

MODULE HANDBOOK

DATA STRUCTURE AND ALGORITHM



**STATISTICS UNDERGRADUATE PROGRAM
DEPARTMENT OF STATISTICS
FACULTY OF SCIENCE AND DATA ANALYTICS
INSTITUT TEKNOLOGI SEPULUH NOPEMBER
SURABAYA**

ENDORSEMENT PAGE



MODULE HANDBOOK DATA STRUCTURE AND ALGORITHM STATISTICS UNDERGRADUATE PROGRAM 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>	Tanda tangan <i>Signature</i>	
Perumus <i>Preparation</i>	Adatul Mukarromah, S.Si, M.Si	Dosen Lecturer		
Pemeriksa dan Pengendalian <i>Review and Control</i>	Adatul Mukarromah, S.Si, M.Si; Dr. Kartika Fithriasari, M.Si; T. Dwi Ary Widhianingsih, Ph.D	Tim kurikulum Curriculum team		
Persetujuan <i>Approval</i>	Prof. Nur Iriawan, M.Ikom, Ph.D	Koordinator RMK Course Cluster Coordinator		
Penetapan <i>Determination</i>	Dr. Kartika Fithriasari, M.Si	Kepala Departemen Head of Department		

MODULE HANDBOOK

DATA STRUCTURE AND ALGORITHM

Module name	DATA STRUCTURE AND ALGORITHM	
Module level	Undergraduate	
Code	SS234628	
Course (if applicable)	DATA STRUCTURE AND ALGORITHM	
Semester	6	
Person responsible for the module	Adatul Mukarromah, S.Si, M.Si	
Lecturer	Adatul Mukarromah, S.Si, M.Si; Dr. Kartika Fithriasari, M.Si; T. Dwi Ary Widhianingsih, Ph.D	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program, mandatory, 6th semester.	
Type of teaching, contact hours	Lectures, <50 students	
Workload	1. Lectures [L] : 2 x 50 = 100 minutes per week. 2. Practicum [P] : 2x45=90 minutes per week. 3. Exercises and Assignments [EA] : 2 x 60 = 120 minutes (2 hours) per week. 4. Independent learning [IL]: 2 x 60 = 120 minutes (2 hours) per week	
Credit points	3 credit points (SKS) Equivalent to 4.8 ECTS	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	-	
Learning outcomes and their corresponding PLOs	CLO-1 Able to understand the concept of data structure for statistical analysis purposes CLO-2 Able to analyze an algorithm. CLO-3 Understand and apply the concept of data structure theory CLO-4 Able to use computational techniques and modern computer equipment to apply structural concepts data and algorithms	PLO-6 PLO-7 PLO-8
Content	The data structure course discusses the dynamic arrangement of data. The basic knowledge that students must have is programming knowledge. This course is useful for compiling simulation result data. Stack material provides an overview of data processing if the arrangement of data is stacked, pointer, queue and list material provide an overview of data processing sequentially. Material Tree, sort graph and search are useful for sorting data.	

Assessment and its weight	Cognitive - Assignment & Test 1(15%) Cognitive - Midterm Exam (35%) Assignment 2 (Project) (15%) Project-Final Exam (35%)
Media employed	LCD, whiteboard, websites (myITS Classroom), zoom
Reading list	<ol style="list-style-type: none"> 1. Hastie, T., Tibshirani, R., and Friedman, J., 2017, <i>The Elements of Statistical Learning: Data Mining, Inference, and Prediction</i>, Second Edition, Springer New York 2. Data Structures and Algorithms with Python, 2015, Kent D. Lee, Steve Hubbard, ISSN 1863-7310 DOI 10.1007/978-3-319-13072-9 3. Data Structures and Algorithms in Python, 2013, Goodrich, Tamassia, and Goldwasser. ISBN: 978-1-118-29027-9 4. Data Structures and Algorithms in C++ (4rd edition), 2013, A. Drozdek, ISBN-13: 978-1-133-60842-4 & ISBN-10: 1-133-60842-6 5. Data Structures and Algorithm Analysis in C++ (3rd edition), 2007, M. A. Weiss. Addison-Wesley, ISBN-10: 032144146X & ISBN-13: 9780321441461 6. Data Structures and Algorithm Analysis in C++, Third Edition, 2012, Clifford A. Shaffer, ISBN: 048648582X,9780486485829



INSTITUT TEKNOLOGI SEPULUH NOPEMBER
FAKULTAS SAINS DAN ANALITIKA DATA
PROGRAM STUDI SARJANA STATISTIKA
DEPARTEMEN STATISTIKA

Kode Dokumen

RENCANA PEMBELAJARAN SEMESTER/
SEMESTER LEARNING PLAN

MATA KULIAH (MK)/ <i>Course</i>	KODE/ <i>Code</i>	Rumpun MK/ <i>Course Group</i>	BOBOT (sks)/ <i>Weight (credit)</i>		SEMESTER/ <i>Semester</i>	Tgl Penyusunan/ <i>Drafting Date</i>
STRUKTUR DATA DAN ALGORITMA/ <i>DATA STRUCTURE AND ALGORITHM</i>	SS234628	SKSD	T=2	P=1	VI	16 Januari 2023
OTORISASI/ <i>AUTHORIZATION</i>	Pengembang RPS/ <i>RPS Developer</i>	Koordinator RMK/ <i>Course Group Coordinator</i>		Ketua PRODI/ <i>Head of Department</i>		
	Adatul Mukaromah, S.Si, M.Si. Dr. Kartika Fithriasari, M.Si. Widhianingsih Tintrim Dwi Ary, S.Si., M.Stat., Ph.D.	Prof. Nur Iriawan, M.Ikom, Ph.D		Dr. Kartika Fithriasari, M.Si		
Capaian Pembelajaran (CP)/ <i>Learning Achievement</i>	CPL-PRODI yang dibebankan pada MK/ <i>PLO</i>					
	CPL-6	Mampu merancang, mengumpulkan, dan melakukan manajemen data dengan metodologi yang tepat				
	CPL-7	Mampu menggunakan teknik komputasi untuk menyelesaikan permasalahan statistik				
	CPL-8	Mampu menggunakan perangkat komputasi modern untuk menyelesaikan permasalahan statistik				
	<i>PLO-6</i>	<i>Able to design, collect, and perform data management with the right methodology</i>				
	<i>PLO-7</i>	<i>Able to use modern computing devices to solve statistical problems</i>				
	<i>PLO-8</i>	<i>Able to use computational techniques to solve statistical problems</i>				
	Capaian Pembelajaran Mata Kuliah (CPMK)/ <i>CLO</i>					

	<p>CPMK-1 Mampu memahami konsep struktur data untuk keperluan analisis statistik CPMK-2 Mampu menganalisis suatu algoritma CPMK-3 Memahami dan menerapkan konsep teori struktur data CPMK-4 Mampu menggunakan teknik komputasi dan perangkat komputer modern untuk mengaplikasikan konsep struktur data dan algoritma</p> <p><i>CLO-1 Able to understand the concept of data structure for statistical analysis purposes</i> <i>CLO-2 Able to analyze an algorithm.</i> <i>CLO-3 Understand and apply the concept of data structure theory</i> <i>CLO-4 Able to use computational techniques and modern computer equipment to apply structural concepts data and algorithms</i></p>																				
	<p>Matrik CPL – CPMK <i>PLO-CLO Matrix</i></p> <table border="1" data-bbox="591 627 1704 836"> <thead> <tr> <th>CPMK</th> <th>CPL-6</th> <th>CPL-7</th> <th>CPL-8</th> </tr> </thead> <tbody> <tr> <td>CPMK-1</td> <td>V</td> <td></td> <td></td> </tr> <tr> <td>CPMK-2</td> <td></td> <td>V</td> <td></td> </tr> <tr> <td>CPMK-3</td> <td></td> <td>V</td> <td>V</td> </tr> <tr> <td>CPMK-4</td> <td></td> <td>V</td> <td>V</td> </tr> </tbody> </table>	CPMK	CPL-6	CPL-7	CPL-8	CPMK-1	V			CPMK-2		V		CPMK-3		V	V	CPMK-4		V	V
CPMK	CPL-6	CPL-7	CPL-8																		
CPMK-1	V																				
CPMK-2		V																			
CPMK-3		V	V																		
CPMK-4		V	V																		
<p>Deskripsi Singkat MK/ Course Description</p>	<p>Mata kuliah struktur data membahas tentang penyusunan data yang bersifat dinamis. Pengetahuan dasar yang harus dimiliki oleh mahasiswa adalah pengetahuan pemrograman. Mata kuliah ini berguna untuk penyusunan data hasil simulasi. Materi stack memberikan gambaran pemrosesan data jika penyusunan data secara bertumpuk, materi pointer, queue dan list memberikan gambaran tentang pemrosesan data secara berurutan. Materi Tree, sort graph dan search berguna untuk pengurutan data.</p> <p><i>The data structure course discusses the dynamic arrangement of data. The basic knowledge that students must have is programming knowledge. This course is useful for compiling simulation result data. Stack material provides an overview of data processing if the arrangement of data is stacked, pointer, queue and list material provide an overview of data processing sequentially. Material Tree, sort graph and search are useful for sorting data.</i></p>																				
<p>Bahan Kajian: Materi Pembelajaran/ Course Material</p>	<p>Manajemen Data, Teknik Komputasi, Pemrosesan Data <i>Data Management, Computational Techniques, Data Processing</i></p>																				

Pustaka/ References	Utama/Primary:		7. Data Structures and Algorithms with Python, 2015, Kent D. Lee, Steve Hubbard, ISSN 1863-7310 DOI 10.1007/978-3-319-13072-9 8. Data Structures and Algorithms in Python, 2013, Goodrich, Tamassia, and Goldwasser. ISBN: 978-1-118-29027-9 9. Data Structures and Algorithms in C++ (4rd edition), 2013, A. Drozdek, ISBN-13: 978-1-133-60842-4 & ISBN-10: 1-133-60842-6 10. Data Structures and Algorithm Analysis in C++ (3rd edition), 2007, M. A. Weiss. Addison-Wesley, ISBN-10: 032144146X & ISBN-13: 9780321441461				
	Pendukung/Secondary:		11. Data Structures and Algorithm Analysis in C++, Third Edition, 2012, Clifford A. Shaffer, ISBN: 048648582X,9780486485829				
Dosen Pengampu/ Lecturers	Adatul Mukarromah, S.Si, M.Si; Dr. Kartika Fithriasari, M.Si; Widhianingsih Tintrim Dwi Ary, S.Si., M.Stat., Ph.D.						
Matakuliah syarat/ Pre-requisite Course	-						
Mg Ke- Week	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) Final capability for each learning step	Penilaian Evaluation		Bantuk Pembelajaran, Metode Pembelajaran, Penugasan Mahasiswa, [Estimasi Waktu] Learning Format Learning Methods Assignment for Student [Estimated Time]		Materi Pembelajaran [Pustaka] Learning Material [References]	Bobot Penilaian (%) Evaluation Weight (%)
		Indikator Indicator	Kriteria & Bentuk Criteria and Format	Luring Offline	Daring Online		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	1. Mampu memahami konsep Struktur Data untuk keperluan analisis	1.1 Dapat menjelaskan dan memahami struktur Data 1.2 Dapat mengidentifikasi	Non tes (observasi aktivitas di kelas) Non test (Observation, In	Kuliah dan praktikum Case Methods Lectures and		Pengenalan Struktur Data Introduction to Data Structure	5%

	<p>statistik</p> <p>1. <i>Understanding the concept of Data Structure for statistical analysis purposes</i></p>	<p>metode struktur data yang sesuai dengan permasalahan n</p> <p>1.1 <i>Can explain and understand the data structure in the information system</i></p> <p>1.2 <i>Can identify data structure methods that correspond to the problem</i></p>	<i>class activity)</i>	<p><i>Practices Case Methods</i></p> <p>TM: 1x[2x50"] P: 1x[1x170"] BM: 1x[2x60"] PT: 1x[2x60"]</p>			
2	<p>2. Mampu menganalisis suatu algoritma</p> <p>2. <i>Able to analyze certain algorithm.</i></p>	<p>2.1 Dapat menganalisis kompleksitas waktu suatu algoritma (<i>time complexity</i>)</p> <p>2.2 Dapat menganalisis kompleksitas ruang suatu algoritma (<i>space complexity</i>)</p> <p>2.3 Dapat melakukan notasi asimtotik suatu algoritma (<i>asymptotic notation</i>)</p> <p>2.1 <i>Able to analyze the time complexity of an algorithm (time complexity)</i></p> <p>2.2 <i>Able to analyze the space complexity of an algorithm (space complexity)</i></p> <p>2.3 <i>Able to perform asymptotic notation of an algorithm (asymptotic notation)</i></p>	<p>Tes – non tes (observasi aktivitas di kelas)</p> <p><i>Test-Non test (Observation, In class activity)</i></p>	<p>Kuliah dan praktikum Case Methods</p> <p><i>Lectures and Practices Case Methods</i></p> <p>TM: 1x[2x50"] P: 1x[1x170"] BM: 1x[2x60"] PT: 1x[2x60"]</p>		<p>Analisis Algoritma</p> <p><i>Algorithm Analysis</i></p>	10%
3-4	<p>3. Mampu memahami dan menerapkan ARRAY dan RECORD dalam struktur data</p> <p>3. <i>Able to understand</i></p>	<p>3.1 Dapat menjelaskan dan menerapkan ARRAY dan RECORD</p> <p>3.2 Dapat menyusun algoritma dan program</p>	<p>Tes – non tes (Observasi Aktifitas di kelas)</p> <p><i>Test-Non test (Observation, In</i></p>	<p>Kuliah dan praktikum Case Methods</p> <p><i>Lectures and Practices Case</i></p>		<p>ARRAY dan RECORD</p> <p><i>ARRAY AND RECORD</i></p>	10%

	<i>and apply ARRAY and RECORD in data structure</i>	dengan menggunakan ARRAY dan RECORD 3.1 <i>Able to explain and implement ARRAY and RECORD</i> 3.2 <i>Able to compile algorithms and programs using ARRAY and RECORD</i>	<i>class activity)</i>	<i>Methods</i> TM: 2x[2x50"] P: 2x[1x170"] BM: 2x[2x60"] PT: 2x[2x60"]			
5	4. Mampu memahami dan menerapkan POINTER dalam struktur data 4. <i>Able to understand and apply POINTER on data structure</i>	4.1 Dapat menjelaskan dan menerapkan POINTER 4.2 Dapat menyusun algoritma dan program dengan menggunakan POINTER 4.1 <i>Able to explain and apply POINTER</i> 4.2 <i>Able to compile algorithms and programs using POINTER</i>	Tes – non tes (Observasi Aktifitas di kelas) <i>Test-Non test (Observation, In class activity)</i>	Kuliah dan praktikum Case Methods <i>Lectures and Practices Case Methods</i> TM: 1x[2x50"] P: 1x[1x170"] BM: 1x[2x60"] PT: 1x[2x60"]		POINTER <i>POINTER</i>	5%
6-7	5. Mampu memahami dan menerapkan LINKED LIST dalam struktur data 5. <i>Able to understand and apply LINKED LIST in data structure</i>	5.1 Dapat menjelaskan dan menerapkan LINKED LIST 5.2 Dapat menyusun algoritma dan program dengan menggunakan LINKED LIST 5.1 <i>Able to explain and implement LINKED LIST</i> 5.2 <i>Able to develop algorithms and programs using LINKED LIST</i>	Tes – non tes (Observasi Aktifitas di kelas) <i>Test-Non test (Observation, In class activity)</i>	Kuliah dan praktikum Case Methods <i>Lectures and Practices Case Methods</i> TM: 2x[2x50"] P: 2x[1x170"] BM: 2x[2x60"] PT: 2x[2x60"]		LINKED LIST <i>LINKED LIST</i>	10%
8	ETS/Midterm						
9	6. Mampu memahami dan menerapkan STACK dalam struktur data	6.1 Dapat menjelaskan dan menerapkan konsep STACK 6.2 Dapat menyusun	Tes – non tes (Observasi Aktifitas di kelas) <i>Test-Non test</i>	Kuliah dan praktikum Case Methods <i>Lectures and</i>		STACK <i>STACK</i>	10%

	6. <i>Able to understand and apply STACK in data structure</i>	<p>algoritma dan program dengan menggunakan konsep STACK permasalahan real</p> <p>6.1 <i>Able to explain and apply the STACK concept</i></p> <p>6.2 <i>Able to compile algorithms and programs using the STACK concept of real problems</i></p>	<i>(Observation, In class activity)</i>	<p><i>Practices Case Methods</i></p> <p>TM: 1x[2x50"] P: 1x[1x170"] BM: 1x[2x60"] PT: 1x[2x60"]</p>			
10	<p>7. Mampu memahami dan menerapkan QUEUE dalam struktur data</p> <p>7. <i>Able to understand and apply QUEUE in data structure</i></p>	<p>7.1 Dapat menjelaskan dan menerapkan konsep QUEUE</p> <p>7.2 Dapat menyusun algoritma dan program dengan menggunakan konsep QUEUE</p> <p>7.1 <i>Able to explain and apply QUEUE</i></p> <p>7.2 <i>Able to compile algorithms and programs using QUEUE</i></p>	<p>Tes – non tes (Observasi Aktifitas di kelas)</p> <p><i>Test-Non test (Observation, In class activity)</i></p>	<p>Kuliah dan praktikum Case Methods <i>Lectures and Practices Case Methods</i></p> <p>TM: 1x[2x50"] P: 1x[1x170"] BM: 1x[2x60"] PT: 1x[2x60"]</p>		<p>QUEUE</p> <p><i>QUEUE</i></p>	10%
11	<p>8. Mampu memahami dan menerapkan SORT dan SEARCH dalam struktur data</p> <p>8. <i>Able to understand and apply SORT and SEARCH in data structure</i></p>	<p>1.1 Dapat menjelaskan dan menerapkan konsep SORT dan SEARCH</p> <p>1.2 Dapat menyusun algoritma dan program dengan menggunakan konsep SORT dan SEARCH</p> <p>8.1 <i>Can explain and apply the concept of SORT and SEARCH</i></p> <p>8.2 <i>Be able to compile algorithms and programs using the SORT and SEARCH</i></p>	<p>Tes – non tes (Observasi Aktifitas di kelas)</p> <p><i>Test-Non test (Observation, In class activity)</i></p>	<p>Kuliah dan praktikum Case Methods <i>Lectures and Practices Case Methods</i></p> <p>TM: 1x[2x50"] P: 1x[1x170"] BM: 1x[2x60"] PT: 1x[2x60"]</p>		<p>SORT dan SEARCH</p> <p><i>SQRT AND SEARCH</i></p>	10%

		<i>concepts</i>					
12-13	9. Mampu memahami dan menerapkan algoritma rekursif dalam struktur data <i>9. Able to understand and apply recursive algorithm in data structure</i>	9.1 Dapat menjelaskan dan menerapkan algoritma rekursif 9.2 Dapat menyusun algoritma dan program dengan menggunakan algoritma rekursif <i>9.1 Can explain and implement recursive algorithms</i> <i>9.2 Able to compile algorithms and programs using recursive algorithms</i>	Tes – non tes (Observasi Aktifitas di kelas) <i>Test-Non test (Observation, In class activity)</i>	Kuliah dan praktikum Case Methods <i>Lectures and Practices Case Methods</i> TM: 2x[2x50"] P: 2x[1x170"] BM: 2x[2x60"] PT: 2x[2x60"]		Rekursif <i>Recursive</i>	15%
14-15	10. Mampu memahami dan menerapkan TREE dalam struktur data <i>10. Able to understand and apply TREE in data structure</i>	10.1 Dapat menjelaskan dan menerapkan konsep TREE 10.2 Dapat menyusun algoritma dan program dengan menggunakan konsep TREE <i>10.1 Can explain and apply the concept of TREE</i> <i>10.2 Able to compile algorithms and programs using the TREE concept</i>	Tes – non tes (Observasi Aktifitas di kelas) <i>Test-Non test (Observation, In class activity)</i>	Kuliah dan praktikum Case Methods <i>Lectures and Practices Case Methods</i> TM: 2x[2x50"] P: 2x[1x170"] BM: 2x[2x60"] PT: 2x[2x60"]		TREE <i>TREE</i>	15%
16	Evaluasi Akhir Semester / Ujian Akhir Semester/ <i>Final Exam</i>						

