SEMESTER COURSE PLAN

INTRODUCTION TO PROGRAMMING COURSES
(23H06110202)

TEACHING TEAM

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STUDI PROGRAM OF GEOPHYSICS - S1
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
HASANUDDIN UNIVERSITY
MAKASSAR
2025

STUDY PROGRAM OF GEOFISIKA - S1
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
HASANUDDIN UNIVERSITY

Vision

Become a program Reliable studies in the field of geophysics to produce superior graduates and mastering science, technology, arts and culture based on BMI in 2030.

Vision Strategy

Misson

Based on the Vision above, the Geophysics Study Program has a mission:

1. Improving the quality of education to produce graduates who are competitive, able to work independently and in groups in implementing and developing BMI science and technology;

2. Carrying out research to produce reliable and competitive scientific work oriented towards the scientific development of solid geophysics, marine geophysics, geoinformatics and hydro-meteorology;

3. Disseminate the results of applied research, action studies and appropriate technology packages in synergistic and accelerated productive activities to improve the quality of life of the community.

Graduate Profiles

Educators in the Field of Geophysics; meteorologist; geomaths; oceanographer; exploration geophysicist; seismologist ; geophysical entrepreneur.

PLO charged to courses

CPL-5 (P2) - Mastering Geophysical concepts and principles in applying applied mathematics in the field of Geophysics

CPL-9 (KU2) - Able to demonstrate independent, quality and measurable performance in maintaining professional collaboration with supervisors and colleagues at national and international levels, as well as completing tasks responsibly using relevant modern geophysical tools

Course Learning Outcomes (CLO)

CPMK-1: Able to implement simple programs using Python, Jupyter Lab and Google Colab and GIT (CPL5)

CPMK-2: Able to apply Python for scientific programming (CPL9)

Sub-CLO

Sub CPMK-1: Able to complete Python, Editor and Virtual Environment installation (CPMK-1)

Sub CPMK-2: Able to apply Python programs using Jupyter Lab and Google Colab (CPMK-1)

Sub CPMK-3: Able to manage Python program source code using GITHUB (CPMK-1)

Sub CPMK-4: Able to apply Python programs for simple mathematical programming (CPMK-1)

Sub CPMK-5: Demonstrated a simple math program using Jupyter Lab or Google Colab and hosted it on GITHUB (CPMK-1)

Sub CPMK-6: Applying Python programs for scientific calculations (CPMK-2)

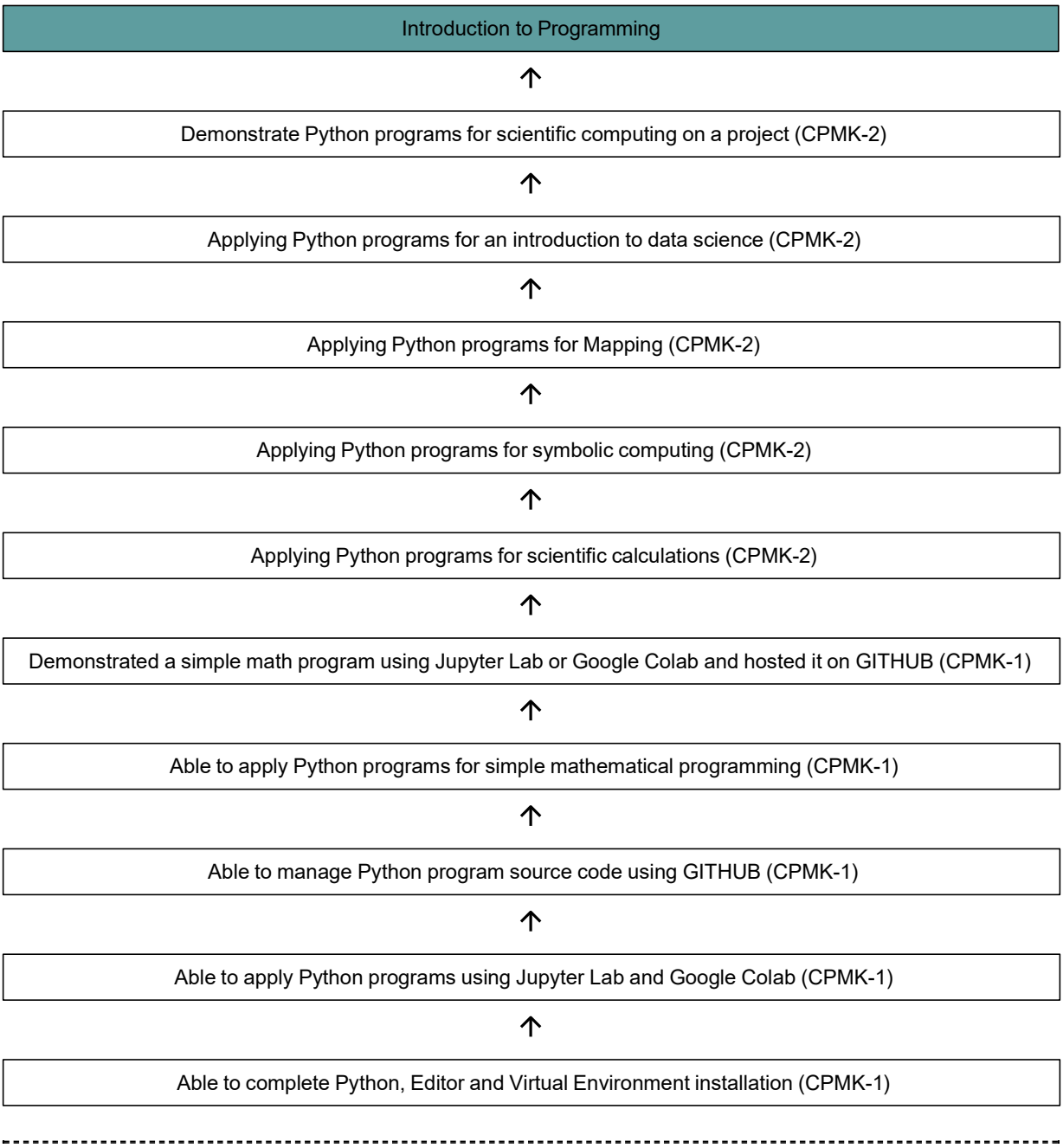
Sub CPMK-7: Applying Python programs for symbolic computing (CPMK-2)

Sub CPMK-8: Applying Python programs for Mapping (CPMK-2)

Sub CPMK-9: Applying Python programs for an introduction to data science (CPMK-2)

Sub CPMK-10: Demonstrate Python programs for scientific computing on a project (CPMK-2)

Learning Analytics



HASANUDDIN UNIVERSITY
FAKULTY OF MATHEMATICS AND NATURAL SCIENCES
STUDY PROGRAM OF GEOPHYSICS - S1
SEMESTER LEARNING PLAN

Course	Code	Cource Group	Credits	SEMESTER	Compilation Date
Introduction to Programming	23H06110202		2	2	1 Juli 2025

AUTHORITY	SLP Developer Lecturer	Coordinator	Head of Study Program
	Dr. Muhammad Alimuddin, Eng., Dr. Muhammad Taufiq Rafi	Dr. Muhammad Alimuddin, Eng.	Dr. Muhammad Alimuddin, Eng.

Learning Outcomes Course	**SLOs that are imposed on the course**	
	SLO-5:	Menguasai konsep Geofisika dan prinsip dalam mengaplikasikan matematika terapan dalam bidang Geofisika
	SLO-9:	Mampu menunjukkan kinerja yang mandiri, berkualitas, dan terukur dalam menjaga kolaborasi profesional dengan pembimbing dan rekan kerja di tingkat nasional maupun internasional, serta menyelesaikan tugas secara bertanggung jawab dengan menggunakan perangkat geofisika modern yang relevan
	SLO ⇒ Course Learning Outcomes	
	After completing this course, it is expected:	
	SLO-5	**CLO-1:** Able to implement simple programs using Python, Jupyter Lab and Google Colab and GIT
	SLO-9	**CLO-2:** Able to apply Python for scientific programming
	CLO ⇒ Sub-CLO	
	CLO-1	**Sub-CLO-1:**Able to complete Python, Editor and Virtual Environment installation
		Sub-CLO-2: Able to apply Python programs using Jupyter Lab and Google Colab
		Sub-CLO-3: Able to manage Python program source code using GITHUB
		Sub-CLO-4: Able to apply Python programs for simple mathematical programming
		Sub-CLO-5: Demonstrated a simple math program using Jupyter Lab or Google Colab and hosted it on GITHUB
	CLO-2	**Sub-CLO-6:**Applying Python programs for scientific calculations
		Sub-CLO-7: Applying Python programs for symbolic computing
		Sub-CLO-8: Applying Python programs for Mapping
		Sub-CLO-9: Applying Python programs for an introduction to data science

	Sub-CLO-10: Demonstrate Python programs for scientific computing on a project

Correlation between SLOs/CLOs to Sub-CLOs

SLOs that are charged on the Course	CPMK	SUB CPMK	Form of Assessment*			Weight	Value	Student Score
			Formative	Sumative				
				Project/Case Study	Task			
SLO-5	CLO-1	SUB-CLO-1	Participation (Forum and/or Learning Flow)	2	0	2		
SLO-5	CLO-1	SUB-CLO-2	Participation (Forum and/or Learning Flow)	4	0	4		
SLO-5	CLO-1	SUB-CLO-3	Participation (Forum and/or Learning Flow)	2	0	2		
SLO-5	CLO-1	SUB-CLO-4	Participation (Forum and/or Learning Flow)	0	8	8		
SLO-5	CLO-1	SUB-CLO-5	Presentations and Reports	28	0	28		
SLO-9	CLO-2	SUB-CLO-6	Participation (Forum and/or Learning Flow) Written test	14	0	14		
SLO-9	CLO-2	SUB-CLO-7	Participation (Forum and/or Learning Flow)	2	0	2		
SLO-9	CLO-2	SUB-CLO-8	Participation (Forum and/or Learning Flow) Quiz (Formative Test)	0	8	8		
SLO-9	CLO-2	SUB-CLO-9	Participation (Forum and/or Learning Flow)	4	0	4		
SLO-9	CLO-2	SUB-CLO-10	Presentations and Reports	28	0	28		
				84	16	100		

Course Description	This Introduction to Programming course discusses the basics of programming using Python for scientific computing with a load of 2 credits. This course implements the Python programming language in creating various basic programs that will be useful for geophysical phenomena including: scientific calculations, symbolic computing, mapping and data science. Presented for second semester students in the Geophysics Undergraduate Study Program. The person in charge of the course is the manager of the Introduction to Programming course. Learning methods are Small Group Discussion and Project-Based Study
Learning Materials/Subjects	1. Installing Python, Editor and Virtual Environment 2. Jupyter Lab and Google Colab 3. GIT 4. Scientific Computing (Python) 5. Data Science (Python)
	Main References

Reference	1. Fuhrer, C., Solem, J.E. and Verdier, O. 2021. Scientific Computing with Python 3: An example-rich, comprehensive guide for all of your Python computational needs. Packt Publishing Ltd. 2. Hill, C. 2020. Learning scientific programming with python 2nd edition. Cambridge University Press. 3. Lynch, S. 2023. Python for Scientific Computing and Artificial Intelligence. CRC Press.
	Additional References
	1. Pajankar, A. 2021. Data visualization with NumPy and Matplotlib. In Practical Python Data Visualization (pp. 57-79). Apress, Berkeley, CA. 2. Madrinovella, I., Herawati, I., and Abdullah, A. 2020. Textbook of Geophysical Computational Methods Using Python. Pertamina University 3. Practical Guide to Introduction to Programming
Teaching Team	Dr. Muhammad Alimuddin, Eng., Dr. Muhammad Taufiq Rafi
Course requirement	

Week	**Sub CPMK (End-of-stage learning ability)**	**Penilaian (*Assesment*)**		**Learning Forms and Methods [time estimate]**		**Content**	**Weight of Assessment (%)**
		Indicator	**Techniques & Criteria**	**Offline**	**Online**		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Able to complete Python, Editor and Virtual Environment installation (CPMK-1)	**Formative:** Skilled in Python installation, Virtual Studio Code (VSC) and Virtual Environment (Anaconda/Miniconda) **Sumative:** -	**Formative Criteria:** Participation (Forum and/or Learning Flow) dinilai dengan rubrik 1 **Sumative Criteria:** Project/Case Study (2) dinilai dengan rubrik 1 **Assessment Technique:** Non Test	**Studying:** Project-Based Learning (Project-based Learning) 50 minutes **Other Forms:** Self-Directed Learning Reading Python Introductory Material on Sikola in Week 1 Learning Flow 60 minutes		1. Tuition Contract 2. Course study materials 3. Python Introduction	2

2-3	Able to apply Python programs using Jupyter Lab and Google Colab (CPMK-1)	**Formative:** Skilled in using Jupyter Lab and Google Colab for implementing Python programs **Sumative:** -	**Formative Criteria:** Participation (Forum and/or Learning Flow) dinilai dengan rubrik 1 **Sumative Criteria:** Project/Case Study (4) dinilai dengan rubrik 1 **Assessment Technique:** Non Test	**Studying:** Project-Based Learning (Project-based Learning) 100 minutes **Other Forms:** Self-Directed Learning Reading Jupyter Lab and Google Colab material on Sikola in the 2nd to 3rd Week Learning Flow 120 minutes **Other Forms:** Project-Based Learning (Project-based Learning) Working in groups on a given project related to the use of Jupyter Lab and Google Colab 120 minutes		Jupyter Lab and Google Colab	4
4	Able to manage Python program source code using GITHUB (CPMK-1)	**Formative:** Skilled in managing Python programs on GITHUB **Sumative:** -	**Formative Criteria:** Participation (Forum and/or Learning Flow) dinilai dengan rubrik 1 **Sumative Criteria:** Project/Case Study (2) dinilai dengan rubrik 1 **Assessment Technique:** Non Test	**Studying:** Project-Based Learning (Project-based Learning) Reading GIT Material in Sikola in Week 4 Learning Flow 60 minutes **Studying:** Project-Based Learning (Project-based Learning) 50 minutes		GIT	2

5-6	Able to apply Python programs for simple mathematical programming (CPMK-1)	**Formative:** Skilled in using NumPy and Matplotlib for programming **Sumative:** -	**Formative Criteria:** Participation (Forum and/or Learning Flow) dinilai dengan rubrik 1 **Sumative Criteria:** Task (8) dinilai dengan rubrik 1 **Assessment Technique:** Test and Non-Test	**Studying:** Project-Based Learning (Project-based Learning) 100 minutes **Other Forms:** Self-Directed Learning Reading Python for Mathematics material at Sikola in the 5th to 6th Week Learning Flow 120 minutes **Other Forms:** Project-Based Learning (Project-based Learning) Working in groups on a given project related to Principal Component Analysis 120 minutes **Practicum, Studio Practice, Workshop Practice, Field Practice:** Project-Based Learning (Project-based Learning) Doing Practicum using the NumPy and Matplotlib libraries 170 minutes		Python for Mathematics	8

7-8	Demonstrated a simple math program using Jupyter Lab or Google Colab and hosted it on GITHUB (CPMK-1)	**Formative:** Skilled in Basic Python Programming on a Specific Project or Problem **Sumative:** -	**Formative Criteria:** Presentation dinilai dengan rubrik 3 Report dinilai dengan rubrik 2 **Sumative Criteria:** Project/Case Study (28) dinilai dengan rubrik 2 **Assessment Technique:** Non Test	**Seminar:** Group discussion (Small Group Discussion) 200 minutes **Other Forms:** Self-Directed Learning - Read the entire material in Sikola in the Learning Flow Weeks 1 to 6 - Proofread feedback on presentations and reports 120 minutes		-Introduction to Python -Jupyter Lab and Google -GIT -Pyton for Mathematics	28

9-10	Applying Python programs for scientific calculations (CPMK-2)	**Formative:** Skilled in using Python for statistical problems and basic numerical methods **Sumative:** -	**Formative Criteria:** Participation (Forum and/or Learning Flow) Written test dinilai dengan rubrik 1 **Sumative Criteria:** Project/Case Study (14) dinilai dengan rubrik 1 **Assessment Technique:** Test and Non-Test	**Studying:** Project-Based Learning (Project-based Learning) 100 minutes **Other Forms:** Self-Directed Learning 120 minutes **Other Forms:** Project-Based Learning (Project-based Learning) Working in groups on a given project related to Python for Scientific Computing 120 minutes **Practicum, Studio Practice, Workshop Practice, Field Practice:** Project-Based Learning (Project-based Learning) Conducting Practicum using the NumPy and Matplotlib Scientific Computing libraries 170 minutes		- Python for Scientific Computing	14

11	Applying Python programs for symbolic computing (CPMK-2)	**Formative:** Skilled in using the SymPy library for simple mathematical calculations **Sumative:** -	**Formative Criteria:** Participation (Forum and/or Learning Flow) dinilai dengan rubrik 1 **Sumative Criteria:** Project/Case Study (2) dinilai dengan rubrik 2 **Assessment Technique:** Non Test	**Studying:** Project-Based Learning (Project-based Learning) 50 minutes **Other Forms:** Self-Directed Learning 60 minutes **Other Forms:** Project-Based Learning (Project-based Learning) Doing Practicum using the SymPy and NumPy/Matplotlib libraries 170 minutes		Symbolic computing	2

12-13	Applying Python programs for Mapping (CPMK-2)	**Formative:** Skilled in using the Cartopy and/or PyGMT libraries for the Plotting/Mapping process **Sumative:** -	**Formative Criteria:** Participation (Forum and/or Learning Flow) Quiz (Formative Test) dinilai dengan rubrik 1 **Sumative Criteria:** Task (8) dinilai dengan rubrik 1 **Assessment Technique:** Test and Non-Test	**Studying:** Project-Based Learning (Project-based Learning) 120 minutes **Other Forms:** Project-Based Learning (Project-based Learning) 120 minutes **Other Forms:** Project-Based Learning (Project-based Learning) Working in groups on a given project related to Python for Mapping 120 minutes **Practicum, Studio Practice, Workshop Practice, Field Practice:** Project-Based Learning (Project-based Learning) Doing Practicum using the Cartopy and PyGMT libraries for Mapping 170 minutes		Python for Mapping	8

14	Applying Python programs for an introduction to data science (CPMK-2)	**Formative:** Skilled in using Pandas and Linear programming libraries **Sumative:** -	**Formative Criteria:** Participation (Forum and/or Learning Flow) dinilai dengan rubrik 2 **Sumative Criteria:** Project/Case Study (4) dinilai dengan rubrik 1 **Assessment Technique:** Test and Non-Test	**Studying:** Project-Based Learning (Project-based Learning) 50 minutes **Other Forms:** Self-Directed Learning Reading Python for data science material at Sikola in Week 14 Learning Flow 60 minutes **Practicum, Studio Practice, Workshop Practice, Field Practice:** Project-Based Learning (Project-based Learning) Doing Practicum using the Pandas library 170 minutes		Gagal diterjemahkan	4

15-16	Demonstrate Python programs for scientific computing on a project (CPMK-2)	**Formative:** Skilled in using Python and supporting libraries (NumPy, Matplotlib, SymPy, Cartopy/PyGMT & Pandas) in solving a particular project or problem **Sumative:** -	**Formative Criteria:** Presentation dinilai dengan rubrik 3 Report dinilai dengan rubrik 2 **Sumative Criteria:** Project/Case Study (28) dinilai dengan rubrik 1 **Assessment Technique:** Test and Non-Test	**Seminar:** Group discussion (Small Group Discussion) 200 minutes **Other Forms:** Other methods - Read the entire material in Sikola in the Learning Flow Weeks 9 to 14 - Proofread feedback on presentations and reports 120 minutes		- Python for Scientific Computing - Symbolic computing - Python for Mapping - Python for data science	28
							100

Matrix of SLO, CLO, and Assessment Method

SLO / CLO	CLO-1	CLO-2
CPL-5 (P2)	Project/Case Study (Weight 2%) Project/Case Study (Weight 4%) Project/Case Study (Weight 2%) Task (Weight 8%) Project/Case Study (Weight 28%)	
CPL-9 (KU2)		Project/Case Study (Weight 14%) Project/Case Study (Weight 2%) Task (Weight 8%) Project/Case Study (Weight 4%) Project/Case Study (Weight 28%)

Evaluation Type and Assessment Weight

Type	Assessment Weight
Project/Case Study	84
Task	16
Total	100

Assessment and Evaluation of Student Achievement of CLOs

SLOs that are charged on the Course	CLO	SUB CLO	Form of Assessment*			Weight	Value	Student Score
			Formative	Sumative				
				Project/Case Study	Task			
SLO-5	CLO-1	SUB-CLO-1	Participation (Forum and/or Learning Flow)	2	0	2		
SLO-5	CLO-1	SUB-CLO-2	Participation (Forum and/or Learning Flow)	4	0	4		
SLO-5	CLO-1	SUB-CLO-3	Participation (Forum and/or Learning Flow)	2	0	2		
SLO-5	CLO-1	SUB-CLO-4	Participation (Forum and/or Learning Flow)	0	8	8		
SLO-5	CLO-1	SUB-CLO-5	Presentations and Reports	28	0	28		
SLO-9	CLO-2	SUB-CLO-6	Participation (Forum and/or Learning Flow) Written test	14	0	14		
SLO-9	CLO-2	SUB-CLO-7	Participation (Forum and/or Learning Flow)	2	0	2		
SLO-9	CLO-2	SUB-CLO-8	Participation (Forum and/or Learning Flow) Quiz (Formative Test)	0	8	8		
SLO-9	CLO-2	SUB-CLO-9	Participation (Forum and/or Learning Flow)	4	0	4		
SLO-9	CLO-2	SUB-CLO-10	Presentations and Reports	28	0	28		
				84	16	100		

Lampiran Rubrik 1 | Rubrik Holistik

Tabel 6. 1 Rubrik Holistik

Grade Capaian	Skor	Uraian
Sangat Baik	≥ 85	Memperlihatkan pemahaman yang lengkap tentang permasalahan. Semua metode dan persyaratan tentang tugas terdapat dalam jawaban
Baik	71 - 84	Memperlihatkan cukup pemahaman tentang permasalahan. Semua persyaratan tentang tugas terdapat dalam jawaban
Cukup Baik	61 - 70	Memperlihatkan hanya sebagian pemahaman tentang permasalahan. Kebanyakan persyaratan tentang tugas terdapat dalam jawaban
Kurang	51 - 60	Memperlihatkan sedikit pemahaman tentang permasalahan. Banyak persyaratan tugas yang tidak ada
Sangat kurang	< 51	Memperlihatkan tidak ada pemahaman tentang permasalahan

Lampiran Rubrik 2 | Rubrik analitik makalah (kelompok atau individu)

Kriteria/Dimensi	**Penilaian mahasiswa**					**Nilai masing masing kriteria**
	Sangat baik	**Baik**	**Cukup**	**Kurang**	**Sangat kurang**	
	Skor≥ 85	**Skor 71 - 84**	**Skor 61 - 70**	**Skor 51 – 60**	**Skor 41 - 50**	
Sistematika Laporan – SL	laporan dibuat sesuai sistematika penulisan yang dijelaskan di detail tugas	laporan dibuat dengan benar tetapi kurang jelas	laporan dibuat cukup benar dan kurang jelas	laporan dibuat kurang benar dan kurang jelas	laporan dibuat dengan sistematika yang tidak sesuai yang diminta	10 %
Kelengkapan Laporan - KL	laporan dibuat secara lengkap sesuai petunjuk pembuatan laporan	laporan dibuat tanpa referensi dalam laporan	laporan dibuat tanpa referensi dalam laporan dan kesimpulan	laporan dibuat tanpa referensi dalam laporan, kesimpulan dan daftar pustaka	laporan dibuat tanpa referensi dalam laporan, kesimpulan, daftar pustaka dan lampiran yang diperlukan	20 $
Kejelasan dan keruntutan penulisan –JR	laporan jelas, dapat dipahami, ditulis secara runtut	laporan jelas, tetapi penulisan kurang runtut	laporan cukup jelas, cukup sesuai dengan keruntutan penulisan, tapi ada beberapa ketidak teraturan	laporan kurang jelas, kurang sesuai dengan keruntutan penulisan	laporan tidak jelas, tidak sesuai dengan keruntutan penulisan	20 %
Validitas Referensi – VR	Mencantumkan referensi yang valid di setiap paragraf, rumus, tabel dan gambar	Mencantumkan referensi yang valid tapi di beberapa paragraf, rumus, tabel dan gambar	Ada beberapa referensi yang kurang valid, walau lengkap tercantum di semua paragraf, rumus, tabel dan gambar	Lebih banyak referensi yang kurang valid, kurang tercantum di paragraf, rumus, tabel dan gambar	Tidak menggunakan referensi yang valid dan dominan tidak dicantumkan di setiap paragraf tabel, rumus dan gambar	20%
Kebenaran konsep ide yang dipaparkan – KI	konsep/ide yang dipaparkan tepat, benar, dan sesuai dengan teori	konsep/ide yang dipaparkan sesuai dengan teori tetapi kurang jelas	konsep/ide yang dipaparkan cukup	konsep/ide yang dipaparkan kurang tepat	konsep/ide yang dipaparkan tidak tepat	30 %