MODULE HANDBOOK

PROBABILITY THEORY

BACHELOR DEGREE PROGRAM
DEPARTEMENT OF STATISTICS
FACULTY OF SCIENCE AND DATA ANALYTICS
INSTITUT TEKNOLOGI SEPULUH NOPEMBER

ENDORSEMENT PAGE

	MODULE HANDBOOK **PROBABILITY THEORY** **DEPARTMENT OF STATISTICS** **INSTITUT TEKNOLOGI SEPULUH NOPEMBER**

Proses ***Process***	**Penanggung Jawab** ***Person in Charge***			**Tanggal** ***Date***
	Nama ***Name***	**Jabatan** ***Position***	**Tandatangan** ***Signature***	
Perumus *Preparation*	Dr. Drs. Purhadi, M.Sc	Dosen *Lecturer*		**March 28, 2019**
Pemeriksa dan Pengendalian *Review and Control*	Dr. Drs. Purhadi, M.Sc ; Prof. Dr. Drs. I Nyoman Budiantara, M.Si ; Santi Puteri Rahayu, M.Si., Ph.D	Tim kurikulum *Curriculum team*		**April 15, 2019**
Persetujuan *Approval*	Dr. Santi Wulan Purnami, M.Si	Koordinator RMK *Course Cluster Coordinator*		**July 17, 2019**
Penetapan *Determination*	Dr. Kartika Fithriasari, M.Si	Kepala Departemen *Head of Department*		**July 30, 2019**

MODULE HANDBOOK
PROBABILITY THEORY

Module name	**PROBABILITY THEORY**	
Module level	Undergraduate	
Code	KS184901	
Course (if applicable)	PROBABILITY THEORY	
Semester	Third Semester (Ganjil)	
Person responsible for the module	Dr. Drs. Purhadi, M.Sc	
Lecturer	Dr. Drs. Purhadi, M.Sc ; Prof. Dr. Drs. I Nyoman Budiantara, M.Si ; Santi Puteri Rahayu, M.Si., Ph.D	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergradute degree program, **mandatory**, 3th semester.	
Type of teaching, contact hours	Lectures, <50 students	
Workload	1. Lectures : 3 x 50 = 150 minutes per week. 2. Exercises and Assignments : 3 x 60 = 180 minutes (3 hours) per week. 3. Private learning : 3 x 60 = 180 minutes (3 hours) per week.	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	1. Matematika I, 2. Mathematics II, 3. Introduction to Statistical Methods.	
Learning outcomes and their corresponding PLOs	*CLO. 1 Master the concept of random experiments, random variables , probability space, distribution function, conditional distribution and stochastic freedom, mathematical expectation, moment generator function, characteristic function, convergence of random variable* *CLO. 2 Can formulate random experiment problems, random variables, probability space, distribution function, conditional distribution and stochastic freedom, mathematical expectation, moment generating function, characteristic function of* *CLO. 3 Can choose the method of determining the convergence of random variables, adapt to probability problems,probability models.*	PLO-01

	CLO. 4 Can formulate problems of random experiments, random variables, probability spaces, distribution functions, conditional distribution and stochastic freedom, mathematical expectation, moment generating function, characteristic function of *CLO. 5 Adaptable to probability problems,probability models.* *CLO. 7 Able to communicate effectively and cooperate in interdisciplinary and multidisciplinary teams.* *CLO. 8 Responsible and having professional ethics.* *CLO. 9 Able to motivate yourself to think creatively and having longlife learning*	PLO-04
Content	*PROBABILITY THEORY is one subject in the field of theory, which aims to master the basic concepts of mathematics to understand the theory of vectors, basic operations of PROBABILITY THEORY, determinants, inverses, random vectors, systems of linear equations, vector spaces, values and eigenvectors. Besides that, students able to use this concept for processing random variables, formulating modeling and calculating univariate and multivariate calculations. To achieve this goal, the learning strategy used is discussion and practice both manually and with a computer program package*	
Study and examination requirements and forms of examination	• In-class exercises • Assignment 1, 2, 3 • Mid-term examination • Final examination	
Media employed	LCD, whiteboard, websites (myITS Classroom), zoom.	
Reading list	1. Hogg, R.V. dan Craig, A.T. 1995. Introduction to Mathematical Statistics, 5th ed.Mac Millon. New York. 2. Mood, A.M., Graybill,F.A. dan Boes, D.C. 1974. Introduction of the Theory of Statistics. 4th ed. Mc-Graw Hill. Tokyo. 3. Rohatgi, W.K., 1976., An Introduction to Probability Theory and Mathematical Statistics, John Wiley and Sons, New York.Salas SL, Hille e,(1982)., “Calculus of One and Several Variables”, 4th ed, Jhon Wiley, New York., 4. Bartoszynski, R. and Bugaj, M.N.,, 1996, Probability and Statistical Inference, John Wiley & Sons, New York. 5. Bhat, B.R., 1981, Modern Probability Theory, John Wiley & Sons, New York	

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	Mata Kuliah	Teori Peluang
	Kode Mata Kuliah	KW184901
	Semester/SKS	III/3
	MK Prasyarat	Matematika I, Matematika II, Pengantar Metode Statistika
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Bahan Kajian *Study Materials*	Dasar Sains, Teori Statistika, Pengumpulan Data, dan Pemodelan *Basic of Science, Statistical Theory, Data Collection, and Modeling*
CPL yang dibebankan MK *PLO*	CPL-1 Mampu menerapkan pengetahuan teori statistika, matematika, dan komputasi CPL-4 Mampu mengindentifikasi,memformulasi, dan menyelesaikan masalah statistika di berbagai bidang terapan *PLO-1 Able to apply knowledge of statistical theory, mathematics, and computation* *PLO-4 Able to identify, formulate, and solve statistical problems in various applied field*
CP-MK *CLO*	CPMK.1 Menguasai konsep percobaan random, variabel random, ruang probabilitas, fungsi distribusi, distribusi bersyarat dan kebebasan stokastik, ekspektasi matematika, fungsi pembangkit momen, fungsi karakteristik, konvergensi variabel random CPMK.2 Dapat memformulasikan permasalahan percobaan random, variabel random, ruang probabilitas, fungsi distribusi, distribusi bersyarat dan kebebasan stokastik, ekspektasi matematika, fungsi pembangkit momen, fungsi karakteristik CPMK.3 Dapat memilih metode penentuan konvergensi variabel random, beradaptasi terhadap masalah probabilitas, model-model probabilitas CPMK.4 Dapat memformulasikan permasalahan percobaan random, variabel random, ruang probabilitas, fungsi distribusi, distribusi bersyarat dan kebebasan stokastik, ekspektasi matematika, fungsi pembangkit momen, fungsi karakteristik CPMK.5 Dapat beradaptasi terhadap masalah probabilitas, model-model probabilitas CPMK.7 Mampu berkomunikasi secara efektif dan bekerjasama dalam tim yang interdisiplin dan multidisiplin CPMK.8 Memiliki tanggung jawab dan etika profesi CPMK.9 Mampu memotivasi diri untuk berpikir kreatif dan belajar sepanjang hayat *CLO.1 Mastering the concept of random experiments, random variables, probability space, distribution functions, conditional distribution and stochastic freedom, mathematical expectations, moment generating functions, characteristic functions, convergence of random variables* *CLO. 2 Can formulate random experimental problems, random variable, probability space, distribution function, conditional distribution and stochastic freedom, mathematical expectation, moment generator function,characteristic function.* *CLO. 3 Can choose the method of determining the convergence of random variables, adapt to probability problems,probability models.* *CLO. 4 Can formulate problems random experiment, random table, probability space, distribution function, conditional distribution and stochastic freedom, mathematical expectation, moment generating function, characteristic function of* *CLO. 5 Adaptable to probability problems,probability* *CLO. 7 Able to communicate effectively and cooperate in interdisciplinary teams and multidisciplinary teams.*

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	CLO. 8 Have responsibility and professional ethics *CLO. 9 Able to motivate yourself to creative thinking and lifelong learning*

Perte-muan *Meeting*	**Kemampuan Akhir Sub CP-MK** *Final Ability*	**Keluasan (materi pembelajaran)** *Extent (learning material)*	**Metode Pembelajaran** *Learning methods*	**Estimasi Waktu** *Duration*	**Bentuk Evaluasi** *Evaluation Type*	**Kriteria dan Indikator Penilaian** *Assessment Criteria and Indicators*	**Bobot Penilaian** *Scoring*
1-2	1. Mampu menjelaskan konsep percobaan random, ruang sampel dan Event/ peristiwa, field dan σ - field beserta sifat dan perannya dalam Statistika inferensial	Himpunan, Percobaan random, ruang sampel dan Event/ Peristiwa. Field dan σ - Field.	Ceramah, diskusi dan latihan soal	300 menit	Testulis Tugas 1 Observasi di kelas	1.1. Mampu menjelaskan dan memberi contoh tentang Himpunan dan sifat-sifatnya, 1.2. Mampu Menjelaskan tentang percobaan random, titik sampel, ruang sampel, Event/peristiwa. 1.3. Mampu menghasilkan Field, minimal Field, σ -Field, Borel Field dari berbagai peristiwa 1.4. Mampumenjelaskansifat –sifat field dan σ -Field besertape rbedaannya. 1.5. Mampume mberikan contoh riil tentang Field dan σ - Field percobaan random, ruang sampel dan Event/ peristiwa	15%/15%
1-2	*1. Able to explain the concept of random experiments, sample space and events, fields and σ - fields along*	*Sets, random experiments, sample space and events. Field and σ - Field.*	*Lecture, discussion and practice questions*	*300 minutes*	*Write down Task 1 Observation in class*	*1.1. Able to explain and give examples of sets and their properties,* *1.2. Able to explain about random experiments, sample points, sample rooms, events / events.*	*15% / 15%*

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	with their properties and roles in inferential statistics sets					*1.3. Able to produce Field, minimum Field, σ -Field, Borel Field from various events.* *1.4. Be able to explain the properties of the field and σ -Field along with their differences.* *1.6. Able to give real examples of Field and σ - Field random experiment, sample space and Event / event*	
2-3	2. Mampu menjelaskan definisi probabilitas aksiomatik berdasarkan konsep field beserta teorema-teorema yang dapat diturunkan dari defins itersebut	Probabilitas : Fungsi himpunan, Definisi probabilitas aksiomatik dan teorema probabilitas, Probabilitas bersyarat Sifat independensi Probabilitas total dan Teorema Bayes	Ceramah, diskusi dan latihan soal	300 menit	Testulis Tugas 2 Observasi di kelas	2.1 Mampu menerangkan, memberi contoh, menerangkakan probabilitas aksiomatik. 2.3 Mampu membedakan antara segitiga Pascal, binomial Newton dan menerapkan pada konsep probabilitas 2.4 Mampu menurunkan teorema-teorema probabilitas, dan probabilitas bersyarat. 2.5 Mampu menjelaskan sifat-sifat independensi. 2.6 Mampu menjelaskan probabilitas total dan teorema Bayes	15%/30%

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2-3	*2. Able to explain the definition of axiomatic probability based on the concept of field along with theorems that can be derived from those definitionsSet*	*Probability: function, Definition axiomatic probability and probability theorem, conditional probability Independent nature Total probability and Bayes' Theorem*	*Lectures, discussion and practice questions*	*300 minutes*	*Writing Task 2 Observations in class*	*2.1 Able to explain, give examples,axiomatic probabilities.* *2.3 Be able to distinguish between Pascal's triangle, Newton's binomial and apply to the concept of probability.* *2.4 Be able to derive probability theorems, and conditional probability.* *2.5 Be able to explain the characteristics of independence.* *2.2 Able to explain total probability and Bayes' theorem*	*15% / 30%*
4-5	3. Mampu menjelaskan pengertian variabel random Diskrit dan Kontinu, serta sifat-sifatnya	Variabel random : variabel random diskrit, Variabel random kontinu	Ceramah, diskusi dan latihan soal	300 menit	Test tulis Tugas 3 Observasi di kelas	3.1. Dapat menerangkan dan memberi contoh tentang fungsi titik, fungsi himpunan, variabel random dan sifat-sifatnya. 3.2. Dapat menerangkan dan member contoh variabel random diskrit 3.3. Dapat menerangkan dan member contoh variabel random kontinu 3.4. Mampu menjelakan perbedaan konsep variabel random diskrit dan kontinu	10%/40%

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4-5	*3. Able to explain the meaning of Discrete and Continuous random variables, and their properties*	*Random variables: discrete random variables, continuous random variables*	*Lectures, discussions and exercises*	*300 minutes*	*Writing test Task 3 Classroom observations*	*3.1. Can explain and give examples of point functions, set functions, random variables and their properties.* *3.2. Can explain and give examples of discrete random variables* *3.3. Can explain and give examples of continuous random variables* *3.5. Able to explain the different concepts of discrete and continuous random variables*	*10% / 40%*
6-7	4. Mampu menjelaskan konsep ruang probabilitas, Probabitas bersyarat dan sifat-sifatnya	Ruang probabilitas, Probabilita sbersyarat, Teorema Bayes dan kebebasan stokastik	Ceramah, diskusi dan latihan soal	300 menit	Test tulis Tugas 4 Observasi di kelas	4.1. Dapat menerangkan, memberi contoh ruang probablitas. 4.2. Dapat menerangkan, dan memberi contoh probabilitas bersyarat. 4.3. Dapat menerangkan, dan memberi contoh Probabilitas Total dan teorema Bayes.	
6-7	*4. Be able to explain the concept of probability space, conditional probability and their properties* *5.*	*Probability space, conditional probability , Bayes' Theorem and stochastic freedom*	*Lecture, discussion and practice questions*	*300 minutes*	*Written test Task 4 Observations in class*	*4.1. Can explain, give examples of probability spaces.* *4.2. Can explain, and give examples of conditional probability.* *4.4. Can explain, and give examples of Total Probability and Bayes' theorem.*	

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8	**ETS/***Mid Term Examination*						
9-10	5. Mampu menjelaskan konsep Distribusi Probabilitas Diskrit dan kontinu beserta sifat-sifatnya *5. Able to explain the concept of Discrete and continuous Probability Distribution and its characteristics*		Ceramah, diskusi dan latihansoal *Lectures, discussions and questions*		Testulis Tugas 4 Observasi di kelas *Writing Task 4 Observations in class*	5.1. Probabilitas bersyarat *5.1. Conditional probability*	15%/55%
		Distribusi variabel random diskrit dan kontinu dan sifat-sifatnya *Distribution of discrete and continuous random variables and their properties*	Ceramah, diskusidan latihan soal *Lectures, discussions and exercises*		Test tulis Tugas 5 Observasi di kelas *Written test Task 5 Observation in class*	5.2. Mampu menjelaskan distribusi variabel random diskrit dan kontinu 5.3. Mampu menjelaskan perbedaan distribusi variabel random diskrit dan kontinu 5.4. Mampu menentukan fungsi distribusi Binomial, Geometrik, Hipergeometrik, Binomial negative 5.5. Mampu menentukan fungsi distribusi Poisson, Multinomial, Uniform diskrit 5.6. Mampu menentukan fungsi distribusi Normal, Uniform, Gamma, Eksponensial, Normal, normal bivariat, beta, weibull.	20%/75%

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						5.2. Be able to explain the distribution of discrete and continuous random variables *5.3. Able to explain differences in the distribution of discrete and continuous random variables* *5.4. Able to determine distribution functions Binomial, Geometric, Hypergeometric, Binomial negative* *5.5. Able to determine Poisson distribution function, Multinomial, Discrete Uniform* *5.6. Able to determine distribution function Normal, Uniform, Gamma, Exponential, Normal, bivariate normal, beta, weibull.*	
11-13	6. Mampu menjelaskan konsep ekspektasi matematika , momen, variansi	Ekspektasi , momen dan variansi dari variabel random diskrit dan kontinu dan sifat-sifatnya	Ceramah, diskusi dan latihan soal	450 menit	Test tulis Tugas 6 Observasi di kelas	6.1. Mampu menjelaskan pengertian konsep ekspektasi matematika, momen dan variansi dan sifat-sifatnya.	15%/90%

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	beserta sifat-sifatnya dan ketaksamaan Chebyshev					6.2. Mampu mengetahui kegunaan dan hubungan dari fungsi pembangkit momen dengan mean, momen, dan variansi 6.3. Mampu mendapatkan fungsi pembangkit momen, mean, momen, variansi untukvariabel random diskrit 6.4. Mampu menjelaskan kegunaan dan hubungan dari fungsi pembangkit momen, mean, momen, variansi untukvariabel random kontinu	
11-13	*6. Able to explain the concepts of mathematical expectations, moments, variance and their properties and inequalities Chebyshev*	*Expectations, moments and variances of discrete and continuous random variables and their properties*	*Lecture, discussion and question exercises*	*450 minutes*	*Test writing assignments 6 Observations in class*	*6.1. Able to explain the concept of mathematical expectations, moments and variances and their properties.* *6.2. Be able to know the usefulness and relationship of the moment generator function with mean, moment, and variance* *6.3. Be able to get the moment, mean, moment, variance generator function for discrete random variables*	*15% / 90%*

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						6.5. Be able to explain the usefulness and relationship of the moment generator function, mean, moment, variance for continuous random variable	
14-15	7. Mampu menjelaskan konsep konvergensi barisan variabel random	Konvergensi dalam probabilitas, Konvergensi almost surely, Konvergensi dalam distribusi dan CLT	Ceramah, diskusi dan latihan soal	300 menit	Testulis Tugas 7 Observasi di kelas	7.1. Dapat menerangkan dan mendemonstrasikan Konvergensi dalam probabilitas. 7.2. Dapat menerangkan dan mendemonstrasikan Konvergensi dalam distribusi. 7.3. Dapat menerangkan dan mendemonstrasikan Konvergensi almost surely. 7.4. Dapat menerangkan dan mendemonstrasikan Konsep tentang CLT.	10%/100%
14-15	*Be able to explain the concept of convergence of sequences of random variables*	*Convergence in probability, Convergence almost surely, Convergence in distribution and CLT*	*Lectures, discussions and exercises*	*300 minutes.*	*Writing Task 7 Observation in class*	*7.1. Can explain and demonstrate Convergence in probability.* *7.2. Can explain and demonstrate convergence in distribution.* *7.3. Can explain and demonstrate Convergence almost surely.* *7.5. Can explain and demonstrate the concept of CLT.*	*10% / 100%*
16	**EAS/** *Final Examination*						

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PUSTAKA/*REFERENCES* :

1. Hogg, R.V. dan Craig, A.T. 1995. Introduction to Mathematical Statistics, 5th ed.Mac Millon. New York.
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