

MODULE HANDBOOK  
**SURVIVAL  
ANALYSIS**



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

## ENDORSEMENT PAGE



# MODULE HANDBOOK SURVIVAL ANALYSIS DEPARTMENT OF STATISTICS INSTITUT TEKNOLOGI SEPULUH NOPEMBER


Proses <i>Process</i>	Penanggung Jawab <i>Person in Charge</i>			Tanggal <i>Date</i>
	Nama <i>Name</i>	Jabatan <i>Position</i>	Tandatangan <i>Signature</i>	
Perumus <i>Preparation</i>	Dr. Santi Wulan Purnami; Jerry D.P Ph.D	Dosen <i>Lecturer</i>		March 28, 2019
Pemeriksa dan Pengendalian <i>Review and Control</i>	Dr. Santi Wulan Purnami, S.Si, M.Si ; Jerry Dwi Trijoyo Purnomo, S.Si. M.Si., Ph.D	Tim kurikulum <i>Curriculum team</i>		April 15, 2019
Persetujuan <i>Approval</i>	Dr. Bambang Widjanarko Otok	Koordinator RMK <i>Course Cluster Coordinator</i>		July 17, 2019
Penetapan <i>Determination</i>	Dr. Kartika Fithriasari, M.Si	Kepala Departemen <i>Head of Department</i>		July 30, 2019

# MODULE HANDBOOK

## SURVIVAL ANALYSIS

Module name	<b>SURVIVAL ANALYSIS</b>	
Module level	Undergraduate	
Code	KS184824	
Course (if applicable)	SURVIVAL ANALYSIS	
Semester	Eighth Semester (Ganjil)	
Person responsible for the module	Dr. Santi Wulan Purnami; Jerry D.P Ph.D	
Lecturer	Dr. Santi Wulan Purnami, S.Si, M.Si ; Jerry Dwi Trijoyo Purnomo, S.Si. M.Si., Ph.D	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program, <b>mandatory</b> , 8 <sup>th</sup> semester.	
Type of teaching, contact hours	Lectures, <50 students	
Workload	<ol style="list-style-type: none"> <li>1. Lectures : 3 x 50 = 150 minutes per week.</li> <li>2. Exercises and Assignments : 3 x 60 = 180 minutes (3 hours) per week.</li> <li>3. Private learning : 3 x 60 = 180 minutes (3 hours) per week.</li> </ol>	
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	Mathematical Statistics II	
Learning outcomes and their corresponding PLOs	<p><i>CLO.1 Able to explain concepts and apply survival analysis theory</i></p> <p><i>CLO.3 Able to analyze data with survival methods and interpret them</i></p> <p><i>CLO.4 Able to identify, formulate and solve problems in the health / medical field with survival analysis</i></p>	<p>PLO-01</p> <p>PLO-03</p> <p>PLO-04</p>

Content	<p><i>Survival analysis is a statistical method that can be applied in various fields, one of which is in the health sector. Survival analysis is a statistical method that emphasizes analyzing the time until an event occurs. In this lecture, the basics of survival analysis will be taught such as the Kaplan Meier survival function, Hazard function, Hazard ratio, survival regression with parametric and semiparametric approaches. To better understand this method, applications in real cases will be taught manually or using software, especially SPSS, SAS and R.</i></p>
Study and examination requirements and forms of examination	<ul style="list-style-type: none"> <li>• In-class exercises</li> <li>• Assignment 1, 2, 3</li> <li>• Mid-term examination</li> <li>• Final examination</li> </ul>
Media employed	<p>LCD, whiteboard, websites (myITS Classroom), zoom.</p>
Reading list	<ol style="list-style-type: none"> <li>1. Cox, D.R. and Oakes, D. 1984. <i>Analysis of Survival Data</i>. Cambridengane : University Printing House</li> <li>2. David, Collet. 2014. <i>Modelling Survival Data in Medical Research</i>. 3rd edition, Chapman and Hall/CRC.</li> <li>3. Hosmer, David W., Lemeshow, Stenley. and May, S. 2008. <i>Applied Survival Analysis</i>. Hoboken, New Jersey : John Wiley dan Sons, Inc.</li> <li>4. Kleinbaum, David G. and Klein, Mitchel. 2012. <i>Survival Analysis: A self-Learning Text</i>. 3rd edition. Springer, Science+Business Media, LLC.</li> <li>5. Le, C. T. 1997. <i>Applied Survival Analysis</i>. John Wiley dan Sons, Inc.</li> </ol>

	Program Studi	Sarjana, Departemen Statistika, FMKSD-ITS
	Mata Kuliah	Analisis Survival
	Kode Mata Kuliah	KS184824
	Semester/SKS	VII/3
	MK Prasyarat	Statistika Matematika I, Analisis Regresi, Analisis Data Kualitatif
RP-S1	Dosen Pengampu	Dr. Santi Wulan Purnami, S.Si, M.Si ; Jerry Dwi Trijoyo Purnomo, S.Si. M.Si., Ph.D

<b>Bahan Kajian</b> <i>Study Materials</i>	Dasar Sains, Teori Statistika, Pengumpulan Data, Deskripsi dan Eksplorasi, Komputasi dan Data Processing, Pemodelan, Kesehatan dan Lingkungan <i>Basic Science, Statistical Theory, Data Collection, Description and Exploration, Computing and Data Processing, Modeling, Health and Environment</i>
<b>CPL yang dibebankan MK</b> <i>PLO of the course</i>	<p>CPL 1. Mampu menerapkan pengetahuan sains, teori statistika, matematika, dan komputasi untuk menyelesaikan permasalahan dalam berbagai bidang terapan</p> <p>CPL 3. Mampu menganalisis data dengan metode statistika yang tepat dan menginterpretasikannya</p> <p>CPL 4. Mampu mengidentifikasi, memformulasi, dan menyelesaikan masalah statistika di berbagai bidang terapan</p> <p><i>PLO 1. Able to apply knowledge of science, statistical theory, mathematics, and computation to solve problems in various applied fields</i></p> <p><i>PLO 3. Able to analyze data with appropriate statistical methods and interpret them</i></p> <p><i>PLO 4. Able to identify, formulate, and solve statistical problems in various applied fields</i></p>
<b>CP-MK</b> <i>CLO</i>	<p>CPMK.1 Mampu menjelaskan konsep dan menerapkan teori analisis survival</p> <p>CPMK.3 Mampu menganalisis data dengan metode survival dan menginterpretasikannya</p> <p>CPMK.4 Mampu mengidentifikasi, memformulasi dan menyelesaikan problem dibidang kesehatan/kedokteran dengan analisis survival</p> <p><i>CLO.1 Able to explain concepts and apply survival analysis theory</i></p> <p><i>CLO.3 Able to analyze data with survival methods and interpret them</i></p> <p><i>CLO.4 Able to identify, formulate and solve problems in the health / medical field with a survival analysis</i></p>

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Pertemuan <i>Meeting</i>	Kemampuan Akhir Sub CP-MK <i>Final Ability</i>	Keluasan (materi pembelajaran) <i>Extent (learning material)</i>	Metode Pembelajaran <i>Learning methods</i>	Estimasi Waktu <i>Duration</i>	Bentuk Evaluasi <i>Evaluation Type</i>	Kriteria dan Indikator Penilaian <i>Assessment Criteria and Indicators</i>	Bobot Penilaian <i>Scoring</i>
1	1.1 Dapat menjelaskan konsep dan tujuan analisis survival <i>1.1 Can explain the concept and purpose of survival analysis</i>	<b>Pengantar analisis survival:</b> konsep dasar analisis survival, censored data <i>Introduction to survival analysis: the basic concepts of survival analysis, censored data</i>	Ceramah interaktif Diskusi (CID) <i>Interactive lecture Discussion (CID)</i>	150 menit <i>150 minutes</i>	Observasi Aktifitas di kelas <i>Observation of classroom activities</i>	1.1 Dapat menjelaskan konsep analisis survival 1.2 Dapat menjelaskan tujuan analisis survival 1.1. Dapat menjelaskan censored data <i>1.1 Can explain the concept of survival analysis</i> <i>1.2 Can explain the purpose of the survival analysis</i> <i>1.3 Can explain censored data</i>	10%/10%
2	1.2 Dapat menghitung estimasi dan membuat grafik fungsi survival menggunakan metode parametrik dan Kaplan Meier <i>1.2 Can calculate estimates and graph survival functions using the parametric method and Kaplan Meier</i>	<b>Fungsi survival:</b> fungsi survival (parametrik), kurva survival Kaplan Meier, hazard rate <i>Survival function: survival function (parametric), Kaplan Meier survival curve, hazard rate</i>	Ceramah interaktif Diskusi Latihan soal (CIDL) <i>Interactive lecture Discussion Practice questions (CIDL)</i>	150 menit <i>150 minutes</i>	Observasi Aktifitas di kelas <i>Observation of classroom activities</i>	2.1 Dapat menghitung probabilitas survival 2.2 Dapat membuat kurva Kaplan Meier (KM) 2.1. Dapat mengidentifikasi bentuk model survival (parametrik) <i>2.1 Can calculate the probability of survival</i> <i>2.2 Can create a Kaplan Meier (KM) curve</i> <i>2.3 Can identify the shape of the survival model (parametric)</i>	10%/20%



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Pertemuan <i>Meeting</i>	Kemampuan Akhir Sub CP-MK <i>Final Ability</i>	Keluasan (materi pembelajaran) <i>Extent (learning material)</i>	Metode Pembelajaran <i>Learning methods</i>	Estimasi Waktu <i>Duration</i>	Bentuk Evaluasi <i>Evaluation Type</i>	Kriteria dan Indikator Penilaian <i>Assessment Criteria and Indicators</i>	Bobot Penilaian <i>Scoring</i>
3,4	1.3 Dapat melakukan pengujian perbedaan dua atau lebih kurva survival <i>1.3 Can test the difference between two or more survival curves</i>	<b>The log rank (LR) test:</b> LR test untuk 2 group dan lebih dari 2 group <i>The log rank (LR) test: LR test for 2 groups and more than 2 groups</i>	Ceramah Interaktif Diskusi Praktikum Latihan Soal Observasi (CIPLSO) <i>Interactive Lecture Discussion Practice Exercises Observation (CIPLSO)</i>	300 menit <i>300 Minutes</i>	Tugas 1 <i>Task 1</i>	3.1 Dapat melakukan uji LR untuk 2 group 3.1. Dapat melakukan uji LR untuk beberapa group (lebih dari 2 group) <i>3.1 Can do LR test for 2 groups</i> <i>3.2 Can perform LR tests for several groups (more than 2 groups)</i>	10%/30%
5,6,7	3.1 Dapat mengidentifikasi dan melakukan estimasi parameter regresi survival untuk data lengkap maupun tersensor	<b>Regresi survival parametrik:</b> Regresi Eksponensial, Weibull, Loglogistik <i>Parametric survival regression: Exponential Regression, Weibull, Logistics</i>	Ceramah Interaktif Diskusi Praktikum Latihan Soal Observasi (CIPLSO)	450 menit <i>450 Minutes</i>	Tugas 2 <i>Task 2</i>	4.1 Dapat mengidentifikasi regresi yang sesuai (regresi eksponensial, weibull, loglogistik) 4.2 Dapat melakukan estimasi MLE dari parameter regres yang sesuai baik untuk data lengkap maupun tersensor 4.1. 4.3 Dapat menganalisis model regresi	20%/50%

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Pertemuan <i>Meeting</i>	Kemampuan Akhir Sub CP-MK <i>Final Ability</i>	Keluasan (materi pembelajaran) <i>Extent (learning material)</i>	Metode Pembelajaran <i>Learning methods</i>	Estimasi Waktu <i>Duration</i>	Bentuk Evaluasi <i>Evaluation Type</i>	Kriteria dan Indikator Penilaian <i>Assessment Criteria and Indicators</i>	Bobot Penilaian <i>Scoring</i>
	3.1 Can identify and estimate survival regression parameters for complete and censored data		Interactive Lecture Discussion Practice Exercises Observation (CIPLSO)			4.1 Can identify suitable regressions (exponential regression, weibull, logistic) 4.2 Can estimate MLE from the appropriate regression parameters for both complete and censored data 4.3 Can analyze the regression model	
8	<b>ETS</b>						
9-10	4.4 Dapat mengidentifikasi dan merumuskan bentuk umum dari model Cox PH 4.4 Can identify and formulate the general form of the Cox PH model	<b>The Model Cox proportional Hazard (PH) model:</b> Estimasi model cox PH, Hazard ratio model cox PH, interval estimation <i>The Model Cox proportional Hazard (PH) model:</i> Cox PH model estimation, Hazard ratio cox PH model, interval estimation	CIPLSO Interactive Lecture Discussion Practice Exercises Observation (CIPLSO)	300 menit 300 Minutes	Observasi Aktifitas di kelas <i>Observation of classroom activities</i>	5.1 Dapat merumuskan bentuk spesifik dari model Cox PH yang sesuai 5.2 Dapat merumuskan bentuk dan sifat-sifat fungsi hazard model Cox PH 5.3 Dapat menginterpretasikan model Cox PH 5.1 Can formulate a specific form of the appropriate Cox PH model 5.2 Can formulate the form and characteristics of the hazard function 5.3 Cox PH model 5.3 Can interpret the Cox PH model	10%/60%





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Pertemuan <i>Meeting</i>	Kemampuan Akhir Sub CP-MK <i>Final Ability</i>	Keluasan (materi pembelajaran) <i>Extent (learning material)</i>	Metode Pembelajaran <i>Learning methods</i>	Estimasi Waktu <i>Duration</i>	Bentuk Evaluasi <i>Evaluation Type</i>	Kriteria dan Indikator Penilaian <i>Assessment Criteria and Indicators</i>	Bobot Penilaian <i>Scoring</i>
11-12	4.1 Dapat melakukan dan menganalisis uji asumsi dari model Cox PH dengan metode grafik dan uji goodness of fit (GOF)  4.1 <i>Can perform and analyze the assumption test of the Cox PH model with the graph method and the goodness of fit (GOF) test</i>	<b>Evaluasi asumsi proportional hazards:</b> pendekatan grafik(log-log plots, nilai aktual dengan nilai prediksi) - pendekatan uji goodness of fit <i>Evaluation of proportional hazards assumptions: graphical approach (log-log plots, actual values with predicted values)</i> - - <i>Goodness of fit test approach</i>	CIPLSO <i>Interactive Lecture Discussion Practice Exercises Observation (CIPLSO)</i>	300 Menit 300 Minutes	Tugas 3 Makalah 1 Presentasi 1 <i>Task 3 Paper 1 Presentation 1</i>	6.1 Dapat melakukan uji asumsi model Cox PH dengan metode: - Grafik - Uji GOF 6.2 Dapat menganalisis dan menginterpretasikan hasil evaluasi asumsi 5.1 <i>Can test the assumptions of the Cox PH model using the following methods: Graphics GOF test</i> 6.2 <i>Can analyze and interpret the results of evaluation assumptions</i>	10%/70%
13-14	5.2 Dapat melakukan pemodelan menggunakan Stratified Cox Model  4.2 <i>Can perform modeling using the Stratified Cox Model</i>	Stratified <b>Cox regression</b> <i>Stratified Cox regression</i>	CIPLSO <i>Interactive Lecture Discussion Practice Exercises Observation (CIPLSO)</i>	300 menit 300 Minutes	Final Project Makalah 2 Presentasi 2 <i>Final Project Paper 2 Presentation 2</i>	8.1 Dapat melakukan pemodelan Stratified <b>Cox regression</b> 8.2. Dapat menganalisis dan menginterpretasikan model Stratified <b>Cox regression</b> 8.1 <i>Can perform Stratified Cox regression modeling</i>	


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Pertemuan <i>Meeting</i>	Kemampuan Akhir Sub CP-MK <i>Final Ability</i>	Keluasan (materi pembelajaran) <i>Extent (learning material)</i>	Metode Pembelajaran <i>Learning methods</i>	Estimasi Waktu <i>Duration</i>	Bentuk Evaluasi <i>Evaluation Type</i>	Kriteria dan Indikator Penilaian <i>Assessment Criteria and Indicators</i>	Bobot Penilaian <i>Scoring</i>
						8.2 Can analyze and interpret the Stratified Cox regression model	
15				150 menit <i>150 Minutes</i>	Kuis 2 <i>Quiz 2</i>		10%/90%
16	<b>EAS</b>						

**PUSTAKA/REFERENCES:**

1. David G. Kleinbaum, Mitchel Klein, Survival Analysis, third edition, Springer Science+Business Media, LLC, 2012
2. David W. Hosmer, Stanley Lemeshow, May, S., Applied Survival Analysis, John Wiley & Sons, Inc., Hoboken, New Jersey, 2008
3. David Collet, Modelling Survival Data in Medical Research, Third Edition, Chapman and Hall/CRC, 2014
4. Cox, D.R., Oakes, D., Analysis of Survival Data, University Printing House, Cambridge, 1984
5. Le, C. T., Applied Survival Analysis, John Wiley & Sons, Inc., 1997

**A. RENCANA ASESMEN DAN EVALUASI (RAE)**  
*D. ASSESSMENT AND EVALUATION PLAN*

	<b>RENCANA ASSESSMENT &amp; EVALUASI</b> <i>Assesment and Evaluation Plan</i> Prodi Sarjana Statistika/ <i>Statistics Bachelor</i> <b>SURVIVAL ANALISIS/ANALYSIS SURVIVAL</b>		<b>RA&amp;E</b>
			SLK-55
<b>Kode: KS18482</b> <i>Code: KS184824</i>	<b>Bobot sks (T/P): 3</b>  <i>CREDITS : 3</i>	<b>Rumpun MK:</b> Statistika Kesehatan dan Lingkungan  <i>Course group:</i> <i>Health and Environmental Statistics</i>	Smt: VII <i>Semester VII</i>
<b>OTORISASI</b> <i>AUTHORIZATION</i>	<b>Penyusun</b> <i>Author</i>  Dr. Santi Wulan Purnami/ Jerry D.P Ph.D	<b>Koordinator RMK</b> <i>Coordinator</i>  Dr. Bambang Widjanarko Otok	<b>Kaprodi</b> <i>Head of Department</i>  Dr. Kartika Fithriasari, M.Si

Mg ke (1)	Sub CP-MK (2)		Bentuk Asesmen (Penilaian) (3)	Bobot (%) (4)
	No	Kemampuan akhir		
1	1.1	Dapat menjelaskan konsep dan tujuan analisis survival <i>Can explain the concept and purpose of survival analysis</i>	Tugas <i>Task</i>	5
2	1.2	Dapat menghitung estimasi dan membuat grafik fungsi survival menggunakan <i>Can calculate estimates and graph survival functions using</i>	Tugas <i>Task</i>	5
3-4	1.3	Dapat melakukan pengujian perbedaan dua atau lebih kurva survival <i>Can test the difference between two or more survival curves</i>	Kuis <i>Quiz</i>	10
5,6,7	3.1	Dapat mengidentifikasi dan melakukan estimasi parameter regresi parametrik untuk data lengkap maupun tersensor <i>Can identify and perform parameter estimation of parametric regression for complete and censored data</i>	Presentasi Laporan ETS <i>Presentation Report Mid Term</i>	5 5 20
8		Evaluasi Tengah Semester <i>Mid Semester Evaluation</i>		

Mg ke (1)	Sub CP-MK (2)		Bentuk Asesmen (Penilaian) (3)	Bobot (%) (4)
	No	Kemampuan akhir		
9-10	3.2	Dapat mengidentifikasi dan merumuskan bentuk umum dari model Cox PH <i>Can identify and formulate the general form of the Cox PH model</i>	Tugas <i>Task</i>	10
11-12	4.1	Dapat melakukan dan menganalisis uji asumsi dari model Cox PH dengan metode grafik dan uji goodness of fit (GOF) <i>Can perform and analyze the assumption test of the Cox PH model with the graph method and the goodness of fit (GOF) test</i>	Presentasi <i>Presentation</i>	10
13-15	4.2	Dapat melakukan pemodelan menggunakan Stratified Cox Model <i>Can do modeling using the Stratified Cox Model</i>	Presentasi Paper <i>Presentation Paper</i>	10 20
16		Evaluasi Akhir <i>Final Evaluation</i>		
			<b>Total bobot penilaian</b>	<b>100%</b>

## Portofolio penilaian & evaluasi proses dan hasil belajar setiap mahasiswa

Tabel ini contoh untuk salah satu mahasiswa, yaitu

Mg ke	CPL (yg dibebankan pd MK)	CPMK (CLO)	Bentuk Penilaian (Bobot%)*		Bobot (%) CPMK	Nilai Mhs (0-100)	$\Sigma((\text{Nilai Mhs}) \times (\text{Sub-Bobot}\%)*)$	Ketercapaian CPL pd MK (%)	Diskripsi Evaluasi & Tindak lanjut perbaikan
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1-2	CPL-1	Sub CPMK 1 Sub CPMK 2 Sub CPMK 3	Tugas Kuis Kuis 2 ETS EAS	5 5 10	20	84 73 70 95 68		79	Lulus

			Tugas (10)	Kuis (20)	Kuis 2 (15)	ETS (30)	EAS (25)
1	6211540000009	Yolan Setyo Utomo	84	73	70	95	68
2	6211540000012	Aprilia Ardiriani	81	92	80	76	68
3	6211540000016	Wikaning Tri Dadari	81	91	80	96	66
4	6211540000033	I Gusti Putu Surya Darma	82	30	76	66	45
5	6211540000043	Riska Devy Aprillyasari	86	92	88	100	89
6	6211540000050	Septia Wulandari	86	46	78	87	60
7	6211540000056	Ganis Ardhaning Saputri	82	68	85	62	47
8	6211540000071	DEWI DAMAYANTI	78	98	85	95	98
9	6211540000076	NABILA SAVINA	83	35	76	90	45
10	6211540000078	ARLANDIO NUR FAWZI	75	90	71	83	84
11	6211540000081	RIZAL ADITYA	75	97	70	76	64
12	6211540000082	MUHAMAD ADRYANTA	73	71	72	78	35
13	6211540000084	BAREP ADJI WIDHI PANGESTU	75	89	70	93	87
14	6211540000086	DEWI WAHYU SETYOWATI	84	66	76	43	35
15	6211540000091	DIAN RIZKY MAULINA	75	82	79	58	44
16	6211540000092	GUNAWAN TANJUM	81	77	73	70	63
17	6211540000095	YUSUF PUJI HERMANTO	80	75	70	55	72
18	6211540000098	MOCHAMMAD FARROS FATCHUR ROJI	78	46	70	40	58
19	6211540000105	DEWI MUSLIMATUL AZIZAH	75	84	78	83	53
20	6211540000107	TAUFIK AZMI	75	84	71	72	57
21	6211540000110	DWINDA INTAN RAMADHANI	84	90	73	66	65
22	6211540000113	DESINTYA RACHMA ANGGRAENI PUTRI	88	91	79	92	77
23	6211540000115	DEVITA PRIMA VERNANDA	81	83	72	72	49
24	6211540000117	DIMAS ACHMAD FADHILA	80	63	76	62	65
25	6211540000124	ARRAFI DWIARGATRA	75	33	70	43	31
26	6211540000131	MOHAMMAD HAIDAR ALVIN PURWANA	75	58	72	65	40
27	6211540007001	NUR ARIFIYANI	88	91	88	73	87
28	6211540007002	NISAR	85	53	78	84	74
29	6211540007003	WD MELVY AGRINA JS	78	76	78	71	59
30	6211540007004	Felaunia D Latumakulita	75	75	70	65	52

Ketercapaian CPMK setiap mahasiswa

			CPMK 1	CPMK 3	CPMK 4	CPMK 6	CPMK 7	CPMK 8	CPMK 9
6211540000009	Yolan Setyo Utomo		79	74	83	79	83	79	79
6211540000012	Aprilia Ardiriani		81	83	72	78	74	79	78
6211540000016	Wikaning Tri Dadari		84	85	82	84	82	83	84
6211540000033	I Gusti Putu Surya Darma		60	51	56	57	60	59	55
6211540000043	Riska Devy Aprillyasari		91	91	95	92	94	92	93
6211540000050	Septia Wulandari		72	63	75	71	76	72	70
6211540000056	Ganis Ardhaning Saputri		71	70	55	65	59	66	64
6211540000071	DEWI DAMAYANTI		90	93	96	93	94	92	94
6211540000076	NABILA SAVINA		66	57	70	65	72	67	64
6211540000078	ARLANDIO NUR FAWZI		81	82	83	82	82	81	82
6211540000081	RIZAL ADITYA		78	82	71	76	71	76	76
6211540000082	MUHAMAD ADRYANTA		68	68	58	64	61	65	64
6211540000084	BAREP ADJI WIDHI PANGESTU		82	83	90	85	88	85	86
6211540000086	DEWI WAHYU SETYOWATI		64	63	39	55	46	57	53
6211540000091	DIAN RIZKY MAULINA		70	74	52	64	55	65	64
6211540000092	GUNAWAN TANJUM		74	73	67	71	69	72	71
6211540000095	YUSUF PUJI HERMANTO		71	70	63	68	65	69	67
6211540000098	MOCHAMMAD FARROS FATCHUR ROJI		59	54	48	54	53	56	53
6211540000105	DEWI MUSLIMATUL AZIZAH		76	79	69	74	70	74	74
6211540000107	TAUFIK AZMI		73	75	65	71	67	71	71
6211540000110	DWINDA INTAN RAMADHANI		78	79	66	73	68	74	73
6211540000113	DESINTYA RACHMA ANGGRAENI PUTRI		86	86	85	86	86	86	86





6211540000115	DEVITA PRIMA VERNANDA	74	74	62	69	65	70	69
6211540000117	DIMAS ACHMAD FADHILA	70	67	63	67	66	68	66
6211540000124	ARRAFI DWIARGATRA	52	46	38	45	43	48	44
6211540000131	MOHAMMAD HAIDAR ALVIN PURWANA	64	62	54	59	57	61	59
6211540007001	NUR ARIFIYANI	86	87	79	84	81	84	84
6211540007002	NISAR	74	67	79	75	80	75	74
6211540007003	WD MELVY AGRINA JS	74	74	66	71	67	71	70
6211540007004	Felaunia D Latumakulita	69	70	59	66	62	66	65

**B. CONTOH EVALUASI (ETS DAN EAS)**

*E. EXAMPLES OF EVALUATION (ETS AND EAS)*

**EVALUASI TENGAH SEMESTER – MIDTERM EXAM**  
**Prodi Sarjana STATISTIKA FMKSD ITS - SEMESTER GANJIL 2019/2020**  
*Undergraduate Program Department of Statistics FMKSD ITS-Odd Semester 2019/2020*

	Mata kuliah / Kelas : Survival Analysis/Kelas A, B	
	Hari , Tanggal : Wednesday, 16 <sup>th</sup> October 2019	
	Sifat / waktu : Closed book/120 Minutes	
	Dosen : Jerry D.T. Purnomo, M.Si., Ph.D, Santi W. Purnami, M.Si., Ph.D.	

ETS ini mengukur 3 dari 7 Capaian Pembelajaran yang harus dicapai dalam mata kuliah ini , yaitu :  
This MID TERM measures 3 of 7 Learning Outcomes to be achieved in this course, ie :

No	Capaian Pembelajaran Mata Kuliah (CPMK)- Course Expected Learning (C-ELO)	Soal Nomor
CPMK-1	Mampu menjelaskan konsep dan menerapkan teori analisis survival	3
CPMK-3	Mampu menganalisis data dengan metode survival yang tepat dan menginterpretasikannya	2
CPMK-4	Mampu mengidentifikasi, memformulasi dan menyelesaikan problem dibidang kesehatan/kedokteran dengan analisis survival	1
CPMK-8	Memiliki tanggung jawab dan etika profesi	1,2,3

1. Berikut adalah data tentang waktu sampai dengan meninggal pasien kanker payudara dengan respon *immunohistochemical* yang berbeda.

***Immunoperoxidase Negative:*** 19, 25, 30, 34, 37, 46, 47, 51, 56, 57, 61, 66, 67, 74, 78, 86, 122+, 123+, 130+, 130+, 133+, 134+, 136+, 141+, 143+, 148+, 151+, 152+, 153+, 154+, 156+, 162+, 164+, 165+, 182+, 189+,

***Immunoperoxidase Positive:*** 22, 23, 38, 42, 73, 77, 89, 115, 144+

Tentukan:

- a.  $\hat{S}(t)$  untuk grup ***Immunoperoxidase Negative*** (IN) dan ***Immunoperoxidase Positive*** (IP).

- b. Gunakan *approximate formula* untuk uji log-rank untuk menguji hipotesis:

$$H_0 : S_{IN}(t) = S_{IP}(t)$$

$$H_1 : S_{IN}(t) \neq S_{IP}(t)$$

Kesimpulan apa yang dapat anda ambil ( $C_{0,05;1}^2 = 3,84$ ).

2. Data pada soal no 1 di atas dimodelkan dengan model survival paramerik dengan pendekatan distribusi Weibull, eksponensial, dan log-logistic. Output R untuk masing-masing distribusi ini adalah sebagai berikut:

#### Weibull

```
Call:
survreg(formula = Surv(Time, Censored) ~ Immuno, data = breast,
  dist = "weibull")
      Value Std. Error      z      p
(Intercept)  6.329      0.539 11.74 <2e-16
Immuno      -0.980      0.370  -2.65 0.0081
Log(scale)  -0.203      0.179  -1.14 0.2563

Scale= 0.816

Weibull distribution
Loglik(model)= -145.8  Loglik(intercept only)= -148.9
      Chisq= 6.33 on 1 degrees of freedom, p= 0.012
Number of Newton-Raphson Iterations: 5
n= 45
```

Soal Sudah Sesuai CP	
Surabaya, .....	
Koord RMK: Statistika Lingkungan-Kesehatan (.....)	TTS/SGW
NIP.....	

Hal1dari2