concepts of interactive multimedia, storyboard, user interface design, application introduction, multimedia elements, multimedia-based multimedia product manufacturing, application introduction, basic action scripts, data processing, interactive multimedia product manufacturing, product packaging. The purpose of this course is that students are able to understand the concept of interactive multimedia, and apply the creation of interactive multimedia products. Learning activities use group discussions, case studies, project-based learning, problem - based learning. Evaluation in this course consists of attitudes and student participation in lectures, assignments, middle term exam, and final term exam.

The program study learning outcomes of this course are:

- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- Able to design research and development theories to improve the quality of informatics education
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- Able to construct innovative solutions as a problem solving in the context of informatics education learning

The course learning outcome of this course are:

- Able to explain theoretical concepts in the field of informatics
- Able to apply innovative learning with informatics scientific content
- Able to apply research theory to improve the quality of informatics education learning in schools
- Able to integrate learning skills and using technology that can help the learning process
- Able to create instructional designs to solve learning problems in informatics education

C. Ways of Studying:

Lectures usually with synchronous-asynchronous mode of inquiry approach (cooperative interaction via small group discussion; working in pairs or in groups; performance evaluation; making analysis products in the form of presentation slides). For the synchronous will use the zoom meeting and asynchronous will conducted by the group assignments. Here is the link of the Teaching Resources which used as learning resources: https://drive.google.com/drive/folders/1DwnLrW6I3Xyohkk069CaqjYl5GLrRxOI?usp=sharing

D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of test questions, performance tests, rubrics, observation sheets etc: https://drive.google.com/drive/folders/1DwnLrW6I3Xyohkk069CaqjYl5GLrRxOI?usp=sharing

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Multimedia Digital (Dasar Teori dan Pengembangannya), Iwan Binanto, Andi, 2010
- Fundamentals of Multimedia, Mark S. Drew, Ze-Nan Li, Prentice Hall, 2004
- Digital Multimedia, Nigel Chapman, Jenny Chapman, Wiley, 2004
- Multimedia Alat untuk Meningkatkan Kebutuhan Bersaing, M. Suyanto, Penerbit Andi Yogyakarta, 2003
- Multimedia Communications: Applications, Networks, and Standards, Fred Halsall, Addison-Wesley, 2001
- Sistem Multimedia dan Aplikasinya, Tri Daryanto, Penerbit Graha Ilmu, 2005

F. Time

16 weekly meetings @150 minutes

37. Game Design

A. Criteria for Participation

The basic knowledge that students must have is storyboarding, basic multimedia and 2-dimensional or 3-dimensional animation

B. Objectives

Game Design course examines the concept of design games, concepts of Fun & Core Experience and Core Loop in a game, Process of Design & MDA Framework as well as how to find a game idea, concept of game balance and techniques used, the concept of making design, making Wireframe, Making Screenflow, Persona User, Character, Control, Camera: 3C Design in a Game, Cress Analysis, Using Tools for Design Games, Creating Prototype Games. The purpose of this course is that students are able to understand the concepts of games and design games. Learning activities use group discussions, case studies, project -based learning, problem -based learning. Evaluation of this course consists of performance assessment and project assessment.

By the end of this module, participants should be able to critically examine a range of issues concerning language form and function in different contexts. Examples include:

- Demonstrate scientific, educative, and religious attitudes and behaviors that contribute to improving the quality of life in society, nation and state based on academic norms and ethics based on THK values
- Able to analyze the theoretical concepts of informatics education and informatics engineering.
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education.
- Able to design research and development theories to improve the quality of informatics education.

C. Ways of Studying:

Students are expected to master various techniques in designing game prototypes. Students determine the project to be carried out during the lecture process. Students are given to look for various references in determining game design ideas to be made. Students are given an overview of game design, various information about basic game design techniques such as character design, story, appearance, rules, and other equipment.

Students work on projects independently, starting from preparing the materials and assets needed to design games. At the end of the meeting, students presented the results of the project that had been done.

D. Assessment

The assessment is carried out by assessing the results of the final project in the form of a game prototype. Through the presentation of the final project results, students are expected to be able to meet the criteria for attitude assessment and participation in presentations.

Attitude assessment and participation are carried out during the presentation of the final project results. For the assessment of prototype products, performance assessments are carried out at each stage of project work ranging from character design, story design, game design techniques, game rules and so on.

The assessment rubric is arranged based on product quality and completeness of the final product.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Adams, E. 2010. Fundamentals of Game Design. Second Edition ed. Berkeley: Pearson Education, Inc.
- Pujiyanto. 2005. Desain Grafis Komputer. Yogyakarta: Andi Publisher.
- Adams, E., & Rollings, A., (2007). Game Design and Development. USA: New Reader Publishing
- Glass, B. D, Maddox, W. T, & Love, B. C. (2013). Real-Time Strategy Game Training Emergence of a Cognitive Flexibility Trait. PloS ONE 8(8):e70350. doi:10.1371/journal.pone.0070350
- Mahardy, D. (2016, Januari 5). Industri Game Indonesia hasilkan 4,45 triliun di 2015. Tecno.Id . Diunduh dari http:// www. Tecno.id
- Rini, A. (2011). Menanggulangi Kecanduan Game Online Pada Anak. Jakarta: Pustaka Mina
- Yudha, A. (2016). Game Online dan Berfikir Kreatif (Studi Korelasional tentang hubungan Game Online DotA terhadap Berfikir Kreatif Mahasiswa di Kelurahan Padang Bulan Medan). Jurnal Ilmu Komunikasi FLOW, 2(12), 1- 10
- Young, K. (2009). Understanding Online Gaming Addiction and Treatment Issues For Adolescents. American Journal of Family Therapy, 37, 355-372. DOI: 10.1080/01926180902942191

F. Time

16 weekly meetings @150 minutes

38. Advanced Computer Animation

A. Criteria for Participation

This course is taken in the second semester so there are no special requirements for participants. But participants must already understand the material of mathematical logic

B. Objectives

The Advanced Computer Animation course examines the theory of pre -production, production and post -production, as well as various animation techniques including: Modeling, Rigging, Skinning, Controlling, Faciall Expression, Animation, Simulation & Rendering. The purpose of this course is that students are able to master hard skills in the form of basic 3D animation concepts, as well as soft skills in the form of solving various problems using the concept of 3D animated film production. Learning activities use group discussions, case studies, project -based learning, problem -based learning. Evaluation of this course consists of an assessment project.

The program study learning outcomes of this course are:

- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- Able to design research and development theories to improve the quality of informatics education
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- Able to construct innovative solutions as a problem solving in the context of informatics education learning

The course learning outcome of this course are:

- Able to explain theoretical concepts in the field of informatics
- Able to apply innovative learning with informatics scientific content
- Able to apply research theory to improve the quality of informatics education learning in schools
- Able to integrate learning skills and using technology that can help the learning process
- Able to create instructional designs to solve learning problems in informatics education

C. Ways of Studying:

Lectures usually with synchronous-asynchronous mode of inquiry approach (cooperative interaction via small group discussion; working in pairs or in groups; performance evaluation; making analysis products in the form of presentation slides). For the synchronous will use the zoom meeting and asynchronous will conducted by the group assignments. Here is the link of the Teaching Resources which used as learning resources: **https://drive.google.com/drive/folders/1M2Hih6dZ9DUFRmDrOrlHHZoQysaacGwE?usp=sharing**

D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of test questions, performance tests, rubrics, observation sheets etc: **https://www.hackerrank.com/ptiundiksha-alprocontest** **https://www.hackerrank.com/ptiundiksha-strukdatcontest**

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- http://pustaka.unp.ac.id/file/abstrak_kki/EBOOKS/Animasi%20Komputer%20Tiga%20Dimensi.pdf
- Gordon C. Fisher. 2012. Blender 3D Basics Beginner's Guide. UK: Packt Publishing Ltd https://drive.google.com/drive/folders/1M2Hih6dZ9DUFRmDrOrlHHZoQysaacGwE?usp=sharing
- Hans P Bacher. 2008. Dream Worlds Production Design In Animation. USA: Elsevier https://drive.google.com/drive/folders/1M2Hih6dZ9DUFRmDrOrlHHZoQysaacGwE?usp=sharing
- Frank Thomas & Ollie Johnston. 1981. 12 Principles of Animation. https://dkv.upi.edu/elibrary/admin/file/file_51.pdf
- Wright Jean. 2005. Animation Writing and Development. Burlington: Focal Press.

F. Time

16 weekly meetings @150 minutes

39. Advanced Mobile Programming

A. Criteria for Participation

This course is taken in the fifth semester, so there are no specific requirements for participants. However, participants must already have an understanding of mobile programming concepts..

B. Objectives

Mobile programming courses continue to study about mobile application technology, layout, widget, mobile programming language, designing mobile -based applications, mobile services, management files, mobile networks, sensors, realtime apps, advanced state management. The purpose of this course is that students are able to master advanced mobile programming and provide effective and productive mobile computing services. Learning activities using the Project Based Learning (PJBL) learning model, Problem Based Learning (PBL) with lecture methods, presentations, group discussions, observations and real case studies. Evaluation of this course consists of assessments by looking at the originality of ideas, creativity, completeness and the level of complexity of the task, UTS, and UAS with problem based.

The program study learning outcomes of this course are:

- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- Able to design research and development theories to improve the quality of informatics education
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- Able to construct innovative solutions as a problem solving in the context of informatics education learning

The course learning outcome of this course are:

- Able to explain theoretical concepts in the field of informatics
- Able to apply innovative learning with informatics scientific content
- Able to apply research theory to improve the quality of informatics education learning in schools
- Able to integrate learning skills and using technology that can help the learning process
- Able to create instructional designs to solve learning problems in informatics education

C. Ways of Studying:

Lectures are typically conducted using synchronous approaches (in-class/lab/teleconference) and asynchronous approaches (via e-learning media) using the Project-Based, Problem-Based, and Case Method methods. Project-Based and Case Method are used for assignments and practical exercises, while Project-Based will be used for the final exam. Here is the link to the Learning Resources used as a source of learning: https://go.undiksha.ac.id/pemrograman-mobile-lanjut_sumber-ajar

D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of test questions, performance tests, rubrics, observation sheets etc: https://go.undiksha.ac.id/pemrograman-mobile-lanjut_soal

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

a. Rap Payne (2019). Beginning App Development with Flutter Create Cross-Platform Mobile Apps. Dallas. Apress .
b. Flutters; Tutorials point team (1) Pvt. Ltd.; www.tutorialspoint.com .
c. H., Nazruddin Safaat, Radinal Dwiki Novendra (2021). Membangun Aplikasi dengan Android Flutter. Bandung. Informatika.
d. https://docs.flutter.dev/
e. https://youtube.com/playlist?list=PL7jdfftn7HKsfTtv8FOaTbLIIf7feiQTRu

F. Time

16 weekly meetings @150 minutes

40. Advanced Database

A. Criteria for Participation

This course is taken in the fifth semester and there are no specific requirements for participants. However, participants must already have an understanding of database material.

B. Objectives

The Advanced Database course examines The design methodology for databases and verifying their structural correctness (Database Development Life Cycle), Implementing databases and software applications primarily in the relational model, Implementing Query Language (Data Definition, Manipulation, & Control Language) - MySQL , Advanced SQL (Procedure, Function, View, Triggers, Indexes), Implementing Database Administration including security and integrity policies relating to databases, The basic principles behind data warehousing and preparation for data analytics , Basic knowledge about Non Relational Databases, Working in group settings to design and implement database projects. The objectives of this course are that students are able to Master Query Language, Master Advanced Query Language, Understand Distributed and Parallel Databases, Understand Data Mining, Understand Database Trends, and Non-relational Databases. Learning activities use the Project Based Learning (PjBL) Learning Model, Problem Based Learning (PBL) with lecture methods, presentations, group discussions, observations and real case studies. Evaluation in this course consists of Assignments, Mid Exam, Final Exam.

The program study learning outcomes of this course are:

- Able to analyze the theoretical concepts of informatics education and informatics engineering
- Able to evaluate learning theory and informatics education content in depth which includes the informatics education curriculum, learning methodology, media and technology, as well as evaluation of learning in accordance with the scientific content (content knowledge) of informatics education
- Able to design research and development theories to improve the quality of informatics education
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners
- Able to reorganize logical, critical, systematic and innovative thinking in the context of science and technology development and implementation focusing humanities values in accordance with their areas of expertise
- Able to construct innovative solutions as a problem solving in the context of informatics education learning

The course learning outcome of this course are:

- Able to explain theoretical concepts in the field of informatics
- Able to apply innovative learning with informatics scientific content

- Able to apply research theory to improve the quality of informatics education learning in schools
- Able to integrate learning skills and using technology that can help the learning process
- Able to create instructional designs to solve learning problems in informatics education

C. Ways of Studying:

Lectures are typically conducted using synchronous approaches (in-class/lab/teleconference) and asynchronous approaches (via e-learning media) using the Project-Based, Problem-Based, and Case Method methods. Project-Based and Case Method are used for assignments and practical exercises, while Project-Based will be used for the final exam. Here is the link to the Learning Resources used as a source of learning: https://go.undiksha.ac.id/basisdata-lanjut_sumber-ajar

D. Assessment

Assessment will be through by assignments, quiz, middle, and final test. For the middle and final test given by the problem based. Here is the link of test questions, performance tests, rubrics, observation sheets etc: https://go.undiksha.ac.id/basisdata-lanjut_soal

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

a. Database Systems: Concepts, Design and Applications. by S. K. Singh. Released August 2009. Publisher(s): Pearson India. ISBN: 9788177585674.
b. Abdul, Kadir. 2003. Konsep dan Tuntunan Praktis Basis Data, Yogyakarta: Penerbit Andi.
c. Hernandez, Michael J. 2013. Database Design for Mere Mortal: A Hands-on Guide to Relational Database Design, New Jersey: Addison Wesley
d. Hoffer, A Jeffrey, et al, 2005.Modern Database Management 7thedition.New Jersey: Pearson Education, Inc
e. Sayeed MM. Tahaghoghi & Hugh E. Williams. 2007. Learning MySQL. California: O'Reilly Media, Inc.
f. Databases Illuminated 3rd Ed., Catherine Ricardo and Susan Urban, Jones and Bartlett, 2017 (ISBN 978-1-284-05694-5)

F. Time

16 weekly meetings @150 minutes

41. Advanced Image Processing

A. Criteria for Participation

Students should understand the basic image processing methods and algorithms.

B. Objectives

Advanced Image Processing discusses the concept of datasets, dataset acquisition and formation techniques, dataset processing and ground truth formation, feature extraction, and image pattern recognition. After following this course, students can analyze digital image processing schemes/models from the dataset formation stage to image pattern recognition. Activities in this course include understanding the concept of datasets, how to build a dataset, making ground truths, extracting image features, and recognizing patterns in images.

By the end of this module, participants should be able to critically examine a range of issues concerning advanced digital image processing in different contexts, include:

- Explain the concept of image dataset
- Explain the techniques used in the dataset acquisition process
- Implement dataset acquisition techniques to become a dataset
- Implement dataset processing techniques
- Describe the process of forming ground truth from an image dataset
- Implement various image feature extraction techniques
- Implement image pattern recognition techniques

C. Ways of Studying:

Students are expected to play very active roles throughout the module. For each topic they will be given tasks to perform *before* the topic is discussed in class. Learning activities use the Project Based Learning model, with lecture methods, assignments, discussions and questions and answers. Activities in this course include understanding the concept of datasets, how to build a dataset, making ground truths, extracting image features, and recognizing patterns in images.

D. Assessment

The assessments used are student activity, completeness of assignments, problem-based Middle Semester Test, and project-based Final Semester Test.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Gonzales, R.C., and Woods, R.E. 2008. Digital Image Processing. USA: Prentice Hall
- Jain, A.K. 1989. Fundamentals of Digital Image Processing. USA: Prentice Hall
- Putra, D. 2010. Pengolahan Citra Digital. Yogyakarta: Andi Publisher
- Kadir, A. dan Susanto, A. 2013. Teori dan Aplikasi Pengolahan Citra. Yogyakarta: Andi Publisher

- Image Processing with Python, Ranjita Nair, Jaimin Maniyar

F. Time

16 weekly meetings @150 minutes

42. Advanced Robotics

A. Criteria for Participation

There are no requirements as such, but previous experience in basic programming and algorithm subjects, Microprocessor and Basic Robotics subjects.

B. Objectives

Advance Robotic is a course that teaches students concepts of robotics, servo principles, flight controller principles, simulating legged robots, and simulating flying robots. Activities in this course include understanding robotics concepts, applying servo principles, applying flight controller principles, simulating legged robots, simulating flying robots.

The program study learning outcomes of this course are:

- Able to explain Robotics concept
- Able to explain Types of robotics
- Able to explain Application of robotics
- Able to explain Development robotics
- Able to simulate servo controlling
- Able to simulate serial communication on servo
- Able to explain the concept of servo ID
- Able to simulate legged robotic
- Able to simulate flying robotic

C. Ways of Studying:

Students are given material in each lecture in accordance with the order of the material, namely the concept of robotics, servo principles, flight controller principles, simulating legged robots, simulating flying robots. Activities in this course include understanding robotics concepts, applying servo principles, applying flight controller principles, simulating legged robots, simulating flying robots. Here is the link of the Teaching Resources which used as learning resources: https://drive.google.com/drive/folders/1_Pz2GPnFYlI-W93kVgtZual3Mr4Fx8-E?usp=share_link

D. Assessment

The assessments used are student activity, completeness of assignments, Midterm Exam, and project-based Final Term Exam. Here is the link of test questions, performance tests, rubrics, observation sheets etc: https://drive.google.com/drive/folders/1m8JlbIY8yoQkEJKsIcaVeTMZDr2MM0-W?usp=share_link

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Muhammad Syahwil. 2014. Panduan Mudah Simulasi & Praktek Mikrokontroler Arduino. Yogyakarta: Andi Offset.
- Abdul Kadir, 2018, Arduino dan Sensor, BukuId
- Adrianto, H, Darmawan, A., 2021, Arduino: Belajar Cepat Dan Pemrograman, Bandung: Informatika.
- Wicaksono, M.F., 2019, Aplikasi Arduino Dan Sensor, Bandung: Informatika
- Budhiarto, W., 2020 Menguasai Pemrograman Arduino dan Robotik, Yogyakarta: Penerbit Andi
- Siregar, Houtman P, 2012, Mekanika robot berkaki, Yogyakarta : Graha Ilmu
- Arduplane Ardupilot, 2022, https://ardupilot.org/plane/index.html
- Ardupcopter Ardupilit, 2022, https://ardupilot.org/copter/index.html

F. Time

16 weekly meetings @150 minutes

43. Big Data

A. Criteria for Participation

To participate in the Big Data course, students should have a basic understanding of data representation in datasets, such as entity relations, attribute representation, data definition language commands, data manipulation language commands, and data control language commands. Proficiency in statistics includes basic statistics, distinguishing descriptive statistics and inferential statistics, repeating set theory, and discrete and continuous probability theory as a basis for inferential statistics. In addition, students must understand the field of artificial intelligence, including knowledge representation, fuzzy methods, probability methods, and artificial neural network methods.

B. Objectives

After taking this course, students can implement big data techniques and applications to store, manage, and analyse data in solving problems. Big Data discusses the concept of big data, data processing techniques, and data mining techniques to obtain specific patterns that can become valuable information and applications and implementation problems of big data in actual conditions. Activities in this course include tutorials, practicums, and discussions synchronously (in class/lab/teleconference) and asynchronously (through e-learning media). The assessment used is student activity, task completion, UTS, and project-based UAS. Learning Achievements of the Referral Study Program, including:

- Able to analyse the theoretical concepts in education, informatics, and informatics engineering education in general.
- Able to evaluate the learning theory and content of informatics engineering in depth, which includes the curriculum of informatics engineering, learning methodologies, media, and technology by the content knowledge of informatics engineering.
- Able to design research and development theory to improve the quality of informatics engineering education in schools
- Able to demonstrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners.
- Able to reorganize logical, critical, systematic, and innovative thinking in developing or implementing science and technology that pays attention to and applies humanities values according to their expertise.
- Able to construct innovative solutions as a problem-solving in informatics education.

C. Ways of Studying:

Students are expected to play a very active role during the learning process by using the modules provided via the https://drive.google.com/drive/folders/1wdOl6avidyC_-98t5FXEpBHqMuGdCIgo?usp=share_link page. In the end, they were asked to practice processing and analyzing case data and presenting it https://drive.google.com/drive/folders/1gVCHQR_bFEENMsCPf_ohylv5Mv6HcAEF?usp=share_link. During lectures, everyone is expected to contribute to the discussion of what they have read.

D. Assessment

Assessment is given through two domains, namely (i) process assessment and (ii) product assessment. Process assessment consists of an attitude assessment with a weight of 20% and task completion with a weight of 40%; (ii) product assessment consisting of midterm exam scores with a weight of 15% and final semester scores with a weight of 25%. Students will try to fulfill all assignments given because they have the highest importance, while for attitude assessment, their participation during lectures is an important point, openly conveying their lack of understanding of a topic so that learning becomes active and meaningful through mutual discussion between students. Students and teachers. In the midterm and final semester exams, students are tested in writing for their ability to solve big data problems in society and analyze these problems.

E. Reading:

This is a general reading list. More detailed lists for individual components will follow later.

- Eaton, C., Dirk, D., Tom, D., George, L., & Paul, Z. (n.d.). Understanding Big Data. Mc Graw Hill.
- Introduction to Data Mining 2nd edition, Tan, Pang-Ning ; Steinbach, Michael; Kumar, Vipin , Pearson Education, Inc, 2015
- Data Mining Concept and Techniques 3rd edition, Han, Jiawei ; Kamber, Micheline, and Jian Pei, Morgan Kaufmann, 2011
- Data Mining: Menemukan Pengetahuan dalam Data, Gede Aditra Pradnyana, dkk., Rajawali Press, 2020
- BUKU SAKU Big Data, KOMINFO., Kementerian Komunikasi dan Informatika, 2015

F. Time

16 weekly meetings @150 minutes