

1. Course Identity			
Course name (Nama mata kuliah)	Simulation Techniques		
Faculty (Fakultas)	Science and Mathematics	Study Program (Program Studi)	Statistics
Code (Kode)	SST-309	Credit poin Sks (Bobot Sks)	3
Group (Grup)	Study Program	Enrollment obligatory (Sifat pengambilan)	mandatory/ optional*
Semester(s) in which the course is taught (Semester)	III	Availability (Ketersediaan)	Only available on Statistics Study Program
Learning method (Bentuk pembelajaran)	blended learning/online learning*	Media (Media)	Zoom, Google Classroom, and Video
Course category (Rumpun mata kuliah/blok)	university compulsory course/ SSP compulsory course/ practicum/ compulsory of scientific interest/ elective course*	Requirements (Prasyarat)	Programming Algorithm
Lecture (Dosen pengampu)	Muhammad Hasan Sidiq Kurniawan, S.Si., M.Sc.	Semester/ Academic year (Semester/ Tahun Akademik)	Odd Semester 2020/2021

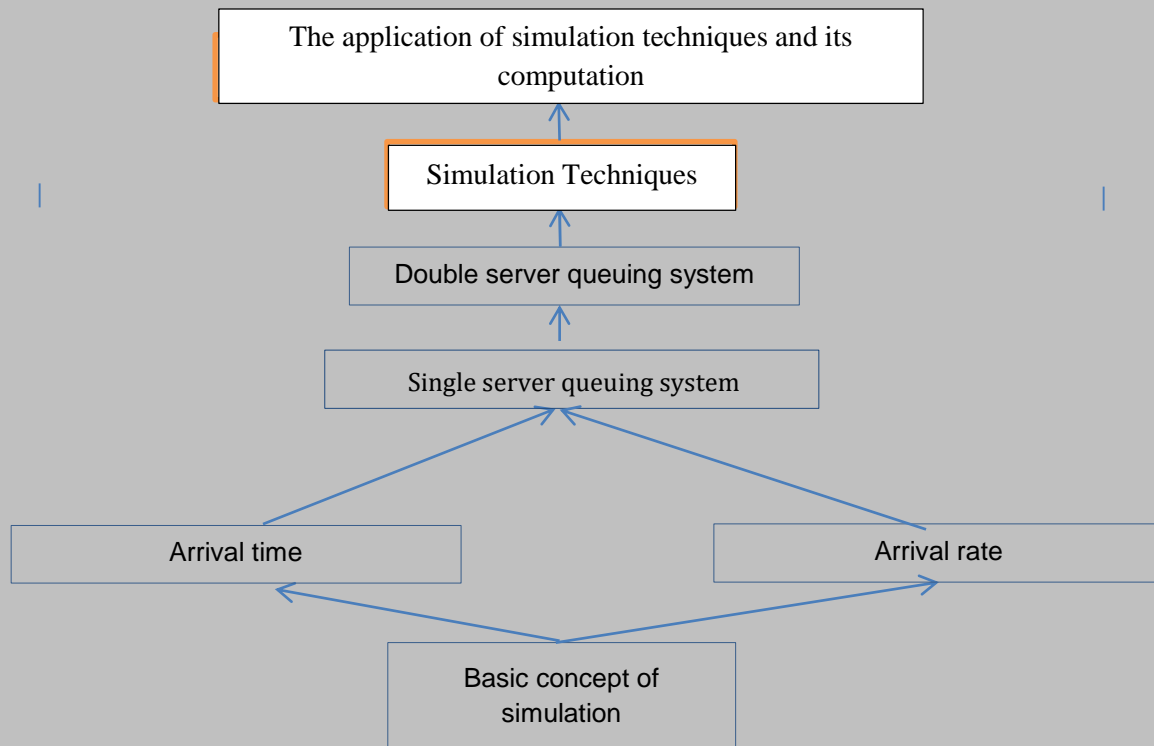
*) cross the unnecessary ones

2a. PROGRAM LEARNING OUTCOME (CAPAIAN PEMBELAJARAN LULUSAN)	
LO Code (Kode CPL)	LO Description (Rumusan CPL)
KKa	Able to conduct experimental design, data collection and generation (in the form of surveys, experiments, or simulations), data organizing, data analysis using statistical techniques, and drawing valid conclusions, by utilizing at least one statistical software.
KUi	Capable of documenting, storing, securing, and recovering data to ensure validity and prevent plagiarism.

2b. COURSE OUTCOME (CAPAIAN PEMBELAJARAN MATA KULIAH)					
Support ed PLO Code (Kode CPL yang didu- kung)	CO Code (Kode CPMK)	CO Descriptions and Indicators (Rumusan CPMK dan Indikator)	Learning Experience (Pengalaman Pembelajaran)	Assessment (Asesmen/penilaian)	Wei ght (Bo - bot)
KKa	KKa1	Students are able to do experimental design, collect data on the single server single line queue model, the single server	1. Students are modeling problems related to the queuing system based on case studies in	Assignment	20 %

		double line queue model, and the double server double line queue model.	<p>everyday life.</p> <p>2. Students are interpreting the queue modeling results that have been obtained.</p>		
	KKa2	Students are able to use statistical techniques to calculate queuing model solutions.	<p>1. Students are modeling and choosing queue models that match the cases at hand.</p> <p>2. Students are choosing a simulation method that suits the data conditions.</p>	Midterm Exam	25 %
	KKa3	Students are able to create, calculate solutions, and draw valid conclusions on queuing using the software.	<p>1. Students are translating simulation techniques into programming languages.</p>	Final Exam	30 %
KUi	KUi1	Students are able to document, store, secure queue model data and supplies that have been obtained.	<p>1. Students are creating original simulation programs based on cases in everyday life.</p>	Assignment	25 %

3. Program Learning Outcome Analysis Map (*Peta Analisis Capaian Pembelajaran*)



4. Reference (*Referensi*)

1. Kallenberg, L.C.M., and Spieksma, F.M. Stochastic Modelling: Performance and Control. Universiteit Leiden.

5. Detail of Learning Activities (*Rincian Aktivitas Pembelajaran*)

Session (sesi)	LOC/Sub-LOC/Criterion (CPMK/Sub-CPMK/Kriteria)	Study Material (<i>Bahan Kajian</i>)	Activity Design and Duration (<i>Rancangan Aktivitas dan Durasi</i>)	Mode	Learning Media/Reference (<i>Media Pembelajaran/Referensi</i>)
1	KKa1	Basic concept of simulation	<ul style="list-style-type: none"> - Lecture explains an introduction about basic concept simulation (100 minutes). - Students are looking for the example of simulation on daily life and explain it (50 minutes) 	FF	
2	KKa2	Queue Simulation: Arrival time and arrival rate.	<ul style="list-style-type: none"> - Lecture gives an example of case-study about queuing situation. (40 minutes) - Students try to estimate every possible statistics that could be found in the example. (90 minutes) - Lecture gives explanation about the case-study. (20 minutes) 	FF	
3	KKa3	Queue simulation: Fingerprint queuing system simulation	<ul style="list-style-type: none"> - Students write their arrival time on the class's fingerprint. (30 minutes) - Class discussion about student's arrival time. (90 minutes) - Students interpret the discussion result. (30 minutes) 	FF	
4	KKa2	Queue simulation: Single server, double server	<ul style="list-style-type: none"> - Lecturer explains about the basic concept of the queuing theory. (70 minutes) - Lecturer gives an example about the single server queuing simulation. (40 minutes) - Students analyze the given case-study using double server queuing simulation. (40 minutes) 	FF	
5	KKa3	Queue simulation: Simulation using random generator.	<ul style="list-style-type: none"> • Lecturer gives an example to conduct some simulations using random numbers. • Students simulate using random numbers. 	FF	
6	KKa2	Monte-Carlo simulation	<ul style="list-style-type: none"> • Lecturer gives a brief explanation about monte-carlo simulation • Case-Study. 	FF	
7	KKa2	Monte-Carlo simulation for grouped Data	<ul style="list-style-type: none"> • Lecturer gives a brief explanation about monte-carlo simulation • Case-Study. 	FF	
8		Midterm Exam		FF	
9	KKa2	Bootstrap Simulation	<ul style="list-style-type: none"> • Lecturer gives an explanation about bootstrap simulation. • Case-Study. 	FF	
10	KKa3, Kui1	Computation for	<ul style="list-style-type: none"> • Lecturer gives a case-study to be solved. • The students create computational program 	FF	

		Bootstrap Simulation	to solve the problem using bootstrap.		
11	KKa3, Kui1	Simulation for estimating standard error	<ul style="list-style-type: none"> Lecturer gives a review about standard error. The students create computational program to estimate the standard error using bootstrap. 	SAA	
12	KKa3	Hypothesis testing using simulation	<ul style="list-style-type: none"> Lecturer gives a review about hypothesis testing. The students create computational program to conduct hypothesis testing using bootstrap. 	SAA	
13	KKa3	Simulation method for paired data	<ul style="list-style-type: none"> Lecturer gives a review about paired data. The student's looking for the method to conduct some simulation using paired data. 	FF	
14	KKa3, Kui1	Linear Regression	<ul style="list-style-type: none"> Explanantion about linear regression using bootstrap estimation. 	FF	
15		Simulation	<ul style="list-style-type: none"> Case-Study 	SAA	
16		Final Examination			

Information:

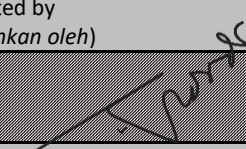
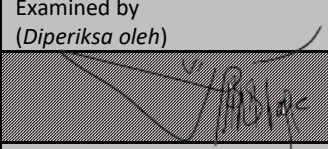
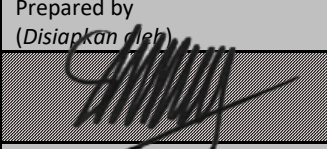
For mode, enter one of the following codes

- FF = activities that require **face-to-face** meetings in class (*aktivitas yang memerlukan tatap muka (TM) langsung di kelas*);
- FFO = activities that require **face to face online** (*aktivitas yang memerlukan tatap muka secara daring (tatap maya/TMD)*);
- SAA = standalone asynchronous online activity (*aktivitas daring asinkron mandiri/ASM*);
- CAA = collaborative asynchronous online activities (*aktivitas daring asinkron kolaborasi/ASK*);

Learning / reference media can be in the form of (1) self-produced results, (2) curated results: media sourced from the internet or other sources chosen by the lecturer, and / or (3) students' own exploration results.

6. Assessment and Evaluation System (*Sistem Penilaian dan Evaluasi*)

Assessment System (<i>Sistem Penilaian</i>)	Benchmark Reference Assessment = PAP (Penilaian Acuan Patokan)
Evaluation System (<i>Sistem Evaluasi</i>)	Each student must achieve a minimum grade / predicate of C for each CLO. If it has not fulfilled it, then the student is obliged to take an examination / remedial assignment for the related CLO.

Date:	Date:	Date:
Validated by (<i>Disyahkan oleh</i>)	Examined by (<i>Diperiksa oleh</i>)	Prepared by (<i>Disiapkan oleh</i>)
		
Head of SSP-UII Dr. Edy Widodo, M.Si.	Scientific Interest Coordinator Achmad Fauzan, S.Pd., M.Si.	Lecture Muhammad Hasan Sidiq K., S.Si., M.Sc.