



MODULE HANDBOOK PROBABILITY AND STATISTICS



**BACHELOR DEGREE PROGRAM
DEPARTMENT OF BIOMEDICAL ENGINEERING
FACULTY OF INTELLIGENT ELECTRICAL AND INFORMATICS
TECHNOLOGY**

INSTITUT TEKNOLOGI SEPULUH NOPEMBER

ENDORSEMENT PAGE



MODULE HANDBOOK
Probability and Statistics
DEPARTMENT OF BIOMEDICAL ENGINEERING
 INSTITUT TEKNOLOGI SEPULUH NOPEMBER
 Number : 6884/IT2.IX.5.1.2/B/PP.03.00.00/2023

| Proses Process | Penanggung Jawab Person in Charge | | | Tanggal Date |
|--|--|---|----------------------------------|--------------------------|
| | Nama Name | Jabatan Position | Tandatangan Signature | |
| Perumus <i>Preparation</i> | Nada F. H., S.T. M.T. | Dosen <i>Lecturer</i> | | November 18, 2022 |
| Pemeriksa dan Pengendalian <i>Review and Control</i> | Dr. Norma Hermawan, S.T., M.Sc. | Tim kurikulum <i>Curriculum team</i> | | November 20, 2022 |
| Persetujuan <i>Approval</i> | Ir. Josaphat Pramudijanto, M.Eng. | Koordinator RMK <i>Course Cluster Coordinator</i> | | April 13, 2023 |
| Penetapan <i>Determination</i> | Dr. Achmad Arifin, S.T., M.Eng. | Kepala Departemen <i>Head of Department</i> | | April 17, 2023 |


MODULE HANDBOOK

PROBABILITY AND STATISTICS

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| Module name | Probability and Statistics | |
| Module level | Undergraduate | |
| Code | EB234102 | |
| Course (if applicable) | Probability and Statistics | |
| Semester | First Semester (Gasal) | |
| Lecturer | M. Hilman Fatoni, S.T., M.T. M. Yazid, B.Eng., M.Eng. Eko Agus Suprayitno, S.Si., M.T. | |
| Language | Bahasa Indonesia and English | |
| Relation to curriculum | Undergraduate degree program, mandatory , 1 st semester. | |
| Type of teaching, contact hours | Lectures, <60 students Tuesdays, 11.00-12.50 (GMT+7) | |
| Workload | 1. Lectures : 2 x 50 = 100 minutes per week. 2. Exercises and Assignments : 2 x 60 = 120 minutes per week. 3. Private learning : 2 x 60 = 120 minutes per week. | |
| Credit points | 2 credit points (sks) | |
| Requirements according to the examination regulations | A student must have attended at least 75% of the lectures to sit in the exams. | |
| Mandatory prerequisites | - | |
| Learning outcomes and their corresponding PLOs | <p>Course Learning Outcome (CLO) after completing this module,</p> <p>CLO 1: Students understand how to represent data based on their characteristics.</p> <p>CLO 2: Students are able to interpret statistical data by using numerical and graphical presentations.</p> <p>CLO 3: Students understand the basic concepts of probability, random variables, probability distributions, and joint probability distributions.</p> <p>CLO 4: Students are able to calculate interval estimates from averages and proportions of a population from one or two sample groups.</p> | <p>PLO-03</p> <p>PLO-03</p> <p>PLO-01</p> <p>PLO-01</p> <p>PLO-03</p> |

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| | <p>CLO 5: Students are able to design and perform hypothesis tests for a population based on the number of sample groups.</p> <p>CLO 6: Students are able to determine the relationship between two or more variables.</p> | PLO-03 |
| Content | <p>This course studies statistics (central tendency, variability, measures of individual in population), data, samples, populations, data presentation in tabular or graphical form, basic concepts of probability, probability, total probability, Bayes theorem, random variables, pdf, cdf, probability distribution (discrete and continuous distribution), estimation and testing, estimation of confidence intervals, hypothesis testing, regression, ANOVA.</p> | |
| Study and examination requirements and forms of examination | <ul style="list-style-type: none"> • In-class exercises • Assignment 1, 2, 3 • Mid-term examination • Final examination | |
| Media employed | <p>LCD, whiteboard, websites (myITS Classroom), zoom.</p> | |
| Reading list | <p>Main :</p> <ol style="list-style-type: none"> 1. Walpole, R.E., Myers, R.H., Myers, S.L., and Keying Ye, 2011, "Probability and Statistics for Engineers and Scientists Ninth Edition", USA: Pearson Education, Inc. 2. Moore, D.S., McCabe, G.P., dan Craig, B.A., 2009, "Introduction to The Practice of Statistics Sixth Edition", New York: W.H. Freeman and Company. <p>Supporting :</p> <ol style="list-style-type: none"> 1. Rosner, B., 2010, "Fundamentals of Biostatistics Seventh Edition", Canada: Cengage Learning, Inc. 2. Zar, J.H., 2010, "Biostatistical Analysis Fifth Edition", USA: Pearson Education, Inc. | |

I. Rencana Pembelajaran Semester / *Semester Learning Plan*

|  | | INSTITUT TEKNOLOGI SEPULUH NOPEMBER (ITS) FACULTY OF INTELLIGENT ELECTRICAL AND INFORMATICS TECHNOLOGY DEPARTMENT OF BIOMEDICAL ENGINEERING | | | | Document Code |
|---|---|--|--|-----|--|------------------------------------|
| SEMESTER LEARNING PLAN | | | | | | |
| MATA KULIAH (MK) COURSE | KODE CODE | Rumpun MK Course Cluster | BOBOT (sks) Credits | | SEMESTER | Tgl Penyusunan Compilation Date |
| Probabilitas dan Statistika <i>Probability and Statistics</i> | EB234102 | Biocybernetics | T=2 | P=0 | I | Feb 27, 2023 |
| OTORISASI / PENGESAHAN AUTHORIZATION / ENDORSEMENT | Dosen Pengembang RPS <i>Developer Lecturer of Semester Learning Plan</i> | | Koordinator RMK <i>Course Cluster Coordinator</i> | | Ka DEPARTEMEN <i>Head of Department</i> | |
| | (Nada Fitriyatul Hikmah, S.T, M.T) | | (Ir. Josaphat Pramudijanto, M.Eng.) | | (Dr. Achmad Arifin, S.T., M.Eng.) | |
| Capaian Pembelajaran | CPL-PRODI yang dibebankan pada MK <i>PLO Program Charged to The Course</i> | | | | | |
| Learning Outcomes | CPL-01 PLO-01 | Mampu menerapkan Ilmu Pengetahuan Alam dan Matematika pada bidang Teknik Biomedika. <i>Able to apply Natural Sciences and Mathematics in the field of Biomedical Engineering.</i> | | | | |
| | CPL-03 PLO-03 | Mampu merancang dan melaksanakan eksperimen laboratorium dan/atau lapangan, menganalisa dan menginterpretasi data, serta menggunakan penilaian yang obyektif untuk menarik kesimpulan. <i>Able to design and implement laboratory experiment and / or field experiments, analyze and interpret data, and use objective assessments to draw conclusions.</i> | | | | |
| | Capaian Pembelajaran Mata Kuliah (CPMK) <i>Course Learning Outcome (CLO) - If CLO as description capability of each Learning Stage in the course, then CLO = LLO</i> | | | | | |
| CP MK 1 | Mahasiswa memahami cara merepresentasikan data berdasarkan karakteristiknya . | | | | | |

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| | CLO 1 | <i>Students understand how to represent data based on their characteristics.</i> | | | | | | | | | | | |
| | CP MK 2 CLO 2 | Mahasiswa mampu menafsirkan data-data statistik dengan menggunakan bantuan numerik dan grafik. <i>Students are able to interpret statistical data by using numerical and graphical presentations.</i> | | | | | | | | | | | |
| | CP MK 3 CLO 3 | Mahasiswa memahami konsep dasar probabilitas, variable acak, distribusi probabilitas, dan distribusi probabilitas gabungan. <i>Students understand the basic concepts of probability, random variables, probability distributions, and joint probability distributions.</i> | | | | | | | | | | | |
| | CP MK 4 CLO 4 | Mahasiswa mampu menghitung estimasi interval dari rata-rata dan proporsi suatu populasi dari satu atau dua grup sampel. <i>Students are able to calculate interval estimates from averages and proportions of a population from one or two sample groups.</i> | | | | | | | | | | | |
| | CP MK 5 CLO 5 | Mahasiswa mampu merancang dan melakukan tes hipotesa untuk suatu populasi berdasarkan jumlah grup sampel. <i>Students are able to design and perform hypothesis tests for a population based on the number of sample groups.</i> | | | | | | | | | | | |
| | CP MK 6 CLO 6 | Mahasiswa mampu menentukan hubungan antara dua variabel atau lebih. <i>Students are able to determine the relationship between two or more variables.</i> | | | | | | | | | | | |
| Peta CPL – CP MK Map of PLO - CLO | | CPL-01 | CPL-02 | CPL-03 | CPL-04 | CPL-05 | CPL-06 | CPL-07 | CPL-08 | CPL-09 | CPL-10 | CPL-11 | CPL-12 |
| | CPMK 1 / SUB CPMK 1 <i>CLO 1 / LLO 1</i> | | | √ | | | | | | | | | |
| | CPMK 2 / SUB CPMK 2 <i>CLO 2 / LLO 2</i> | | | √ | | | | | | | | | |
| | CPMK 3 / SUB CPMK 3 <i>CLO 3 / LLO 3</i> | √ | | | | | | | | | | | |
| | CPMK 4 / SUB CPMK 4 <i>CLO 4 / LLO 4</i> | √ | | | | | | | | | | | |
| | CPMK 5 / SUB CPMK 5 <i>CLO 5 / LLO 5</i> | | | √ | | | | | | | | | |
| | CPMK 6 / SUB CPMK 6 <i>CLO 6 / LLO 6</i> | | | √ | | | | | | | | | |
| Diskripsi Singkat MK | Mata kuliah ini mempelajari tentang besaran statistik (central tendency, variability, measure of individual in a population), data, sampel, populasi, presentasi data dalam bentuk tabel atau grafik, konsep dasar probabilitas (peluang), probabilitas bersyarat, probabilitas total, Teorema Bayes, variabel acak, pdf, cdf, distribusi probabilitas (distribusi diskrit dan kontinu), estimasi dan pengujian, estimasi rentang keyakinan (confidence intervals), uji hipotesis, regresi, ANOVA. | | | | | | | | | | | | |

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| Short Description of Course | <i>This course studies statistics (central tendency, variability, measures of individual in population), data, samples, populations, data presentation in tabular or graphical form, basic concepts of probability, probability, total probability, Bayes theorem, random variables, pdf, cdf, probability distribution (discrete and continuous distribution), estimation and testing, estimation of confidence intervals, hypothesis testing, regression, ANOVA.</i> |
| Bahan Kajian: Materi pembelajaran Course Materials: | <ol style="list-style-type: none"> 1. Representasi Data / <i>Data Representation</i> 2. Statistik Deskriptif / <i>Descriptive Statistics</i> 3. Konsep dasar probabilitas / <i>The basic concept of probability</i> 4. Probabilitas bersama dan kondisional / <i>Joint and conditional probabilities</i> 5. Variabel random diskrit dan kontinu / <i>Discrete and continuous random variables</i> 6. Estimasi dan Tes Hipotesa / <i>Estimation and Hypothesis Testing</i> 7. Korelasi / <i>Correlation</i> 8. ANOVA |
| Pustaka References | <p>Utama / Main:</p> <ol style="list-style-type: none"> 1. Walpole, R.E., Myers, R.H., Myers, S.L., and Keying Ye, 2011, "Probability and Statistics for Engineers and Scientists Ninth Edition", USA: Pearson Education, Inc. 2. Moore, D.S., McCabe, G.P., dan Craig, B.A., 2009, "Introduction to The Practice of Statistics Sixth Edition", New York: W.H. Freeman and Company. <p>Pendukung / Supporting:</p> <ol style="list-style-type: none"> 1. Rosner, B., 2010, "Fundamentals of Biostatistics Seventh Edition", Canada: Cengage Learning, Inc. 2. Zar, J.H., 2010, "Biostatistical Analysis Fifth Edition", USA: Pearson Education, Inc. |
| Dosen Pengampu Lecturers | Nada Fitriyatul Hikmah, Atar Fuady Babgei |
| Matakuliah syarat Prerequisite | - |

| Mg ke/ Week | Kemampuan akhir tiap tahapan belajar (Sub-CPMK) / <i>Final ability of each learning stage (LLO)</i> | Penilaian / Assessment | | Bantuk Pembelajaran; Metode Pembelajaran; Penugasan Mahasiswa; [<i>Estimasi Waktu</i>] / <i>Form of Learning; Learning Method; Student Assignment;</i> [<i>Estimated Time</i>] | | Materi Pembelajaran [<i>Pustaka</i>] / <i>Learning Material</i> [<i>Reference</i>] | Bobot Penilaian / Assessment Load (%) |
|----------------|--|--|--|--|---|---|--|
| | | Indikator / <i>Indicator</i> | Kriteria & Teknik / <i>Criteria & Techniques</i> | Tatap Muka / <i>In-class</i> (5) | Daring / <i>Online</i> (6) | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 1 | Mahasiswa memahami cara merepresentasikan data berdasarkan karakteristiknya. <i>Students understand how to represent data based on their characteristics.</i> | <ul style="list-style-type: none"> • Mampu menentukan karakteristik dari sebuah data. • Mampu mengidentifikasi level of measurement dari sebuah data. • Mampu merepresentasikan data tersebut sesuai dengan karakteristik dan level of measurement. • <i>Able to determine the characteristics of data.</i> • <i>Able to identify the level of measurement of data.</i> • <i>Able to represent the data in accordance with the</i> | <p>Non-tes : Tugas 1 tahap 1: Merepresentasikan data sesuai dengan karakteristik dan level of measurement data.</p> <p>Non-test : Task 1 stage 1: <i>Representing data according to the characteristics and level of measurement data.</i></p> | <ul style="list-style-type: none"> • Kuliah dan brainstorming, tanya jawab. [TM : 2 x 50"] [BM : 2 x 60"] [PT : 2 x 60"] • <i>Presentation and brainstorming, ask and answer.</i> [FF : 1 x 50"] [SA : 1 x 60"] [SS : 1 x 60"] | <ul style="list-style-type: none"> • Chatting dan diskusi dalam forum platform ITS. • <i>Chat and discussion in ITS platform forum.</i> | <ul style="list-style-type: none"> • Kontrak kuliah: - Motivasi belajar - Rencana pembelajaran - Aturan-aturan perkuliahan - Tujuan perkuliahan - Sistem penilaian, buku ajar/sumber pustaka • Karakteristik Data • Levels of Measurement • Representasi Data dengan Grafik • Representasi Data dengan Tabel [Link materi di MyITSClassroom] • <i>Course contract:</i> - <i>Motivation to</i> | 4 |

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| | | <i>characteristics and level of measurement.</i> | | | | <i>learn</i> - Lesson plan - Lecture rules - Course objective - Assessment system, textbooks / library resources • Data Characteristics • Levels of Measurement • Data Representation with Graph • Data Representation with Table | |
| 2-3 | Mahasiswa mampu menafsirkan data-data statistik dengan menggunakan bantuan numerik dan grafik. <i>Students are able to interpret statistical data by using numerical and graphical presentations.</i> | <ul style="list-style-type: none"> • Mampu menghitung central tendency dari sebuah kelompok data. • Mampu menentukan kelompok data yang memiliki banyak variasi data. • Mampu menentukan apakah nilai dari suatu kelompok data termasuk umum atau tidak dengan | Non-tes : Tugas 1 tahap 1: Membandingkan data dari dua kelompok atau lebih dengan menghitung central tendency dan penyebaran data tersebut. Non-test : Task 1 stage 1: | <ul style="list-style-type: none"> • Kuliah, diskusi, tanya jawab, latihan soal, tugas. [TM : 2 x 50"] [BM : 2 x 50"] [PT : 2 x 50"] • <i>Presentation, discussion, ask and answer, exercise, assignment</i> | | <ul style="list-style-type: none"> • Measure of Central Tendency • Range, Interquartile Range, dan Boxplot • Varian dan Standar Deviasi • Z-score • <i>Measure of Central Tendency</i> • <i>Range, Interquartile Range, and Boxplot</i> | 4 |

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| | | <p>menghitung z-score nya.</p> <ul style="list-style-type: none"> • Able to calculate the central tendency of a group of data. • Able to determine data groups that have a lot of data variations. • Able to determine whether the value of a group of data is general or not by calculating the z-score. | <p><i>Comparing data from two or more groups by calculating central tendency and data distribution.</i></p> | <p>[FF : 2 x 50"] [SA : 2 x 60"] [SS : 2 x 60"]</p> | | <ul style="list-style-type: none"> • Variant and Standard Deviation • Z-score | |
| 4 - 7 | <p>Mahasiswa memahami konsep dasar probabilitas, variable acak, distribusi probabilitas, dan distribusi probabilitas gabungan.</p> <p><i>Students understand the basic concepts of probability, random variables, probability distributions, and joint probability distributions.</i></p> | <ul style="list-style-type: none"> • Mampu menghitung probabilitas bersama dan kondisional. • Mampu membedakan distribusi Binomial, Poisson, dan Normal. • Mampu melakukan pendekatan variable diskrit menjadi variabel kontinu. • Able to calculate joint and conditional probabilities. • Able to distinguish Binomial, Poisson, and Normal distributions. | <p>Non-tes : Tugas 1 tahap 2:</p> <ul style="list-style-type: none"> - Menghitung probabilitas sesuai dengan case study yang dipaparkan. - Menyelesaikan case study yang berhubungan dengan bidang Teknik Biomedik melalui pendekatan variabel diskrit dan kontinu. | <ul style="list-style-type: none"> • Kuliah, diskusi, tanya jawab, latihan soal, tugas [TM : 2 x 50"] [BM : 2 x 50"] [PT : 2 x 50"] • Presentation, discussion, ask and answer, exercise, assignment [FF : 4 x 50"] [SA : 4 x 60"] [SS : 4 x 60"] | | <ul style="list-style-type: none"> • Konsep Dasar Probabilitas • Probabilitas bersama dan kondisional • Variabel acak diskrit dan Distribusi Binomial dan Poisson • Variabel acak kontinu dan Distribusi Normal • Pendekatan terhadap Distribusi Normal | 12 |

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| | | <ul style="list-style-type: none"> • <i>Able to approach discrete variables into continuous variables.</i> | <ul style="list-style-type: none"> - Menghitung central tendency dan penyebaran data tersebut <p>Non-test : Task 1 stage 2:</p> <ul style="list-style-type: none"> - <i>Calculating the probability in accordance with the case study described.</i> - <i>Completing case studies relating to the field of Biomedical Engineering through discrete and continuous variable approaches.</i> - <i>Calculating the central tendency and spread of the data.</i> | | | <ul style="list-style-type: none"> • <i>Basic Probability Concepts</i> • <i>Joint and conditional probabilities</i> • <i>Discrete random variables, Binomial and Poisson distributions</i> • <i>Continuous random variables and Normal Distribution</i> • <i>Approach to Normal Distribution</i> | |
| 8 | EVALUASI TENGAH SEMESTER MID-SEMESTER EXAM | | | | | | 30 |
| 9 - 10 | Mahasiswa mampu menghitung estimasi interval dari rata-rata dan proporsi | <ul style="list-style-type: none"> • Mampu menentukan teknik sampling yang sesuai dengan ukuran | <p>Non-tes :</p> <p>Tugas 2:</p> | <ul style="list-style-type: none"> • Kuliah, Diskusi, tanya jawab, | | <ul style="list-style-type: none"> • Teknik sampling. • Estimasi titik. | 5 |


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| | <p>suatu populasi dari satu atau dua grup sampel.</p> <p><i>Students are able to calculate interval estimates from averages and proportions of a population from one or two sample groups.</i></p> | <p>populasi dan data yang diinginkan.</p> <ul style="list-style-type: none"> • Mampu menentukan jumlah grup sampel berdasarkan eksperimen yang diinginkan. • Mampu menghitung estimasi interval untuk rata-rata atau proporsi sesuai dengan data yang diperoleh. • <i>Able to determine the sampling technique that is suitable for the population size and the desired data.</i> • <i>Able to determine the number of sample groups based on desired experiments.</i> • <i>Able to calculate interval estimates for averages or proportions according to the data obtained.</i> | <ul style="list-style-type: none"> - Menghitung confidence interval dari sampel yang diambil secara random. - Menghitung one side bound confidence limit dari case study yang dipaparkan. <p>Non-test :</p> <p>Task 2:</p> <ul style="list-style-type: none"> - <i>Calculating the confidence interval of random sample.</i> - <i>Calculating the one side bound confidence limit of the case study presented.</i> | <p>latihan soal, tugas. [TM + BM: 2 x 2 x 50 menit]</p> <ul style="list-style-type: none"> • <i>Presentation, discussion, ask and answer, exercise, assignment.</i> <p>[FF + SA: 2 x 2 x 50"]</p> | | <ul style="list-style-type: none"> • Estimasi interval untuk rata-rata atau proporsi dari sebuah populasi dengan satu grup sampel. • Estimasi interval untuk rata-rata atau proporsi dari sebuah populasi dengan dua grup sampel. • <i>Sampling technique.</i> • <i>Point estimation.</i> • <i>Interval estimation for averages or proportions of a population with one sample group.</i> • <i>Interval estimation for averages or proportions of a population with two sample groups.</i> | |
| 11 -12 | Mahasiswa mampu merancang dan melakukan tes hipotesa untuk suatu | <ul style="list-style-type: none"> • Mampu menentukan jumlah grup sampel yang dibutuhkan | <p>Non tes:</p> <p>Tugas 3:</p> | <ul style="list-style-type: none"> • Kuliah, Diskusi, tanya jawab, | | <ul style="list-style-type: none"> • Tes Hipotesa dengan satu grup sampel. | 5 |

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| | <p>populasi berdasarkan satu atau dua grup sampel.</p> <p><i>Students are able to design and perform hypothesis tests for a population based on the number of sample groups.</i></p> | <p>untuk sebuah eksperimen.</p> <ul style="list-style-type: none"> • Mampu menentukan hipotesa nul dan alternatif yang sesuai dengan eksperimen. • Mampu memberikan kesimpulan yang sesuai dengan hasil tes hipotesa. • <i>Able to determine the number of sample groups needed for an experiment.</i> • <i>Able to determine the hypotheses and alternatives that are suitable with experiment.</i> • <i>Able to provide conclusions in accordance with the results of the hypothesis test.</i> | <ul style="list-style-type: none"> - Menghitung probabilitas terjadinya penolakan terhadap hipotesis null pada suatu pernyataan. - Menghitung p-value dari suatu hasil studi. - Mendapatkan kemungkinan error tipe I dan tipe II dari suatu hipotesis. <p>Non-test:</p> <p>Task 3:</p> <ul style="list-style-type: none"> - <i>Calculating the probability of a rejection of the null hypothesis in a statement.</i> - <i>Calculating the p-value of study result.</i> | <p>latihan soal, tugas. [TM + BM: 2 x 2 x 50 menit]</p> <ul style="list-style-type: none"> • <i>Presentation, discussion, ask and answer, exercise, assignment.</i> <p>[FF + SA: 2 x 2 x 50"]</p> | | <ul style="list-style-type: none"> • Tes Hipotesa dengan dua grup sampel. • Tes Hipotesa dengan satu grup sampel dan dua pengambilan data. • ANOVA. • <i>Hypothesis testing with one sample group.</i> • <i>Hypothesis testing with two sample groups.</i> • <i>Hypothesis testing with one sample group and two data collection.</i> • ANOVA. | |
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| | | | - <i>Obtaining possible type I and type II errors from hypothesis.</i> | | | | |
| 13-14 | <p>Mahasiswa mampu menentukan hubungan antara dua variabel atau lebih.</p> <p><i>Students are able to determine the relationship between two or more variables.</i></p> | <ul style="list-style-type: none"> • Mampu merepresentasikan data dari dua variabel sesuai dengan karakteristiknya • Mampu menentukan kuatnya korelasi antara dua variabel • <i>Able to represent data from two variables according to their characteristics</i> • <i>Able to determine the strength of the correlation between two variables</i> | <p>Diskusi, tanya jawab, latihan soal, tugas.</p> <p><i>Discussion, question dan answer, exercise.</i></p> | <ul style="list-style-type: none"> • Kuliah [TM + BM: 2 x 50 menit] • <i>Presentation [FF + SA: 2 x 2 x 50"]</i> | | <ul style="list-style-type: none"> • Tabel kontigensi • Scatterplot • Pearson's R • <i>Contingency table</i> • <i>Scatterplot</i> • <i>Pearson's R</i> | |
| 15-16 | EVALUASI AKHIR SEMESTER FINAL-SEMESTER EXAM | | | | | | 40 |

TM=Tatap Muka, PT=Penugasan Terstruktur, BM=Belajar Mandiri.
FF = Face to Face, SA = Structured Assignment, SS = Self Study.

II. Rencana Asesmen & Evaluasi (RAE) / *Assessment & Evaluation Plan*

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|  | ASSESSMENT & EVALUATION PLAN BACHELOR DEGREE PROGRAM OF BIOMEDICAL ENGINEERING - FTEIC ITS Course : Probability and Statistics | | RA&E |
| | | | Write Doc Code |
| Kode/code: EB234102 | Bobot sks/credits (T/P): 2/0 | Rumpun MK: Biocybernetics Course Cluster: Biocybernetics | Smt: I |
| OTORISASI <i>AUTHORIZATION</i> | Penyusun RA & E <i>Compiler A&EP</i> Nada Fitriyatul H, S.T, M.T | Koordinator RMK <i>Course Cluster Coordinator</i> Ir. Josaphat Pramudijanto, M.Eng. | Ka DEP <i>Head of DEP</i> Dr. Achmad Arifin, S.T., M.Eng. |

| Mg ke/ Week (1) | Sub CP-MK / <i>Lesson Learning Outcomes (LLO)</i> (2) | Bentuk Asesmen (Penilaian) <i>Form of Assessment</i> (3) | Bobot / Load (%) (4) |
|--------------------------|--|--|----------------------------|
| 1 | Sub CP-MK 1: Mahasiswa memahami cara merepresentasikan data berdasarkan karakteristiknya. LLO 1: <i>Students understand how to represent data based on their characteristics.</i> | Non-tes : Tugas 1 tahap 1: Merepresentasikan data sesuai dengan karakteristik dan level of measurement data. Non-test : Task 1 stage 1: <i>Representing data according to the characteristics and level of measurement data.</i> | 4 |
| 2 | Sub CP-MK 2: Mahasiswa mampu menafsirkan data-data statistik dengan menggunakan bantuan numerik dan grafik. LLO 2: <i>Students are able to interpret statistical data by using numerical and graphical presentations.</i> | Non-tes : Tugas 1 tahap 1: Membandingkan data dari dua kelompok atau lebih dengan menghitung central tendency dan penyebaran data tersebut Tes: ETS Soal 1 (12% dari ETS 30%) Non-test : Task 1 stage 1: <i>Comparing data from two or more groups by calculating central tendency and data distribution.</i> Test: <i>Question 1 in Mid Exam (12% of Mid Exam 30%)</i> | 4 |
| 5-6 | Sub CP-MK 3: | Non-tes : Tugas 1 tahap 2: | 12 |

| Mg ke/ Week (1) | Sub CP-MK / Lesson Learning Outcomes (LLO) (2) | Bentuk Asesmen (Penilaian) Form of Assessment (3) | Bobot / Load (%) (4) |
|-----------------------|---|--|----------------------------|
| | <p>Mahasiswa memahami konsep dasar probabilitas, variable acak, distribusi probabilitas, dan distribusi probabilitas gabungan.</p> <p>LLO 3: <i>Students understand the basic concepts of probability, random variables, probability distributions, and joint probability distributions.</i></p> | <ul style="list-style-type: none"> - Menghitung probabilitas sesuai dengan case study yang dipaparkan. - Menyelesaikan case study yang berhubungan dengan bidang Teknik Biomedik melalui pendekatan variabel diskrit dan kontinu. - Menghitung central tendency dan penyebaran data tersebut <p>Tes: ETS Soal 2 dan Soal 3 (18% dari ETS 30%)</p> <p>Non-test : Task 1 stage 2:</p> <ul style="list-style-type: none"> - Calculating the probability in accordance with the case study described. - Completing case studies relating to the field of Biomedical Engineering through discrete and continuous variable approaches. - Calculating the central tendency and spread of the data. <p>Test: Questions 2 and 3 in Mid Exam (18% of Mid Exam 30%)</p> | |
| 8 | <p>Evaluasi Tengah Semester</p> <p>Mid Exam</p> | <p>Tes: Ujian Tulis/Ujian Daring</p> <p>Test: Writing Exams / Online Exams</p> | 30 |
| 10 | <p>Sub CP-MK 4: Mahasiswa mampu menghitung estimasi interval dari rata-rata dan proporsi suatu populasi dari satu atau dua grup sampel.</p> <p>LLO 4: <i>Students are able to calculate interval estimates from averages and proportions of a population from one or two sample groups.</i></p> | <p>Non-tes : Tugas 2:</p> <ul style="list-style-type: none"> - Menghitung confidence interval dari sampel yang diambil secara random - Menghitung one side bound confidence limit dari case study yang dipaparkan <p>Tes: EAS Soal No 1 (6% dari EAS 40%) EAS Soal No 2 (10% dari EAS 40%)</p> <p>Non-test : Task 2:</p> <ul style="list-style-type: none"> - Calculating the confidence interval of random sample - Calculating the one side bound confidence limit of the case study presented <p>Test: Question 1 in Final Exam (6% of Final Exam 40%) Question 2 in Final Exam (10% of Final Exam 40%)</p> | 5 |

| Mg ke/ Week (1) | Sub CP-MK / Lesson Learning Outcomes (LLO) (2) | Bentuk Asesmen (Penilaian) Form of Assessment (3) | Bobot / Load (%) (4) |
|--|---|--|----------------------------|
| 12 | <p>Sub CP-MK 5: Mahasiswa mampu merancang dan melakukan tes hipotesa untuk suatu populasi berdasarkan satu atau dua grup sampel.</p> <p>LLO 5: <i>Students are able to design and perform hypothesis tests for a population based on the number of sample groups.</i></p> | <p>Non-tes : Tugas 3:</p> <ul style="list-style-type: none"> - Menghitung probabilitas terjadinya penolakan terhadap hipotesis null pada suatu pernyataan - Menghitung p-value dari suatu hasil studi - Mendapatkan kemungkinan error tipe I dan tipe II dari suatu hipotesis <p>Tes: EAS Soal No 3 (12% dari EAS 40%)</p> <p>Non-test: Task 3:</p> <ul style="list-style-type: none"> - Calculating the probability of a rejection of the null hypothesis in a statement - Calculating the p-value of study result - Obtaining possible type I and type II errors from hypothesis <p>Test: Question 3 in Final Exam (12% of Final Exam 40%)</p> | 5 |
| 14 | <p>Sub CP-MK 6: Mahasiswa mampu menentukan hubungan antara dua variabel atau lebih.</p> <p>LLO 6: <i>Students are able to determine the relationship between two or more variables.</i></p> | <p>Tes: EAS Soal No 4 (12% dari EAS 40%)</p> <p>Test: Question 4 in Final Exam (12% of Final Exam 40%)</p> | |
| 16 | <p>Evaluasi Akhir</p> <p>Final Exam</p> | <p>Tes: Ujian Tulis/Ujian Daring</p> <p>Test: Writing Exams / Online Exams</p> | 40 |
| Total bobot penilaian Total assessment load | | | 100% |

Indikator Pencapaian CPL Pada MK / *Indicator of PLO achievement charged to the course*

| CPL yang dibebankan pada MK / <i>PLO charged to the course</i> | CPMK / <i>Course Learning Outcome (CLO)</i> | Minggu ke / <i>Week</i> | Bentuk Asesmen / <i>Form of Assessment</i> | Bobot / <i>Load (%)</i> |
|--|---|-------------------------|--|-------------------------|
| CPL-01 / <i>PLO-01</i> | CPMK 3 / <i>CLO 3</i> | Week- 5-6 | <i>Task 1 stage 2</i> | 12 |
| | | Week- 8 | <i>Mid Exam Question 2 and 3</i> | 18 |
| CPL-03 / <i>PLO-03</i> | CPMK 4 / <i>CLO 4</i> | Week- 10 | <i>Task 2</i> | 5 |
| | | Week- 16 | <i>Final Exam Question 1 and 2</i> | 16 |
| | CPMK 1 / <i>CLO 1</i> | Week- 1 | <i>Task 1 stage 1</i> | 4 |
| | | CPMK 2 / <i>CLO 2</i> | Week- 2 | <i>Task 1 stage 1</i> |
| | | Week- 8 | <i>Mid Exam Question 1</i> | 12 |
| | CPMK 5 / <i>CLO 5</i> | Week- 12 | <i>Task 3</i> | 5 |
| | | Week- 16 | <i>Final Exam Question 3</i> | 12 |
| | CPMK 6 / <i>CLO 6</i> | Week- 16 | <i>Final Exam Question 4</i> | 12 |
| | | | | Σ = 100% |

| No | Form of Assessment | PLO-01 | PLO-02 | PLO-03 | PLO-04 | PLO-05 | PLO-06 | PLO-07 | PLO-08 | PLO-09 | PLO-10 | PLO-11 | PLO-12 | Total |
|----|--------------------|-------------|--------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------------|
| 1 | <i>Task 1</i> | 0.12 | | 0.08 | | | | | | | | | | 0.2 |
| 2 | <i>Task 2</i> | 0.05 | | | | | | | | | | | | 0.05 |
| 3 | <i>Task 3</i> | | | 0.05 | | | | | | | | | | 0.05 |
| 4 | <i>Mid Exam</i> | 0.18 | | 0.12 | | | | | | | | | | 0.3 |
| 5 | <i>Final Exam</i> | 0.16 | | 0.24 | | | | | | | | | | 0.4 |
| | <i>Total</i> | 0.51 | | 0.49 | | | | | | | | | | 1 |

