MODULE HANDBOOK
PHYSICS 1

Module name	**Physics 1**	
Module level	Undergradute	
Code	SF184101	
Course (if applicable)	Physics 1	
Semester	First Semester (Gasal)	
Person responsible for the module	Ir. Tutug Dhanardono.	
Lecturer		
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergradute degree program, **mandatory**, 1st semester.	
Type of teaching, contact hours	Lectures, <60 students	
Workload	1. Lectures : 3 x 50 = 150 minutes per week. 2. Exercises and Assignments : 3 x 50 = 150 minutes per week. 3. Private learning : 3 x 50 = 150 minutes per week.	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 75% of the lectures to sit in the exams.	
Mandatory prerequisites	-	
Learning outcomes and their corresponding PLOs	Course Learning Outcome (CLO) after completing this module, CLO 1: Students are able to apply logical thinking, critical, systematic, and inovative in problem solving and implementing physics 1. CLO 2: Students are able to demonstrate independent, quality, and measurable performance. CLO 3: Students show an attitude of responsibility for work in their field of expertise independently.	PLO-03 PLO-03 PLO-01
Content	This course studies basic laws of physics, particle kinematics, particle dinamics, work and energy, rotational motion, vibration and fluid mechanics, through simple mathematical description also introducing	

	the examples of usage concepts, and doing material analysis in the form of practice.
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	Main : 1. Sears & Zemanky,"University Physics", Pearson Education, 14thed, USA, 2016 2. Douglas C. Giancoli, 'Physics for Scientists and Engineers, Pearson Education, 4th ed, London, 2014 3. Tim Dosen, " Fisika I", Fisika FMIPA-ITS 4. "Petunjuk Praktikum Fisika Dasar", Fisika, MIPA-ITS Supporting : 1. Halliday, Resnic, Jearl Walker; 'Fundamental of Physics'. John Wiley and Sons, 10th ed, New York, 2014 2. Tipler, PA, 'Physics for Scientists and Engineers ‘,6th ed, W.H. Freeman and Co, New York, 2008

I. Rencana Pembelajaran Semester / *Semester Learning Plan*

	INSTITUT TEKNOLOGI SEPULUH NOPEMBER (ITS) **FACULTY OF INTELLIGENT ELECTRICAL AND INFORMATICS TECHNOLOGY** **DEPARTMENT OF ELECTRICAL ENGINEERING**	**Document Code**

SEMESTER LEARNING PLAN

MATA KULIAH (MK) ***COURSE***	**KODE** ***CODE***	**Rumpun MK** ***Course Cluster***	**BOBOT (sks)** **Credits**		**SEMESTER**	**Tgl Penyusunan** ***Compilation Date***
Fisika 1 ***Physics 1***	SF184101	Ilmu Dasar Teknik *Basic Engineering*	T=3	P=0	I	Feb 27, 2020

OTORISASI / PENGESAHAN ***AUTHORIZATION / ENDORSEMENT***	**Dosen Pengembang RPS** ***Developer Lecturer of Semester Learning Plan***	**Koordinator RMK** ***Course Cluster Coordinator***	**Ka DEPARTEMEN** ***Head of Department***
	(Ir. Tutug Dhanardono.)	**(Dimas Anton Asfani, ST., MT., Ph.D)**	**(Dedet Candra Riawan, ST., M.Eng., Ph.D.)**

Capaian Pembelajaran ***Learning Outcomes***	**CPL-PRODI yang dibebankan pada MK** ***PLO Program Charged to The Course***	
	CPL-01 *PLO-01*	Mampu **menerapkan** Ilmu Pengetahuan Alam dan Matematika pada bidang Teknik Elektro. *Able to **apply** Natural Sciences and Mathematics in the field of Electrical Engineering*.
	CPL-03 *PLO-03*	Mampu **merancang** dan **melaksanakan** eksperimen laboratorium dan/atau lapangan, **menganalisa** dan **menginterpretasi** data, serta menggunakan penilaian yang obyektif untuk menarik kesimpulan. *Able to **design** and **implement** laboratory experiment and / or field experiments, **analyze** and **interpret** data, and use objective assessments to draw conclusions.*
	CPL-06	Mampu **menerapkan** ilmu pengetahuan, keterampilan, dan metode terkini dalam menyelesaikan permasalahan di bidang Teknik Elektro.

	PLO-06	*Able to **apply** the latest knowledge, skills and methods in solving problems in the field of Electrical Engineering.*
	Capaian Pembelajaran Mata Kuliah (CPMK) ***Course Learning Outcome (CLO) - If CLO as description capability of each Learning Stage in the course, then CLO = LLO***	
	CP MK 1 ***CLO 1***	Mahasiswa mampu menerapkan pemikiran logis, kritis, sistematis, dan inovatif dalam menyelesaikan masalah dan implementasi ilmu fisika I. *Students are able to apply logical thinking, critical, systematic, and inovative in problem solving and implementing physics 1.*
	CP MK 2 ***CLO 2***	Mahasiswa mampu menunjukkan kinerja mandiri, bermutu, dan terukur. *Students are able to demonstrate independent, quality, and measurable performance.*
	CP MK 3 ***CLO 3***	Mahasiswa menunjukkan sikap bertanggung jawab atas pekerjaan di bidang keahliannya secara mandiri. *Students show an attitude of responsibility for work in their field of expertise independently.*

Peta CPL – CP MK

Map of PLO - CLO

	KU1	KU3	S9
SUB CPMK 1 *LLO 1*	√		
SUB CPMK 2 *LLO 2*	√	√	√
SUB CPMK 3 *LLO 3*	√	√	√
SUB CPMK 3 *LLO 4*	√	√	√
SUB CPMK 3 *LLO 5*	√	√	√
SUB CPMK 3 *LLO 6*	√	√	√
SUB CPMK 3 *LLO 7*	√	√	√
SUB CPMK 3 *LLO 8*	√	√	√

Diskripsi Singkat MK

Short Description of Course

Pada mata kuliah ini mahasiswa akan belajar memahami hukum-hukum dasar fisika, Kinematika partikel; Dinamika partikel; Kerja dan energi; Gerak
rotasi ; Getaran dan Mekanika fluida, melalui uraian matematika sederhana serta memperkenalkan contoh pemakaian konsep, dan melakukan
analisa materi dalam bentuk praktikum.

	This course studies basic laws of physics, particle kinematics, particle dinamics, work and energy, rotational motion, vibration and fluid mechanics, through simple mathematical description also introducing the examples of usage concepts, and doing material analysis in the form of practice.
Bahan Kajian: Materi pembelajaran ***Course Materials:***	1. Besaran dan vektor / *Magnitude and vectors* 2. Kinematika partikel / *Particle kinematics* 3. Dinamika partikel / *Particle dinamics* 4. Kerja dan energi / *Work and energy* 5. Impuls dan Momentum / *Momentum and Impulse* 6. Dinamika rotasi / *Dinamics rotation* 7. Getaran / *Vibration* 8. Mekanika Fluida / *Fluid mechanics*
Pustaka ***References***	**Utama / *Main*:** 1. Sears & Zemanky,"University Physics", Pearson Education, 14thed, USA, 2016 2. Douglas C. Giancoli, 'Physics for Scientists and Engineers, Pearson Education, 4th ed, London, 2014 3. Tim Dosen, " Fisika I", Fisika FMIPA-ITS 4. "Petunjuk Praktikum Fisika Dasar", Fisika, MIPA-ITS **Pendukung / *Supporting*:** 1. Halliday, Resnic, Jearl Walker; 'Fundamental of Physics'. John Wiley and Sons, 10th ed, New York, 2014 *2.* Tipler, PA, 'Physics for Scientists and Engineers ‘,6th ed, W.H. Freeman and Co, New York, 2008
Dosen Pengampu ***Lecturers***	Nada Fitrieyatul Hikmah, Atar Fuady Babgei
Matakuliah syarat ***Prerequisite***	-

		Penilaian / *Assessment*			

Mg ke/ *Week*	**Kemampuan akhir tiap tahapan belajar (Sub-CPMK) / *Final ability of each learning stage (LLO)***	**Indikator / *Indicator***	**Kriteria & Teknik / *Criteria & Techniques***	**Bantuk Pembelajaran; Metode Pembelajaran; Penugasan Mahasiswa; [Estimasi Waktu] / *Form of Learning; Learning Method; Student Assignment; [Estimated Time]***		**Materi Pembelajaran [Pustaka] / *Learning Material [Reference]***	**Bobot Penilaian /*Assess-ment Load* (%)**
(1)	**(2)**	**(3)**	**(4)**	**Tatap Muka / *In-class* (5)**	**Daring / *Online* (6)**	**(7)**	**(8)**
1-2	**Sub-CPMK1**: Mahasiswa mampu menjelaskan dan menggunakan besaran, satuan, dan vektor, serta mampu menerapkan operasi matematika pada vektor secara geometris dan analitis untuk menyelesaikan permasalahan vektor. ***LLO 1:*** *Students are able to explain and use magnitude, units, and vector, also able to apply mathematical operations on vector geometrically and analytically to solving vector problems.*	● Ketepatan menjelaskan besaran fisis dan sistem satuan ● Ketepatan menjelaskan ciri besaran skalar dan besaran vektor serta menerapkan dan menggunakan aljabar vektor. ● *Accuracy to explain physical magnitude and unit systems* ● *Accuracy to explain the features of scalar magnitude and vector*	**Kriteria :** Menggunakan rubrik analitik dan pedoman penskoran (Marking Scheme) **Non-tes :** ● Meringkas materi kuliah. **Tes :** ● Tanya jawab lisan ● Latihan menyelesaikan soal-soal mengenai besaran fisika, satuan,	● **Kuliah** ● **Diskusi.** [TM : 1x(2 x 50")] ● **Tugas 1 :** Menyusun ringkasan kuliah dan mengerjakan contoh latihan soal yang diberikan dalam kuliah [PT+BM : (1+1) x (2 x 60")]] ● **Latihan Soal** Latihan	● **Kuliah tatap muka maya (zoom)** ● **MyITS-Classroom** Sumber belajar : https://www.youtube.com/watch?v=GtOGurrUPmQ; https://www.youtube.com/watch?v=0na1JdPE_JY; https://www.youtube.com/watch?v=CtysVq9eO-0;	**Besaran dan vektor:** Sistem Satuan Internasional (SI), perubahan satuan, besaran dasar, besaran turunan, vektor dan skalar, komponen vektor, vektor satuan, penambahan vektor, perkalian vektor **Pustaka:** ● Halliday,R.,et all, 2014 ● Douglas C. Giancoli, 2014 ● Serway, 2004 ● Tim Dosen Fisika ITS	**10**

		magnitude also applying and using vector algebra	besaran skalar, besaran vektor serta aljabar vektor ● (Tugas-1: Problem & Solving) ***Criteria:*** *Use analytic rubrics and Marking Scheme* ***Non-test :*** ● *Summarize the lecture material.* ***Test :*** ● *Verbal questions and answers* ● *Exercises to solve problems regarding physical quantities, units, scalar quantities, vector*	menyelesaikan soalsoal aplikasi besaran fisika, satuan, besaran skalar, besaran vektor serta aljabar vektor [PT+BM : (1+1) x (2 x 60")]] ● ***Lectures*** ● ***Discussion*** *[FF : 1x(2 x 50")]* ● ***Task 1*** *Arrange lecture summaries and work on sample practice questions given in the*	https://www.youtube.com/watch?v=xEHZArgLlUo&list=PLyQSN7X0ro23IUORJBSDBH8AUWZ1mQBna&index=4&t=0s; https://www.youtube.com/watch?v=ZAeLlaFxR_o&list=PLyQSN7X0ro23IUORJBSDBH8AUWZ1mQBna&index=5&t=0s; https://www.youtube.com/watch?v=ZCFPNlVed4&list=PLyQSN7X0ro23IUORJBSDBH8AUWZ1mQBna&index=6&t=0s ● **Diskusi** Menyusun ringkasan kuliah dan	***Quantities and vectors:*** *International System of Units (SI), change of units, basic quantities, derivative quantities, vectors and scalars, vector components, unit vectors, vector addition, vector multiplication* ***References:*** ● *Halliday,R.,et all, 2014* ● *Douglas C. Giancoli, 2014* ● *Serway, 2004* ● *ITS Physics Lecturer Team*	

			quantities and vector algebra ● *Task-1: Problem & Solving*	*lecture [SA + SS: (1 + 1) x (2 x 60 "]]* ● ***Practice*** *Exercises to solve problems in the application of physical quantities, units, scalar quantities, vector quantities and vector algebra [SA + SS: (1 + 1) x (2 x 60 "]]*	mengerjakan contoh latihan soal yang diberikan dalam kuliah [PT+BM : (1+1) x (2 x 60"]] ● **Latihan Soal** Latihan menyelesaikan soalsoal aplikasi besaran fisika, satuan, besaran skalar, besaran vektor serta aljabar vektor [PT+BM : (1+1) x (2 x 60"]] ● ***Virtual face-to-face lecture (zoom)***		

					• ***MyITS-Classroom*** *Learning Resources : https://www.youtube.com/watch?v=GtOGurrUPmQ;https://www.youtube.com/watch?v=0na1JdPE_JY;https://www.youtube.com/watch?v=CtysVq9eO-0; https://www.youtube.com/watch?v=xEHZArqLlUo&list=PLyQSN7X0ro23IUORJBSDBH8AUWZ1mQBna&index=4&t=0s; https://www.youtube.com/watch?v=ZAeLlaFxR_o&list=PLyQSN7X0ro23IU*		

					[ORJBSDBH8AUWZ1mQBna&index=5&t=0s](); [https://www.youtube.com/watch?v=ZCFPNlVed4&list=PLyQSN7X0ro23IUORJBSDBH8AUWZ1mQBna&index=6&t=0s]() ● ***Discussion*** *Arrange lecture summaries and working on sample practice questions given in the lecture [SA + SS: (1 + 1) x (2 x 60 "]]* ● ***Practice*** *Exercises to solve problems for the application of physical quantities,*		

					units, scalar quantities, vector quantities and vector algebra [SA + SS: (1 + 1) x (2 x 60 "]]		
3-6	**Sub-CPMK2**: Mahasiswa Mampu mendefinisikan pergeseran posisi, kecepatan, percepatan gerak lurus dan melengkung secara grafis dan matematis serta mendemontrasikannya (P). ***LLO 2 :*** *Students are able to define shifts in position, velocity, acceleration of linearand curved motion graphically and mathematically and demonstrate (P).*	● Ketepatan menjelaskan prinsip Pergeseran posisi, kecepatan, percepatan ● Ketepatan menjelaskan prinsip gerak lurus, gerak lengkung (parabola dan melingkar), gerak relatif. ● *Accuracy to explains the principles of shifting position, velocity, acceleration*	**Kreteria:** Pedoman Penskoran **Non-tes :** Meringkas materi kuliah dan tanya jawab lisan. **Tes:** Latihan soal ***Criteria*:** *Marking Scheme* ***Non-test :*** *Summarize the course material and verbal*	● **Kuliah** ● **Diskusi** [TM : 2x(3 x 50")] ● **Kuis-1:** Menyelesaikan soal-soal posisi, kecepatan, percepatan ● **Latihan soal :** menghitung percepatan suatu benda yang dipengaruhi	● **Kuliah tatap muka maya (zoom)** [TM : 2x(3x50'')] ● **MyITS-Classroom** Sumber belajar : https://www.youtube.com/watch?v=RIGMaw8gsic; ● Kuis-1: Daring dengan MyITS Classroom ● **Latihan Soal :**	● **Kinematika Partikel:** Pergeseran posisi, kecepatan, percepatan, gerak lurus, gerak lengkung (parabola dan melingkar); gerak relatif ● ***Particle Kinematics:*** *Shifting of position, velocity, acceleration, linear motion,*	**2**

		● *Accuracy to describes the principles of linear motion, curved motion (parabolic and circular), relative motion.*	*questions and answers.* ***Test:*** *exercises*	oleh resultan gaya. ● **Latihan soal:** menguraikan persamaan gerak lurus, gerak lengkung (parabola dan melingkar), gerak relatif. [PT+BM:(2+2)x(3 x60")] ● *Lectures* ● *Discussion* *[TM : 2x(3 x 50")]* ● **Quiz-1:** Solve problems of position, speed, acceleration ● ***Practice :*** *calculate the acceleration*	menghitung posisi, kecepatan dan percepatan benda berdasar komponen vektor. ● **Latihan Soal :** menguraikan persamaan gerak lurus, gerak lengkung (parabola dan melingkar), gerak relatif. [PT+BM:(2+2)x(3x 60")] ● ***Virtual face-to-face lecture (zoom)*** *[FF: 2x (3x50 ')]* ● ***MyITS-Classroom*** *Learning resources : https://www.youtube.com/wat*	*curved motion (parabolic and circular); relative motion*	

				of an object which is affected by the resultant force. ● ***Practice :*** *describe equations of linear motion, curved motion (parabola and circular), relative motion.* *[SA + SS: (2 + 2) x (3x60 ")]*	*ch?v=RIGMaw8gsic;* ● *Quiz-1: Online via MyITS Classroom* ● ***Practice :*** *calculate the position, velocity and acceleration of objects based on vector components.* ● ***Practice :*** *describe equations of linear motion, curved motion (parabola and circular), relative motion.* *[SA + SS : (2 + 2) x (3x60 ")]*		
		● Ketepatan menghitung penyelesaian soalsoal yang	**Kreteria:** Pedoman Penskoran **Non-tes :**	● **Kuliah** ● **Diskusi** [TM : 2 x(3x 50"] ● **Kuis 1**	● **Kuliah tatap muka maya** [TM : 2x(3x50'')]	● **Kinematika Partikel:** Pergeseran posisi, kecepatan,	**7**

		berhubungan. Pergeseran posisi, kecepatan, percepatan, gerak lurus, gerak lengkung (parabola dan melingkar); gerak relatif ● *Accuracy to calculate the solving of related problems. Shifting of position, speed, acceleration, linear motion, curved motion (parabolic and circular); relative motion.*	● Tanya-jawab lisan ● Menyalin jawaban soalsoal yang dibahas selama perkuliahan **Tes:** ● Kuis 1 ● Latihan Soal ● Tugas rumah ***Criteria*:** *Marking Scheme* ***Non-test*** ● *Verbal questions and answers* ● *Copying answers discussed during lectures* ***Test:*** ● *Quiz 1* ● *Exercises* ● *Home work*	Menyelesaikan soal-soal tentang posisi, kecepatan dan percepatan. ● **Latihan soal** Menghitung kecepatan rata–rata dan sesaat, percepatan rata–rata dan sesaat. ● **Latihan soal** Menghitung permasalahan gerak lurus beraturan (GLB) dan gerak lurus berubah beraturan (GLBB) ● **Latihan soal** Menghitung gerak lurus,	● **MyITS-Classroom** Sumber belajar : https://www.youtube.com/watch?v=Po7li9JbEs;; ● Kuis-1: Daring dengan MyITS Classroom ● **Latihan soal** Menghitung kecepatan rata-rata dan sesaat, percepatan rata-rata dan sesaat. ● **Latihan soal** Menghitung permasalahan gerak lurus beraturan (GLB) dan gerak lurus berubah	percepatan, persamaan gerak lurus berubah beraturan, gerak lurus, gerak lengkung (parabola dan melingkar); gerak relatif ● ***Particle Kinematics:*** *Shifting position, velocity, acceleration, equations of Accelerated Linear Motion, linear motion, curved motion (parabolic and circular); relative motion*	

				gerak lengkung (parabola dan melingkar); gerak relatif [PT+BM : (2+2) x(3x 60”] ● ***Lectures*** ● ***Discussion*** *[FF : 2 x(3x 50”]* ● ***Quiz 1*** *Solve problems about position, speed and acceleration.* ● ***Practice*** *Calculate average and instantaneous velocity, average and instantaneous acceleration.* ● ***Practice***	beraturan (GLBB) ● **Latihan soal** Menghitung gerak lurus, gerak lengkung (parabola dan melingkar); gerak relatif ● ***Virtual face-to-face lecture*** *[FF : 2x(3x50’’)]* ● ***MyITS-Classroom*** *Learning resource: https://www.youtube.com/watch?v=Po7li9JbEs;;* ● *Quiz 1: Online via MyITS Classroom* ● ***Practice*** *Calculate average and*		

				Calculate the problem of Uniform Linear Motion and Accelerated Linear Motion ● ***Practice*** *Calculate linear motion, Menghitung gerak lurus, curved motion (parabolic and circular); relative motion [SA+SS : (2+2) x(3x 60"]*	*instantaneous velocity, average and instantaneous acceleration.* ● ***Practice*** *Calculate the problem of Uniform Linear Motion and Accelerated Linear Motion* ● ***Practice*** *Calculate linear motion, Menghitung gerak lurus, curved motion (parabolic and circular); relative motion*		
	Praktikum **Sub-CPMK3:** Mampu menggunakan konsep dan teori pergeseran posisi, kecepatan, percepatan gerak lurus dan melengkung serta	● Ketepatan menghitung dan mendemonstrasikan pergeseran posisi, kecepatan, percepatan	**Kriteria:** Rubrik Modul praktikum Fisika Dasar 1 **Non-tes:**	● **Praktikum :** Modul : Gerak, kecepatan dan percepatan	● **Mengakses demonstrasi praktimum secara real time yang dilakukan oleh asisten,**		**5**

	mendemontrasikannya (M-4) ***Practicum*** ***Sub-CPMK3:*** *Students are able to use and demonstrate the concepts and theories of position shift, velocity, acceleration of straight and curved motion (M-4)*	● *Accuracy to calculate and demonstrates position shift, velocity, acceleration*	● Praktikum di dampingi oleh asisten lab. ● Mencatat Data hasil praktikum, acc asisten. **Tes :** ● Tes pendahuluan lisan. ● Laporan akhir ● presentasi ***criteria:*** *Rubric* *Physics 1 practicum module* ***Non-test:*** ● *Practicum accompanied by lab assistants.* ● *Record data on practicum results, assistant acc.* ***Test***	7 jam: Tutorial / Pretest, Persiapan, Pelaksanaan Praktikum, Penyusunan laporan, Presentasi hasil. ● ***Practicum :*** *Module : Motion, speed and acceleration* *7 hours: Tutorial / Pretest, Preparation, Practicum Implementation, Report preparation, Presentation of results.*	**melalui live streaming** ● **Melakukan praktikum Mandiri Menggunakan program animasi yang telah disiapkan oleh TIM ITS** ● ***Accessing real-time practicum demonstrations conducted by assistants, via live*** ● ***Doing independent practicum using animation program that has been prepared by ITS TEAM***		

			● *Verbal preliminary test* ● *Final report presentation*				
	Asistensi **Sub-CPMK 3:** Mahasiswa mampu menggunakan konsep dan teori pergeseran posisi, kecepatan, percepatan gerak lurus dan melengkung serta mendemontrasikannya (P). ***Assistance*** ***Sub-CPMK 3****: Students are able to use the concepts and theories of shifting position, velocity, acceleration of straight and curved motion and demonstrate it (P).*	● Ketepatan menghitung penyelesaian soal-soal yang berhubungan dengan posisi, kecepatan, percepatan, gerak lurus, gerak lengkung (parabola dan melingkar); gerak relatif ● *Accuracy to calculate the completion of problems related to position, velocity, acceleration, straight motion, curved motion (parabolic and circular); relative motion*	**Kreteria:** Pedoman Penskoran **Non-tes :** ● Tanya-jawab lisan ● Menyalin jawaban soal-soal yang dibahas oleh asisten selama perkuliahan **Tes :** ● Keaktifan dan ketepatan jawaban atas pertanyaan yang diajukan oleh asisten **Criteria :** *Marking Scheme* ***Non-test :***	● Pembahasan soal-soal terkait posisi, kecepatan, percepatan, gerak lurus, gerak lengkung (parabola dan melingkar); gerak relatif ● Diskusi, [TM: 1x(3x50")] ● Discussion of problems related to position, velocity, acceleration, straight motion, curved motion	● **Kuliah oleh asisten melalui tatap muka maya;** ● **Pembahasan soal melalui group Wa, Line, dll.** [TM: 1x(3x50"] ● **MyITS-Classroom** Sumber belajar: https://www.youtube.com/watch?v=Po7li9JbEs ● ***virtual face-to-face lectures by assistants;*** ● ***Discussion through Wa***	● **Kinematika Partikel:** Pergeseran posisi, kecepatan, percepatan, persamaan gerak lurus berubah beraturan, gerak lurus, gerak lengkung (parabola dan melingkar); gerak relatif ● ***Particle Kinematics:*** *Shifting position, velocity, acceleration, equations of Accelerated Linear Motion, linear motion, curved motion*	**2**

			● *Verbal questions and answers* ● *Copying the answers of the questions discussed by the assistant during lectures* ***Test:*** *Activeness and accuracy of answers to questions asked by the assistant*	(parabolic and circular); ● Discussion [FF: 1x(3x50")]	***group, Line, etc.*** *[FF: 1x(3x50")]* ● ***MyITS-Classroom*** *Learning resources:* https://www.youtube.com/watch?v=Po7li9JbEs	*(parabolic and circular); relative motion*	
3	**Sub-CPMK3:** Mahasiswa Mampu menggunakan konsep dan teori Newton I, II, dan III untuk menguraikan gaya-gaya pada berbagai sistem benda, serta mendemontrasikannya (P). ***Sub-CPMK3:*** *Students are able to use Newton I, II, and III concepts and theories to describe the*	● Ketepatan menjelaskan prinsip Hukum Newton I, Hukum Newton II, dan Hukum Newton III ● Ketepatan menjelaskan prinsip macam-macam gaya (gaya gravitasi, gaya berat, gaya apung, gaya berat, gaya tegangan tali, gaya	**Kreteria:** Pedoman Penskoran **Non-tes :** ● Meringkas materi kuliah ● Tanya jawab lisan. ● Menyalin contoh soal **Tes:** Latihan soal	● **Kuliah** ● **Diskusi,** [TM: 1x(3x50")] ● **Kuis-1:** Menyelesaikan soal-soal Hukum Newton ● **Latihan soal:** menghitung percepatan suatu benda yang	● **Kuliah tatap muka maya;** [TM: 1x(3x50")] ● **MyITS-Classroom:** Sumber belajar: ● https://www.youtube.com/watch?v=g550H4e5FCY	● **Dinamika Partikel:** Hukum Newton I, II dan III, macam-macam gaya (gaya gravitasi, gaya berat, gaya tegang tali, gaya normal, gaya gesek dan gaya pegas), kesetimbangan gaya, penerapan	**2**

	forces in various systems of objects, and demonstrate them (P).	normal, gaya gesek, gaya pegas) ● *Accuracy to explain the principles of Newton's Law I, Newton's Law II, and Newton's Law III* ● *Accuracy to explain the principle of various forces (gravity, gravity, buoyancy, weight, rope tension, normal force, friction, spring force)*	***Criteria*:** *Marking Scheme* ***Non-test :*** ● *Summarize the course material* ● *verbal questions and answers.* ● *Copying sample questions* ***Test:*** *exercises*	dipengaruhi oleh resultan gaya. ● **Latihan soal:** menguraikan komponen-komponen gaya yang dimiliki oleh suatu benda pada bidang horizontal , bidang miring, dan katrol. [PT+BM:(2+2)x(3 x60")] ● ***Lectures*** ● ***Discussion*** *[FF: 1x(3x50")]* ● ***Quiz-1:*** *Solve Newton's Law problems* ● ***Practice:*** *Calculate the acceleration of an object*	● **Kuis-1:** Daring dengan MyITS Classroom; ● **Latihan soal:** menghitung percepatan suatu benda yang dipengaruhi oleh resultan gaya. ● **Latihan soal** menguraikan komponenkom ponen gaya yang dimiliki oleh suatu benda pada bidang horizontal , bidang miring, dan katrol. [PT+BM:(2+2)x(3x 60")] ● ***Virtual face-to-face lectures;*** *[FF: 1x(3x50")]*	hukum Newton I,II dan III ● ***Particle Dynamics:*** *Newton's laws I, II and III, various forces (gravitational force, gravity, rope tension, normal force, friction and spring force), force balance, application of Newton's laws I, II and III*	

				which is affected by the resultant force. ● ***Practice*** *Describes the components of the force possessed by an object in the horizontal plane, inclined plane, and pulley.* ● [SA+SS:(2+2)x (3x60")]	● ***MyITS-Classroom:*** *Learning resources:* ● *https://www.youtube.com/watch?v=g550H4e5FCY* ● ***Quiz-1:*** *Online via MyITS Classroom;* ● ***Practice :*** *Calculate the acceleration of an object which is affected by the resultant force.* ● ***Practice :*** *Describes the components of the force possessed by an object in the horizontal plane, inclined plane, and pulley.*		

					● *[SA+SS:(2+2)x(3x60")]*		
		● Ketepatan menghitung penyelesaian soalsoal yang berhubungan dengan Hukum Newton I, Hukum Newton II, dan Hukum Newton III ● *Accuracy to calculating the solving of problems related to Newton's Law I, Newton's Law II, and Newton's Law III*	**Kreteria:** Pedoman Penskoran **Non-tes :** ● Tanya jawab lisan. ● Menyalin jawaban soalsoal yang dibahas selama perkuliahan **Tes:** ● Kuis 1 ● Latihan soal ● Tugas Rumah ***Criteria*:** *Marking Scheme* ***Non-test :*** ● *Verbal questions and answers.* ● *Copying answers of questions*	● **Kuliah** ● **Diskusi** [TM: 2x(3x50")] ● **Kuis-1**: Menyelesaikan soal-soal Hukum Newton ● **Latihan soal:** Menghitung kecepatan /gaya gesek benda, pada bidang horizontal karena adanya pengaruh resultan gaya. ● **Latihan soal:** Menghitung kecepatan /gaya gesek benda, pada bidang miring karena	● **Kuliah tatap muka maya;** [TM: 2x(3x50")] ● **MyITS-Classroom**: Sumber belajar: https://www.youtube.com/watch?v=RDwXQeWWbz0 ● **Kuis-1:** Daring dengan MyITS Classroom; ● **Latihan soal:** Menghitung kecepatan /gaya gesek benda, pada bidang horizontal karena adanya pengaruh resultan gaya. ● **Latihan soal:**	● **Dinamika Partikel:** Hukum Newton I, II dan III, macam-macam gaya (gaya gravitasi, gaya berat, gaya tegang tali, gaya normal, gaya gesek dan gaya pegas), kesetimbangan gaya, penerapan hukum Newton I,II dan III ● ***Particle Dynamics:*** *Newton's laws I, II and III, various forces (gravitational force, gravity, rope tension, normal force, friction and spring*	**7**

			*discussed during lec*tures **Test:** ● Quis 1 ● Exercises ● Home work	adanya pengaruh resultan gaya. ● **Latihan soal** Menghitung tegangan tali pada katrol, akibat adanya gaya berat benda. [PT+BM:(2+2)x(3 x60")] ● ***Lectures*** ● ***Discussion*** *[FF: 2x(3x50")]* ● ***Quiz-1****: Solve Newton's Law problems* ● ***Practice:*** *Calculating the velocity / frictional force of an object on a horizontal plane due to the effect of*	Menghitung kecepatan /gaya gesek benda, pada bidang miring karena adanya pengaruh resultan gaya. ● **Latihan soal** Menghitung tegangan tali pada katrol, akibat adanya gaya berat benda ● ***Virtual face-to-face lectures;*** *[FF: 2x(3x50")]* ● ***MyITS-Classroom****: Learning resources: https://www.youtube.com/watch?v=RDwXQeWWbz0*	*force), force balance, application of Newton's laws I, II and III*	

				the resultant force. ● ***Practice:*** *Calculating the velocity / frictional force of an object on an inclined plane due to the effect of the resultant force.* ● ***Practice*** *Calculating the rope tension on the pulley, due to the weight of the object.* *[SA+SS:(2+2)x(3x 60")]*	● ***Quis-1:*** *Online via MyITS Classroom;* ● ***Practice:*** *Calculating the velocity / frictional force of an object on a horizontal plane due to the effect of the resultant force.* ● ***Practice:*** *Calculating the velocity / frictional force of an object on an inclined plane due to the effect of the resultant force.* ● ***Latihan soal*** *Calculating the rope tension on the pulley, due*		

					to the weight of the object.		
	Praktikum **Sub-CPMK 3**: Mahasiswa mampu menggunakan konsep dan teori Newton I, II, dan III untuk menyelesaikan masalah gaya-gaya dalam fisika, serta mendemontrasikannya (M-4). ***LLO 3 :*** *Students are able to use Newton I, II, and III concepts and theories to solve problems of forces in physics, and demonstrate them (M-4).*	● Ketepatan menghitung dan mendemonstrasikan koefisien gesek statis dan kinetis ● *Accuracy to calculate and demonstrate static and kinetic coefficient of friction*	**Kriteria:** Rubrik Modul praktikum Fisika Dasar 1 **Non-tes:** ● Praktikum di dampingi oleh asisten lab. ● Mencatat Data hasil praktikum, acc asisten. **Tes :** ● Tes pendahuluan lisan. ● Laporan akhir ● presentasi ***criteria:*** *Rubric Physics 1 practicum module* ***Non-test:*** ● *Practicum accompanied*	● **Praktikum :** Modul M-4: Gaya gesek 7 jam: Tutorial / Pretest, Persiapan, Pelaksanaan Praktikum, Penyusunan laporan, Presentasi hasil. ● ***Practicum :*** *Module M-4: Friction force 7 hours: Tutorial / Pretest, Preparation, Practicum Implementation, Report preparation, Presentation of results.*	● **Mengakses demonstrasi praktimum secara real time yang dilakukan oleh asisten, melalui live streaming** ● **Melakukan praktikum Mandiri Menggunakan program animasi yang telah disiapkan oleh TIM ITS** ● ***Accessing real-time practicum demonstrations conducted by assistants, via live*** ● ***Doing independent***		**5**

			by lab assistants. ● *Record data on practicum results, assistant acc.* ***test*** ● *Verbal preliminary test* ● *Final report* ● *presentation*		***practicum using animation program that has been prepared by ITS TEAM***		
	Asistensi **Sub-CPMK 3**: Mahasiswa mampu menggunakan konsep dan teori Newton I, II, dan III untuk menyelesaikan masalah gaya-gaya dalam fisika, serta mendemontrasikannya (P). ***Asistance*** ***LLO 3 :*** *Students are able to use Newton I, II, and III concepts and theories to solve problems of forces in physics, and demonstrate them (P).*	● Ketepatan menghitung penyelesaian soal-soal yang berhubungan dengan Hukum Newton I, Hukum Newton II, dan Hukum Newton III ● *Accuracy to calculate the solution of problems related to Newton's Law I, Newton's Law II, and Newton's Law III*	**Kreteria:** Pedoman Penskoran **Non-tes :** ● Tanya-jawab lisan ● Menyalin jawaban soal-soal yang dibahas oleh asisten selama perkuliahan **Tes :** ● Keaktifan dan ketepatan jawaban atas pertanyaan	● **Pembahasan soal – soal terkait Hukum Newton I, Hukum Newton II, dan Hukum Newton III** ● **Diskusi,** [TM: 2x(3x50")] ● ***Discussion of problems related to Newton's Law I,***	● **Kuliah oleh asisten melalui tatap muka maya;** ● **Pembahasan soal melalui group Wa, Line, dll.** [TM: 1x(3x50")] ● **MyITS-Classroom** Sumber belajar: https://www.youtube.com/watch?v=wrhT5xGS-f8	● **Dinamika Partikel:** Hukum Newton I, II dan III, macam-macam gaya (gaya gravitasi, gaya berat, gaya tegang tali, gaya normal, gaya gesek dan gaya pegas), kesetimbangan gaya, penerapan hukum Newton I,II dan III	**2**

			yang diajukan oleh asisten **Criteria :** *Marking Scheme* ***Non-test :*** ● *Verbal questions and answers* ● *Copying the answers of the questions discussed by the assistant during lectures* ***Test:*** ● *Activeness and accuracy of answers to questions asked by the assistant*	***Newton's Law II, and Newton's Law III*** ● ***Discussion*** *[FF: 2x(3x50")]*	● ***virtual face-to-face lectures by assistants;*** ● ***Discussion through Wa group, Line, etc.*** *[FF: 1x(3x50")]* ● ***MyITS-Classroom*** *Learning resources:* https://www.youtube.com/watch?v=wrhT5xGS-f8	● ***Particle Dynamics:*** *Newton's laws I, II and III, various forces (gravitational force, gravity, rope tension, normal force, friction and spring force), force balance, application of Newton's laws I, II and III*	
4	**Sub-CPMK 4** : Mahasiswa memahami azas kerja dan energi mekanik, hukum kekekalan energi mekanik, impuls, momentum, kekekalan momentum, dan	● Ketepatan Menjelaskan kerja dan energi: konsep kerja, energi kinetik, energi potensial (gravitasi dan pegas) (TM 12)	**Kreteria:** Pedoman Penilaian **Non-tes :** ● Penjelasan materi kuliah	● **Kuliah** ● **Diskusi** [TM: 1x(2x50")] ● **Tugas**: Menyelesaikan soal-soal konsep kerja,	● **Kuliah tatap muka daring (zoom);** [TM: 1x(2x50")] ● **MyITS-Classroom:** https://www.y	**Kerja dan Energi:** Menjelaskan Konsep kerja Energi Kinetik Energi Potensial Gravitasi Energi Potensial Energi Kinetik	**3**

	menerapkannya kedalam penyelesaian soal ***LLO 4** : Students understand the principles of work and mechanical energy, the law of conservation of mechanical energy, impulses, momentum, conservation of momentum, and apply them to solving problems*	• *Accuracy to describes work and energy: the concept of work, kinetic energy, potential energy (gravity and spring) (FF 12)*	• Diskusi dan tanya-jawab • Mengerjakan latihan soal bersama-sama di buku tentang konsep kerja dan energi • **Tes :** Latihan soal & Tugas ***Criteria :*** *Marking Scheme* ***Non-test :*** • *Explanation of course material* • *Discussion, questions and answers* • *Doing practice questions together in books about the concept of work and energy*	Energi Potensial Gravitasi dan Energi Potensial Pegas Newton • **Latihan soal:** Menghitung Kerja Oleh Gaya konservatif dan non konsevatif [BM:2x(2x60")] • ***Lectures*** • ***Discussion*** *[FF: 1x(2x50"]* • ***Task**: Complete work concept problems, Gravitational Potential Energy and Spring*	outube.com/watch?v=zVRH9d5PW8g Tugas: Daring dengan MyITS Classroom • **Latihan soal:** menghitung kerja oleh gaya konservatif dan non konservatif, menghitung energi kinetik, potensial gravitasi dan potensial pegas [BM:2x(2x60")] • ***Face-to-face online lectures (zoom);*** *[FF: 1x(2x50")]* • ***MyITS-Classroom:*** *https://www.youtube.com/w*	**Pustaka :** • Halliday,R.,et all, 2014 • Douglas C. Giancoli, 2014 • Serway, 2004 • Tim Dosen Fisika ITS ***Work and Energy:** Explaining the working concept of Kinetic Energy. Potential Energy Gravity Potential Energy. Kinetic Energy* ***References :*** • *Halliday,R.,et all, 2014* • *Douglas C. Giancoli, 2014* • *Serway, 2004* • *ITS Physics Lecturer Team*	

			● ***Test :*** *Practice & Assignments*	*Potential Energy* ● ***Exercise:*** *calculating work by conservative and non-conservative forces* *[SS:2x(2x60")]*	*atch?v=zVRH9d5PW8q* *Assignments : Online via MyITS Classroom* ● ***Exercises:*** *calculating the work by conservative and non-conservative forces, calculating kinetic energy, gravitational potential and spring* ***[****SS:2x(2x60")]*		
		● Ketepatan menjelaskan kerja dan energi: teorema kerja energi, hukum kekekalan energi mekanik (TM 13) ● *The accuracy to explain work and energy: the work*	**Kreteria:** Pedoman Penilaian **Non-tes :** ● Penjelasan materi kuliah ● Diskusi dan tanya-jawab ● Mengerjakan latihan soal	● **Kuliah** ● **Diskusi** [TM: 1x(2x50")] ● **Tugas:** Mengitung tentang hukum kekekalan energi ● **Latihan soal :**	● **Kuliah tatap muka maya (zoom)** [TM: 1x(2x50")] ● **MyITS-Classroom** Sumber belajar: https://www.youtube.com/w	**Kerja dan Energi:** menjelaskan kerja dan energi: teorema kerja energi, hukum kekekalan energi mekanik **Pustaka :** ● Halliday,R.,et all, 2014	**3**

		energy theorem, the law of conservation of mechanical energy (TM 13)	bersama-sama di buku tentang hukum kekekalan energi ● **Tes :** Latihan soal & Tugas ***Criteria :*** *Marking Scheme* ***Non-test :*** ● *Explanation of course material* ● *Discussion, questions and answers* ● *Doing practice problems together in books about the law of conservation of energy* ● ***Test :*** *Practice & Assignments*	Mengitung tentang hukum kekekalan energi [BM:2x(2x60")] ● ***Lectures*** ● ***Discussion*** *[FF: 1x(2x50")]* ● ***Tasks:*** *Calculating the law of conservation of energy* ● ***excercises :*** *Calculating the law of conservation of energy* *[SS:2x(2x60")]*	atch?v=HR5iEX3Sy1k Tugas: Daring dengan MyITS Classroom; ● **Latihan soal :** Mengitung tentang hukum kekekalan energi [BM:2x(2x60")] ● **Virtual face-to-face lecture (zoom)** [FF: 1x(2x50"] ● **MyITS-Classroom** Learning resources: https://www.youtube.com/watch?v=HR5iEX3Sy1k Task: Online with MyITS Classroom; ● ***excercises :***	● Douglas C. Giancoli, 2014 ● Serway, 2004 ● Tim Dosen Fisika ITS ***Work and Energy:*** *explain work and energy: the work energy theorem, the law of conservation of mechanical energy* ***References :*** ● *Halliday,R.,et all, 2014* ● *Douglas C. Giancoli, 2014* ● *Serway, 2004* ● *ITS Physics Lecturer Team*	

					Calculating the law of conservation of energy *[SS:2x(2x60")]*		
		● Ketepatan menjelaskan Impuls dan Momentum : impuls, momentum, tumbukan (elastis dan tidak elastis), pusat massa; (TM 14) ● Accuracy to describes Impulse and Momentum: impulse, momentum, collision (elastic and inelastic), center of mass; (FF 14)	**Kreteria:** Pedoman Penilaian **Non-tes :** ● Penjelasan materi kuliah ● Diskusi dan tanya-jawab ● Mengerjakan latihan soal bersama-sama di buku tentang Impuls dan momentum (tumbukan) ● **Tes :** Latihan soal & Tugas ***Criteria :*** *Marking Scheme* ***Non-test :***	● **Kuliah** ● **Diskusi** [TM: 1x(2x50")] ● **Tugas:** Menyelesaikan soal-soal impuls dan momentum, tumbukan lenting sempurna, lenting sebagian dan tidak lenting sama sekali ● **Latihan soal :** Menghitung impuls dan momentum, kecepatan benda setelah tumbukan lenting	● **Kuliah tatap muka maya (zoom)** [TM: 1x(2x50")] ● **MyITS-Classroom** Sumber belajar: https://www.youtube.com/watch?v=pHJQTtEEX4M Tugas: Daring dengan MyITS Classroom; ● **Latihan soal :** Menghitung impuls dan momentum, kecepatan benda setelah tumbukan lenting	**Kerja dan Energi:** menjelaskan Impuls dan Momentum : impuls, momentum, tumbukan (elastis dan tidak elastis), pusat massa **Pustaka :** ● Halliday,R.,et all, 2014 ● Douglas C. Giancoli, 2014 ● Serway, 2004 ● Tim Dosen Fisika ITS ***Work and Energy:*** *describes Impulse and Momentum: impulse, momentum, collision (elastic and*	**3**

			● *Explanation of course material* ● *Discussion, questions and answers* ● *Doing practice problems together in a book about impulses and momentum (collisions)* ● ***Test :*** *Practice & Assignments*	sempurna, sebagian dan tidak lenting sama sekali [BM:2x(2x60")] ● ***Lectures*** ● ***Discussion*** *[FF: 1x(2x50")]* ● ***Tasks:*** *Solves problems of impulse and momentum, perfectly resilient, partially resilient and not at all resilient* ● ***excercises :*** *Calculating impulse and momentum, the velocity of the object after the collision is*	sempurna, sebagian dan tidak lenting sama sekali [BM:2x(2x60")] ● **Virtual face-to-face lecture (zoom)** [FF: 1x(2x50"] ● **MyITS-Classroom** Learning resources: https://www.youtube.com/watch?v=pHJQTtEEX4M Task: Online with MyITS Classroom; ● ***excercises :*** *Calculating impulse and momentum, the velocity of the object after the collision is perfectly*	*inelastic), center of mass* ***References :*** ● *Halliday,R.,et all, 2014* ● *Douglas C. Giancoli, 2014* ● *Serway, 2004* ● *ITS Physics Lecturer Team*	

				perfectly resilient, partly and completely non-resilient *[SS:2x(2x60")]*	*resilient, partly and completely non-resilient* *[SS:2x(2x60")]*		
	Asistensi (3) **Sub-CPMK 3**: Mahasiswa memahami azas kerja dan energi mekanik, hukum kekekalan energi mekanik impuls, momentum, kekekalan momentum, dan menerapkannya kedalam penyelesaian soal ***Assistance (3)*** ***LLO 3*** *: Students understand the principles of work and mechanical energy, the law of conservation of impulse mechanical energy, momentum, conservation of momentum, and apply it to solving problems*	● Ketepatan dalam meyelesaikan dan menghitung soal-soal tentang kosep kerja dan energi, impuls dan mometum (TM 15) ● *Accuracy to explain and calculating problems regarding the concept of work and energy, impulses and mometum (FF 15)*	**Kreteria:** Pedoman Penilaian **Non-tes :** ● Tanya-jawab lisan ● Menyalin jawaban soalsoal yang dibahas oleh asisten selama perkuliahan. **Tes :** ● Keaktifan dan ketepatan jawaban atas pertanyaan yang diajukan oleh asisten ***Criteria :*** *Marking Scheme*	● Pembahasan soal-soal terkait terkait Kerja dan Energi, Impuls dan Momentum ● Diskusi [TM: 1x(2x50")] ● *Discussion of questions related to Work and Energy, Impulse and Momentum* ● *Discussion* *[FF: 1x(2x50")]*	● **Kuliah oleh asisten melalui tatap muka secara daring;** ● **Pembahasan soal melalui group Wa, Line, dll.** [TM: 1x(2x50"] ● ***Face-to-face online lectures by assistants;*** ● ***Discussion of questions through the Wa group, Line, etc.*** *[FF: 1x(2x50"]*	**Kerja dan Energi:** Membahas soal-soal terkait Menjelaskan kerja dan energi: konsep kerja, energi kinetik, energi potensial (gravitasi dan pegas), teorema kerja energi, hukum kekekalan energi mekanik, Impuls dan Momentum **Pustaka :** ● Halliday,R.,et all, 2014 ● Douglas C. Giancoli, 2014 ● Serway, 2004 ● Tim Dosen Fisika ITS	**2**

			Non-test : ● *Verbal questions and answers* ● *Copying the answers to the questions discussed by the assistant during lectures.* ***Test :*** ● *Activeness and accuracy of answers to questions asked by the assistant*			***Work and Energy:*** *Discusses related problems explaining work and energy: the concept of work, kinetic energy, potential energy (gravity and spring), energy work theorem, conservation of mechanical energy, impulses and momentum* ***References :*** ● *Halliday,R.,et all, 2014* ● *Douglas C. Giancoli, 2014* ● *Serway, 2004* ● *ITS Physics Lecturer Team*	
5	**Sub-CPMK 5** : Mahasiswa mampu memahami konsep benda pejal, menghitung momen inersia, torsi, serta mendemontrasikannya (P). Mahasiswa mampu	● Ketepatan menjelaskan konsep dan teori dinamika rotasi, pusat massa, dan momen inersia,	**Kreteria:** Menggunakan rubrik analitik dan Pedoman Penskoran **Non-tes :**	● **Kuliah** ● **Diskusi** [TM: 1x(3x50”] ● **Tugas-5:** Menyusun ringkasan	● **Kuliah tatap muka maya (zoom);** ● **MyITS-Classroom**	**Dinamika rotasi:** Pergeseran kecepatan sudut dan percepatan sudut, momen gaya (torsi), pusat massa,	**12**

	menggunakan konsep dan teori, dan hukum kekekalan energi untuk menyelesaikan masalah-masalah dinamika rotasi pada sistem katrol, gerak menggelinding, kekekalan momentum sudut ***LLO 5** : Students are able to understand the concept of solid objects, calculate the moment of inertia, torque, and demonstrate (P). Students are able to use concepts and theories, and the law of conservation of energy to solve problems of rotational dynamics in pulley systems, rolling motion, conservation of angular momentum*	serta penggunaannya ● Ketepatan menerapkan prinsip benda tegar dan gerak menggelinding dalam penyelesaian soal-soal dinamika rotasi ● *Accuracy to explain the concepts and theories of the dynamics of rotation, center of mass, and moment of inertia, and their use* ● *Accuracy to applie the rigid body principle and rolling motion in solving rotational dynamics problems*	● Meringkas materi kuliah; **Tes :** ● Tanya jawab lisan ● Latihan menyelesaikan soal-soal dinamika rotasi dan aplikasinya ● (Tugas-5: Problem & Solving) ***Criteria :*** *Using analytical rubrics and Marking Scheme* ***Non-test :*** ● *Summarize the lecture material;* ***Test :*** ● *verbal questions and answers* ● *Exercises to solve rotational*	kuliah dan menghitung penyeleaian soal dinamika rotasi dengan kasus dalam fisika. [PT+BM:(1+1)x(3x60")] ● **Latihan soal** Latihan menyelesaikan soalsoal dinamika rotasi [PT+BM:(1+1)x(3x60")] ● ***Lecturer*** ● ***Discussion*** *[FF: 1x(3x50")]* ● ***Task-5:*** *Arrange lecture summaries and calculate the solving of rotational*	Sumber belajar: https://www.youtube.com/watch?v=fDJeVR0o w ● **Diskusi;** [TM: 1x(3x50")] ● **Tugas-1:** Menyusun ringkasan kuliah dan dan menghitung penyeleaian soal dinamika rotasi dengan kasus dalam fisika. [PT+BM:(1+1)x(3x60")] ● **Latihan soal** Latihan menyelesaikan soalsoal dinamika rotasi [PT+BM:(1+1)x(3x60")]	kesetimbangan momen gaya, momen inersia, energi kinetik rotasi, gerak menggelinding, hukum kekekalan energi (translasi dan rotasi) **Pustaka :** ● Halliday,R.,et all, 2014 ● Douglas C. Giancoli, 2014 ● Serway, 2004 ● Tim Dosen Fisika ITS **Rotational dynamics :** Angular displacement, angular velocity and angular acceleration, force moment (torque), center of mass, balance of force moment, moment	

			dynamics problems and their application ● *(Task-5: Problem & Solving)*	*dynamics problems with cases in physics.* *[SA+SS:(1+1)x(3 x60")]* ● ***Practice*** *Exercises to solve rotational dynamics problems* *[SA+SS:(1+1)x(3x 60")]*	● ***Virtual face-to-face lecture (zoom);*** ● ***MyITS-Classroom*** *Learning resources: https://www.youtube.com/watch?v=fDJeVR0o w* ● ***Discussion;*** *[FF: 1x(3x50")]* ● ***Task-1:*** *Arrange lecture summaries and calculate the solving of rotational dynamics problems with cases in physics.* *[PT+BM:(1+1)x(3x 60")]* ● ***Practice :*** *Exercises to solve rotational*	of inertia, rotational kinetic energy, rolling motion, energy conservation law (translation and rotation) ***References :*** ● *Halliday,R.,et all, 2014* ● *Douglas C. Giancoli, 2014* ● *Serway, 2004* ● *ITS Physics Lecturer Team*	

					dynamics problems *[SA+SS:(1+1)x(3x60")]*		
		● Ketepatan menghitung dan mendemonstrasikan dinamika rotasi ● *Accuracy to calculate and demonstrate rotational dynamics*	**Kreteria:** Menggunakan rubrik analitik **Non-tes :** ● Menyusun tahapan metode praktikum M5 (Momen Inersia) ● Praktikum M5 (Momen inersia) yang di dampingi oleh asisten laboratorium Fisika Dasar ● Mencatat data hasil praktikum sesuai dengan variabel yang dijelaskan oleh asisten. **Tes :**	● **Praktikum:** Modul-5 (M5): Momen Inersia, 7 jam: Tutorial/ Pre-test, Persiapan, Pelaksanaan Praktikum, Penyusunan laporan, Presentasi hasil. ● ***Practicum:*** *Module-5 (M5): Moment of Inertia, 7 hours: Tutorial / Pre-test, Preparation, Practicum*	● **Praktikum Mandiri** Memanfaatkan virtual laboratory untuk mempelajari konsep gerak rotasi dari suatu benda, sebagai contohnya penggunaan aplikasi PhET (https://phet.colorado.edu/) ● ***Independent Practicum*** *Use a virtual laboratory to learn the concept of rotational*		**5**

			● Tes pendahuluan lisan. ● Membuat laporan akhir ● Presentasi hasil ***Criteria :*** *Using the holistic rubric* ***Non-test :*** ● *Arrange the stages of the M5 practicum method (Moment of Inertia)* ● *Practicum M5 (Moment of inertia) accompanied by Basic Physics laboratory assistant* ● *Record practicum*	*Implementation, Report preparation, Presentation of results.*	*motion of an object, for example using the PhET application (https://phet.colorado.edu/)*		

			result data according to the variables described by the assistant. ***Test :*** ● *Verbal preliminary test.* ● *Make the final report* ● *Presentation of results*				
	Asistensi **Assistance**	● Ketepatan menghitung penyelesaian soal - soal dinamika rotasi melalui asistensi ● *Accuracy to calculate the completion of the rotational dynamics problems through assistance*	**Kreteria:** Menggunakan rubrik analitik dan pedoman penskoran **Non-tes :** ● Tanya -jawab lisan ● Latihan soal yang dibahas dengan asisten **Tes :** ● Keaktifan dan ketepatan jawaban atas	● **Diskusi** [TM: 1x(3x50")] ● **Latihan soal** Latihan dan pembahasan penyelesaian soal-soal dinamika rotasi [PT+BM:(1 + 1)x(3x60")] ● ***Discussion*** *[FF: 1x(3x50")]*	● **Kuliah dengan asisten melalui tatap muka maya (Zoom)** ; ● Diskusi Online (Chatting) pembahasan soal melalui email, group WA, Line, dll. [TM: 1x(3x50")] ● **Latihan soal** Latihan dan pembahasan penyelesaian		**4**

			pertanyaan yang diajukan oleh asisten ***Criteria :*** *Using analytical rubrics and Marking Scheme* ***Non-test :*** ● *Verbal questions and answers* ● *Practice questions discussed with assistants* ● *Record practicum result data according to the variables described by the assistant.* ***Tess :*** ● *Activeness and accuracy to answer to questions*	● ***Practice*** *Exercises and discussions to solve rotational dynamics problems* *[SA+SS:(1 + 1)x(3x60")]*	soal-soal dinamika rotasi [PT+BM:(1+1)x(3x 60")] ● ***Virtual face-to-face Lecture with assistants (Zoom);*** ● *Online Discussion (Chat) discussing questions via email, WA group, Line, etc.* *[FF: 1x(3x50")]* ● ***Practice*** *Exercises and discussions to solve rotational dynamics problems* *[SA+SS:(1+1)x(3x6 0")]*		

			asked by the assistant				
6	**Sub-CPMK 6**: Mahasiswa memahami dan mampu menerapkan konsep gerak harmonis sederhana, energi gerak harmonis sederhana, bandul matematis, bandul fisis, bandul punter dan mampu mendemonstrasikannya, serta mampu menghitung gabungan getaran selaras (sejajar dan tegak lurus) ***LLO 6 :*** *Students understand and are able to apply the concept of simple harmonic motion, simple harmonic motion energy, mathematical pendulum, physical pendulum, punter pendulum and are able to demonstrate them, and are able to calculate the combination of harmonious vibrations (parallel and perpendicular)*	● Ketepatan dalam menerangkan secara tulisan dan verbal dengan tepat terhadap konsep energi pada gerak harmonis sederhana, bandul matematis, bandul fisis, bandul puntir, gabungan getaran selaras (sejajar dan tegak lurus) ● *Accuracy in writing and verbally explaining the concept of energy in simple harmonic motion, mathematical pendulum, physical pendulum, torsional pendulum, combination of harmonious*	**Kreteria:** Menggunakan rubrik analitik dan pedoman penskoran **Non-tes :** ● Meringkas materi kuliah; ● Memberikan ide sederhana aplikasi **Tes :** ● Tanya jawab lisan ● Latihan menyelesaikan soal-soal mengenai harmonis sederhana, bandul matematis, bandul fisis, bandul puntir, gabungan getaran selaras	● **Kuliah** ● **Diskusi** [TM: 1x(2x50")] ● **Tugas-1:** Menyusun ringkasan kuliah dan mengerjakan contoh latihan soal yang diberikan dalam kuliah [PT+BM:(1+1)x(2 x60")] ● **Latihan soal** Latihan menyelesaikan soalsoal aplikasi harmonis sederhana, bandul matematis, bandul fisis, bandul puntir,	● **Kuliah tatap muka maya (Zoom);** ● **MyITS-Classroom** sumber belajar : https://www.youtube.com/watch?v=pKKfmthLNmQ;https://www.youtube.com/watch?v=aMas-Z8K2-I; https://www.youtube.com/watch?v=_o0_lJCnMQE https://www.youtube.com/watch?v=NN--nwtXrsw;https://www.youtube.com/watch?v=X6Hz0rPzxvc; https://www.y	**Getaran:** harmonis sederhana, bandul matematis, bandul fisis, bandul puntir, gabungan getaran selaras (sejajar dan tegak lurus) **Pustaka :** ● Halliday,R.,et all, 2014 ● Douglas C. Giancoli, 2014 ● Serway, 2004 ● Tim Dosen Fisika ITS ***Vibration:*** *simple harmonic, mathematical pendulum, physical pendulum, torsional pendulum, combination of harmonious vibrations (parallel and perpendicular)*	**12**

		vibrations (parallel and perpendicular)	(sejajar dan tegak lurus) ● (Tugas-1: Problem & Solving) ***Criteria :*** *Using analytical rubrics and Marking Scheme* ***Non-test :*** ● *Summarize the lecture material;* ● *Give a simple idea of the application* ***Test :*** ● *verbal questions and answers* ● *Exercises to solve problems regarding simple harmonies, mathematical pendulum,*	gabungan getaran selaras (sejajar dan tegak lurus) [PT+BM:(1+1)x(2x60")] ● ***Lectures*** ● ***Discussion*** *[FF: 1x(2x50")]* ● ***Task-1:*** *Arrnge lecture summaries and work on practice questions given in the lecture* *[SA+SS:(1+1)x(2x60")]* ● ***Practice*** *Exercises to solve problems regarding simple*	outube.com/watch?v=cj4XTyW6ums ● Diskusi; [TM: 1x(2x50")] Tugas-1: Menyusun ringkasan kuliah dan mengerjakan contoh latihan soal yang diberikan dalam kuliah [PT+BM:(1+1)x(2x60")] ● **Latihan soal** Latihan menyelesaikan soal-soal aplikasi harmonis sederhana, bandul matematis, bandul fisis, bandul puntir, gabungan getaran selaras	***References :*** ● *Halliday,R.,et all, 2014* ● *Douglas C. Giancoli, 2014* ● *Serway, 2004* ● *ITS Physics Lecturer Team*	

			physical pendulum, torsional pendulum, combination of harmonious vibrations (parallel and perpendicular) ● *(task-1: Problem & Solving)*	*harmonies, mathematical pendulum, physical pendulum, torsional pendulum, combination of harmonious vibrations (parallel and perpendicular)* *[SA+SS:(1+1)x(2x60")]*	(sejajar dan tegak lurus) [PT+BM:(1+1)x(2x 60")] ● ***Virtual face-to-face lecture (Zoom);*** ● ***MyITS-Classroom*** *Learning resources : https://www.youtube.com/watch?v=pKKfmthLNmQ;https://www.youtube.com/watch?v=aMas-Z8K2-I; https://www.youtube.com/watch?v=_o0_lJCnMQE https://www.youtube.com/watch?v=NN--nwtXrsw;https://www.youtub*		

					e.com/watch?v=X6Hz0rPzxvc; https://www.youtube.com/watch?v=cj4XTyW6ums ● *Discussion;* *[FF: 1x(2x50")]* *Task-1: Arrange lecture summaries and work on practice questions given in the lecture* *[SA+SS:(1+1)x(2x60")]* ● **Practice** *Exercises to solve problems regarding simple harmonies, mathematical pendulum, physical pendulum, torsional pendulum,*		

					combination of harmonious vibrations (parallel and perpendicular) [SA+SS:(1+1)x(2x60”)]		
	Praktikum Mahasiswa mampu menggunakan getaran, hukum Hooke pada konsep bandul matematis dan bandul fisis. ***Practicum*** *Students are able to use vibration, Hooke's law on the concept of a mathematical pendulum and physical pendulum.*	● Ketepatan menghitung dan mendemonstrasikan terkat perbedaan sistem bandul matematis dan bandul fisis. ● *Accuracy to calculate and demonstrate the difference between the mathematical pendulum system and the physical pendulum system.*	**Kriteria:** Rubrik Modul praktikum Fisika Dasar 1 **Non-tes:** ● Praktikum di dampingi oleh asisten lab. ● Mencatat Data hasil praktikum, acc asisten. **Tes:** ● Tes pendahuluan lisan. ● Laporan akhir ● presentasi **criteria:** Rubric	● **Praktikum:** Modul G1 dan G2 : Bandul matematis dan Bandul Fisis 7 jam: Tutorial / Pretest, Persiapan, Pelaksanaan Praktikum, Penyusunan laporan, Presentasi hasil. ● *Practicum: Module G1 and G2: Mathematical*	● **Praktikum Mandiri Menggunakan program animasi yang telah disiapkan oleh TIM ITS** ● ***Independent Practicum Using an animation program that has been prepared by the ITS TEAM***		**5**

			Physics 1 practicum module **Non-test:** ● *Practicum accompanied by lab assistants.* ● *Record data on practicum results, assistant acc.* ***Test:*** ● *Verbal preliminary test* ● *Final report* ● *presentation*	*pendulum and physical pendulum* *7 hours: Tutorial / Pretest, Preparation, Practicum Implementation, Report preparation, Presentation of results.*			
	Asistensi Mahasiswa mampu menerapkan konsep gerak harmonis sederhana, energi gerak harmonis sederhana, bandul matematis, bandul fisis, bandul punter serta mampu menghitung gabungan getaran selaras (sejajar dan tegak lurus)	● Ketepatan menghitung penyelesaian soalsoal berkenaan dengan konsep gabungan dua getaran selaras dan tegak lurus. ● *Accuracy to calculate the*	**Kriteria:** Pedoman Penskoran (Marking Scheme) **Non-tes:** ● Tanya-jawab lisan ● Menyalin jawaban soalsoal yang dibahas oleh	● Pembahasan soal-soal berkenaan energi osilasi dan gabungan dua getaran baik selaras maupun tegak lurus. • Diskusi ● Diskusi	● Pembahasan soal – soal tatap maya (Zoom, melalui group WA, LINE, dll.) berkenaan dengan energi osilasi dan gabungan dua getaran		**2**

	Assistance *Students are able to apply the concept of simple harmonic motion, simple harmonic motion energy, mathematical pendulum, physical pendulum, punter pendulum and able to calculate the combination of harmonious vibrations (parallel and perpendicular)*	*solution of the problem relates to the combined concept of two vibrations in harmony and perpendicularity.*	asisten selama perkuliahan. **Tes:** ● Keaktifan dan ketepatan jawaban atas pertanyaan yang diajukan oleh asisten ***Criteria:*** *Marking Scheme* ***Non-test:*** ● *Verbal questions and answers* ● *Copying the answers of the questions discussed by the assistant during lectures.* ***Test:*** ● *Activeness and accuracy of answers to questions*	[TM: 1x(3x50”] ● *Discussion of problems regarding oscillation energy and the combination of two vibrations both aligned and perpendicular* ● *Discussion* *[FF: 1x(3x50”]*	[TM: 1x(3x50”)] ● *Virtual face-to-face discussion (Zoom, via the WA group, LINE, etc.) regarding oscillation energy and a combination of two vibrations* *[FF: 1x(3x50”)]*		

			asked by the assistant				
7	**Sub-CPMK7:** Mahasiswa mampu menggunakan konsep elastisitas, teori hidrostatis yang meliputi: tekanan hidrostatis, prinsip Pascal, Archimedes, Tegangan Permukaan dan Kapilaritas. Mampu menggunakan konsep hidrodinamika yang meliputi: persamaan kontinyuitas dan Bernoulli. ***Sub-CPMK7:*** *Students are able to use the concept of elasticity, hydrostatic theory which includes: hydrostatic pressure, Pascal's principle, Archimedes, Surface Tension and Capillary. Able to use hydrodynamic concepts which include: continuity and Bernoulli equations.*	● Ketepatan menjelaskan tentang konsep elastisitas, teori hidrostatis, prinsip Pascal, Archimedes, Tegangan Permukaan dan Kapilaritas ● menghitung penyelesaian soal-soal berkenaan dengan elastisitas, hidrostatis, prinsip Pascal, Archimedes, dan Tegangan Permukaan ● *Accuracy to explain the concept of elasticity, hydrostatic theory, Pascal's principle, Archimedes, Surface Tension and Capillary.*	**Kreteria:** Menggunakan pedoman penskoran **Non-tes :** ● Meringkas materi kuliah; ● Tanya-jawab lisan ● Menyalin contoh soal **Tes :** ● Latihan soal ***Criteria :*** *Using Marking Scheme* ***Non-test :*** ● *Summarize the lecture material* ● *Verbal questions and answers*	● **Kuliah** ● **Diskusi** [TM:1x(3x50")] ● **Tugas :** Menyusun ringkasan kuliah dan menghitung berhubungan dengan elastisitas, teori hidrostatis, prinsip Pascal, Archimedes, Tegangan Permukaan dan Kapilaritas [PT+BM:(1+1)x(3x50")] ● ***Lectures*** ● ***Discussion*** *[FF:1x(3x50")]*	● **Kuliah tatap muka maya (zoom)** ● **Diskusi** [TM : 1x(3x50'')] ● **Tugas**: Menyusun ringkasan kuliah dan menghitung berkenaan teori elastisitas, hidrostatis, prinsip Pascal, Archimedes, Tegangan Permukaan, dan Kapilaritas [PT+BM:(1+1)x(3x50")] **Praktikum Mandiri Menggunakan program animasi**	**Mekanika fluida**: elastisitas, tekanan hidrostatika, prinsip Pascal, prinsip Archimedes, tegangan permukaan dan kapilaritas ***Fluid mechanics:*** *elasticity, hydrostatic pressure, Pascal's principle, Archimedes principle, surface tension and capillary*	**5**

		● *calculating the solution of problems with respect to elasticity, hydrostatics, Pascal's principle, Archimedes, and Surface Tension*	● *Copying sample questions* ***Test :*** ● *Exercises*	● ***Task :*** *Arangging lecture summaries and calculating related to elasticity, hydrostatic theory, Pascal's principle, Archimedes, Surface Tension and Capillary* *[SA+SS:(1+1)x(3 x50")]*	**tentang viskositas cairan yang telah disiapkan oleh TIM ITS** ● **Virtual face-to-face lecture (zoom)** ● **Discussion** [FF : 1x(3x50'')] ● ***Task :*** *Arangging lecture summaries and calculating related to elasticity, hydrostatic theory, Pascal's principle, Archimedes, Surface Tension and Capillary* *[SA+SS:(1+1)x(3x5 0")]*		

	Praktikum ***Practicum***	● Ketepatan menghitung dan mendemonstrasikan viskositas cairan. ● *Accuracy to calculate and demonstrating the viscosity of fluids.*	**Kriteria:** Rubrik Modul praktikum Fisika Dasar 1 **Non-tes:** ● Praktikum di dampingi oleh asisten lab. ● Mencatat Data hasil praktikum, acc asisten. **Tes :** ● Tes pendahuluan lisan. ● Laporan akhir ● presentasi ***criteria:*** *Rubric Physics 1 practicum module* ***Non-test:*** ● *Practicum accompanied by lab assistants.*	**Modul:** Viskositas cairan 7 jam: Tutorial / Pretes, Persiapan, Pelaksanaan Praktikum, Penyusunan laporan, Presentasi hasil. ***Module:*** *Viscosity of liquid* *7 hours: Tutorial / Pretest, Preparation, Practicum Implementation, Report preparation, Presentation of results.*	**Praktikum Mandiri Menggunakan program animasi tentang viskositas cairan yang telah disiapkan oleh TIM ITS** ***Independent Practicum Using an animation program on liquid viscosity that has been prepared by the ITS TEAM***		

			● *Record data on practicum results, assistant acc.* ***test*** ● *Verbal preliminary test* ● *Final report* ● *presentation*				
	Asistensi Mahasiswa mampu menggunakan konsep dan teori hidrostatis, prinsip Pascal, Archimedes, Tegangan Permukaan, Bernoulli dalam menyelesaikan masalahmasalah mekanika fluida ***Assistance*** *Students are able to use hydrostatic concepts and theories, Pascal's principles, Archimedes, Surface Tension, Bernoulli in solving fluid mechanics problems.*	● Ketepatan menghitung penyelesaian soalsoal berkenaan dengan konsep dan teori hidrostatis, prinsip Pascal, Archimedes, Tegangan Permukaan, Bernoulli ● *Accuracy to calculate the solving of problems related to hydrostatic concepts and theories, Pascal's principle,*	**Kreteria:** Pedoman Penskoran **Non-tes :** ● Tanya-jawab lisan ● Menyalin jawaban soal-soal yang dibahas oleh asisten selama perkuliahan **Tes :** - Keaktifan dan ketepatan jawaban atas pertanyaan yang diajukan oleh asisten	● **Pembahasan soal – soal** berkenaan teori elastisitas, hidrostatis, prinsip Pascal, Archimedes, Tegangan Permukaan, Bernoulli dalam menyelesaikan masalahmasalah mekanika fluida ● **Diskusi**, [TM: 1x(3x50")]	● **Pembahasan soal – soal tatap maya (Zoom, melalui group WA, LINE, dll.)** berkenaan dengan teori hidrostatis, prinsip Pascal, Archimedes, Tegangan Permukaan, Bernoulli dalam menyelesaikan masalah-masalah	● Mekanika fluida: elastisitas, tekanan hidrostatika, prinsip Pascal, prinsip Archimedes, tegangan permukaan, persamaan kontinuitas, persamaan Bernoulli, viskositas ● ***Fluid mechanics****: elasticity, hydrostatic pressure, Pascal's*	**2**

		Archimedes, Surface Tension, Bernoulli	***Criteria :*** *Marking Scheme* ***Non-test :*** ● *Verbal questions and answers* ● *Copying the answers of the questions discussed by the assistant during lectures* ***Test:*** *Activeness and accuracy of answers to questions asked by the assistant*	● ***Discussion of problems*** *regarding the theory of elasticity, hydrostatics, Pascal's principle, Archimedes, Surface Tension, Bernoulli in solving fluid mechanics problems* ● ***Discussion,*** *[FF: 1x(3x50")]*	mekanika fluida [TM: 1x(3x50")] ● **MyITS-Classroom:** Sumber belajar: https://www.youtube.com/watch?v=UJ3-Zm1wbIQ ● ***virtual face-to-face discussion of problems (Zoom, via the WA group, LINE, etc.)*** *regarding hydrostatic theory, Pascal's principle, Archimedes, Surface Tension, Bernoulli in solving fluid*	*principle, Archimedes principle, surface tension, continuity equation, Bernoulli's equation, viscosity*	

					mechanics problems *[FF: 1x(3x50")]* ● ***MyITS-Classroom:*** *Learning resource: https://www.youtube.com/watch?v=UJ3-Zm1wbIQ*		

TM=Tatap Muka, **PT**=Penugasan Terstuktur, **BM**=Belajar Mandiri.
***FF** = Face to Face, **SA** = Structured Assignment, **SS** = Self Study.*

II. Rencana Asesmen & Evaluasi (RAE) / *Assessment & Evaluation Plan*

	ASSESSMENT & EVALUATION PLAN BACHELOR DEGREE PROGRAM OF BIOMEDICAL ENGINEERING - FTEIC ITS **Course : Physics 1**		**RA&E** Write Doc Code
Kode/*code*: **SF184101**	**Bobot sks/*credits* (T/P): 3/0**	**Rumpun MK: Ilmu Dasar Teknik** ***Course Cluster: Basic Engineering***	Smt: I
OTORISASI ***AUTHORIZATION***	**Penyusun RA & E** ***Compiler A&EP*** **Ir. Tutug Dhanardono.**	**Koordinator RMK** ***Course Cluster Coordinator*** **Dimas Anton Asfani, ST., MT., Ph.D**	**Ka DEP** ***Head of DEP*** **Dedet Candra Riawan, ST., M.Eng., Ph.D.**

Mg ke/ *Week* (1)	**Sub CP-MK / *Lesson Learning Outcomes (LLO)* (2)**	**Bentuk Asesmen (Penilaian) *Form of Assessment* (3)**	**Bobot / *Load* (%) (4)**
1-2	**Sub-CPMK1**: Mahasiswa mampu menjelaskan dan menggunakan besaran, satuan, dan vektor, serta mampu menerapkan operasi matematika pada vektor secara geometris dan analitis untuk menyelesaikan permasalahan vektor. ***LLO 1:*** *Students are able to explain and use magnitude, units, and vector, also able to apply mathematical operations on vector geometrically and analytically to solving vector problems.*	**Non-tes :** ● Meringkas materi kuliah. **Tes :** ● Tanya jawab lisan ● Latihan menyelesaikan soal-soal mengenai besaran fisika, satuan, besaran skalar, besaran vektor serta aljabar vektor ● (Tugas-1: Problem & Solving) ***Non-test :*** ● *Summarize the lecture material.* ***Test :*** ● *Verbal questions and answers* ● *Exercises to solve problems regarding physical quantities, units, scalar quantities, vector quantities and vector algebra* *Task-1: Problem & Solving.*	10
3-6	**Sub-CPMK2**: Mahasiswa Mampu mendefinisikan	**Non-tes :** Meringkas materi kuliah dan tanya jawab lisan.	2

	pergeseran posisi, kecepatan, percepatan gerak lurus dan melengkung secara grafis dan matematis serta mendemontrasikannya (P). ***LLO 2 :*** *Students are able to define shifts in position, velocity, acceleration of linearand curved motion graphically and mathematically and demonstrate (P).*	**Tes:** Latihan soal ***Non-test :*** *Summarize the course material and verbal questions and answers.* ***Test:*** *exercises*	
		Non-tes : ● Tanya-jawab lisan ● Menyalin jawaban soalsoal yang dibahas selama perkuliahan **Tes:** ● Kuis 1 ● Latihan Soal ● Tugas rumah ***Non-test*** ● *Verbal questions and answers* ● *Copying answers discussed during lectures* ***Test:*** ● *Quiz 1* ● *Exercises* ● *Home work*	7
	Praktikum **Sub-CPMK3:** Mampu menggunakan konsep dan teori pergeseran posisi, kecepatan, percepatan gerak lurus dan melengkung serta mendemontrasikannya (M-4) ***Practicum*** ***Sub-CPMK3:*** *Students are able to use and demonstrate the concepts and theories of position shift, velocity, acceleration of straight and curved motion (M-4)*	**Non-tes:** ● Praktikum di dampingi oleh asisten lab. ● Mencatat Data hasil praktikum, acc asisten. **Tes :** ● Tes pendahuluan lisan. ● Laporan akhir ● presentasi ***Non-test:*** ● *Practicum accompanied by lab assistants.* ● *Record data on practicum results, assistant acc.* ***test*** ● *Verbal preliminary test* ● *Final report* ● *presentation*	5
	Asistensi **Sub-CPMK 3:** Mahasiswa mampu menggunakan	**Non-tes :** ● Tanya-jawab lisan	2

	konsep dan teori pergeseran posisi, kecepatan, percepatan gerak lurus dan melengkung serta mendemontrasikannya (P). ***Assistance*** ***Sub-CPMK 3****: Students are able to use the concepts and theories of shifting position, velocity, acceleration of straight and curved motion and demonstrate it (P).*	● Menyalin jawaban soal-soal yang dibahas oleh asisten selama perkuliahan **Tes :** ● Keaktifan dan ketepatan jawaban atas pertanyaan yang diajukan oleh asisten ***Non-test :*** ● *Verbal questions and answers* ● *Copying the answers of the questions discussed by the assistant during lectures* ***Test:*** *Activeness and accuracy of answers to questions asked by the assistant*	
3	**Sub-CPMK3:** Mahasiswa Mampu menggunakan konsep dan teori Newton I, II, dan III untuk menguraikan gaya-gaya pada berbagai sistem benda, serta mendemontrasikannya (P). ***Sub-CPMK3:*** *Students are able to use Newton I, II, and III concepts and theories to describe the forces in various systems of objects, and demonstrate them (P).*	**Non-tes :** ● Meringkas materi kuliah ● Tanya jawab lisan. ● Menyalin contoh soal **Tes:** Latihan soal ***Non-test :*** ● *Summarize the course material* ● *verbal questions and answers.* ● *Copying sample questions* ***Test:*** *exercises*	2
		Non-tes : ● Tanya jawab lisan. ● Menyalin jawaban soalsoal yang dibahas selama perkuliahan **Tes:** ● kuis 1 ● Latihan soal ● Tugas Rumah ***Non-test :*** ● *Verbal questions and answers.* ● *Copying answers of questions discussed during lec*tures ***Test:*** ● *Quiz 1*	7

		● *Exercises* ● *Home work*	
	Praktikum **Sub-CPMK 3**: Mahasiswa mampu menggunakan konsep dan teori Newton I, II, dan III untuk menyelesaikan masalah gaya-gaya dalam fisika, serta mendemontrasikannya (M-4). ***Practicum*** ***LLO 3 :*** *Students are able to use Newton I, II, and III concepts and theories to solve problems of forces in physics, and demonstrate them (M-4).*	**Non-tes:** ● Praktikum di dampingi oleh asisten lab. ● Mencatat Data hasil praktikum, acc asisten. **Tes :** ● Tes pendahuluan lisan. ● Laporan akhir ● presentasi ***Non-test:*** ● *Practicum accompanied by lab assistants.* ● *Record data on practicum results, assistant acc.* ***test*** ● *Verbal preliminary test* ● *Final report* ● *presentation*	5
	Asistensi **Sub-CPMK 3**: Mahasiswa mampu menggunakan konsep dan teori Newton I, II, dan III untuk menyelesaikan masalah gaya-gaya dalam fisika, serta mendemontrasikannya (P). ***Asistance*** ***LLO 3 :*** *Students are able to use Newton I, II, and III concepts and theories to solve problems of forces in physics, and demonstrate them (P).*	**Non-tes :** ● Tanya-jawab lisan ● Menyalin jawaban soal-soal yang dibahas oleh asisten selama perkuliahan **Tes :** ● Keaktifan dan ketepatan jawaban atas pertanyaan yang diajukan oleh asisten ***Non-test :*** ● *Verbal questions and answers* ● *Copying the answers of the questions discussed by the assistant during lectures* ***Test:*** *Activeness and accuracy of answers to questions asked by the assistant*	2
4	**Sub-CPMK 4** : Mahasiswa memahami azas kerja dan energi mekanik, hukum kekekalan energi mekanik, impuls, momentum, kekekalan momentum, dan	**Non-tes :** ● Penjelasan materi kuliah ● Diskusi dan tanya-jawab ● Mengerjakan latihan soal bersama-sama di buku tentang konsep kerja dan energi ● **Tes :** Latihan soal & Tugas	3

	menerapkannya kedalam penyelesaian soal ***LLO 4** : Students understand the principles of work and mechanical energy, the law of conservation of mechanical energy, impulses, momentum, conservation of momentum, and apply them to solving problems*	***Non-test :*** ● *Explanation of course material* ● *Discussion, questions and answers* ● *Doing practice questions together in books about the concept of work and energy* ● ***Test :*** *Practice & Assignments*	
		Non-tes : ● Penjelasan materi kuliah ● Diskusi dan tanya-jawab ● Mengerjakan latihan soal bersama-sama di buku tentang hukum kekekalan energi ● **Tes :** Latihan soal & Tugas ***Non-test :*** ● *Explanation of course material* ● *Discussion, questions and answers* ● *Doing practice problems together in books about the law of conservation of energy* ● ***Test :*** *Practice & Assignments*	3
		Non-tes : ● Penjelasan materi kuliah ● Diskusi dan tanya-jawab ● Mengerjakan latihan soal bersama-sama di buku tentang Impuls dan momentum (tumbukan) ● **Tes :** Latihan soal & Tugas ***Non-test :*** ● *Explanation of course material* ● *Discussion, questions and answers* ● *Doing practice problems together in a book about impulses and momentum (collisions)* ● ***Test :*** *Practice & Assignments*	3
	Asistensi (3) **Sub-CPMK 3**: Mahasiswa memahami azas kerja dan energi mekanik, hukum kekekalan energi mekanik impuls, momentum, kekekalan momentum, dan menerapkannya	**Non-tes :** ● Tanya-jawab lisan ● Menyalin jawaban soalsoal yang dibahas oleh asisten selama perkuliahan. **Tes :** ● Keaktifan dan ketepatan jawaban atas pertanyaan yang diajukan oleh asisten ***Non-test :***	2

	kedalam penyelesaian soal ***Assistance (3)*** ***LLO 3*** *: Students understand the principles of work and mechanical energy, the law of conservation of impulse mechanical energy, momentum, conservation of momentum, and apply it to solving problems*	● *Verbal questions and answers* ● *Copying the answers to the questions discussed by the assistant during lectures.* ***Test :*** ● *Activeness and accuracy of answers to questions asked by the assistant*	
5	**Sub-CPMK 5** : Mahasiswa mampu memahami konsep benda pejal, menghitung momen inersia, torsi, serta mendemontrasikannya (P). Mahasiswa mampu menggunakan konsep dan teori, dan hukum kekekalan energi untuk menyelesaikan masalah-masalah dinamika rotasi pada sistem katrol, gerak menggelinding, kekekalan momentum sudut ***LLO 5*** *: Students are able to understand the concept of solid objects, calculate the moment of inertia, torque, and demonstrate (P). Students are able to use concepts and theories, and the law of conservation of energy to solve problems of rotational dynamics in pulley systems, rolling motion, conservation of angular momentum*	**Non-tes :** ● Meringkas materi kuliah; **Tes :** ● Tanya jawab lisan ● Latihan menyelesaikan soal-soal dinamika rotasi dan aplikasinya ● (Tugas-5: Problem & Solving) ***Non-test :*** ● *Summarize the lecture material;* ***Test :*** ● *verbal questions and answers* ● *Exercises to solve rotational dynamics problems and their application* ● *(Task-5: Problem & Solving)*	12
		Non-tes : ● Menyusun tahapan metode praktikum M5 (Momen Inersia) ● Praktikum M5 (Momen inersia) yang di dampingi oleh asisten laboratorium Fisika Dasar ● Mencatat data hasil praktikum sesuai dengan variabel yang dijelaskan oleh asisten. **Tes :** ● Tes pendahuluan lisan. ● Membuat laporan akhir ● Presentasi hasil ***Non-test :*** ● *Arrange the stages of the M5 practicum method (Moment of Inertia)*	5

		● *Practicum M5 (Moment of inertia) accompanied by Basic Physics laboratory assistant* ● *Record practicum result data according to the variables described by the assistant.* ***Test :*** ● *Verbal preliminary test.* ● *Make the final report* *Presentation of results*	
	Asistensi **Asistance**	**Non-tes :** ● Tanya -jawab lisan ● Latihan soal yang dibahas dengan asisten **Tes :** ● Keaktifan dan ketepatan jawaban atas pertanyaan yang diajukan oleh asisten ***Non-test :*** ● *Verbal questions and answers* ● *Practice questions discussed with assistants* ● *Record practicum result data according to the variables described by the assistant.* ***Tess :*** *Activeness and accuracy to answer to questions asked by the assistant*	4
6	**Sub-CPMK 6**: Mahasiswa memahami dan mampu menerapkan konsep gerak harmonis sederhana, energi gerak harmonis sederhana, bandul matematis, bandul fisis, bandul punter dan mampu mendemonstrasikannya, serta mampu menghitung gabungan getaran selaras (sejajar dan tegak lurus) ***LLO 6 :*** *Students understand and are able to apply the concept of simple harmonic motion, simple harmonic motion energy, mathematical pendulum, physical pendulum, punter*	**Non-tes :** ● Meringkas materi kuliah; ● Memberikan ide sederhana aplikasi **Tes :** ● Tanya jawab lisan ● Latihan menyelesaikan soal-soal mengenai harmonis sederhana, bandul matematis, bandul fisis, bandul puntir, gabungan getaran selaras (sejajar dan tegak lurus) ● (Tugas-1: Problem & Solving) ***Non-test :*** ● *Summarize the lecture material;* ● *Give a simple idea of the application* ***Test :*** ● *verbal questions and answers* ● *Exercises to solve problems regarding simple harmonies, mathematical pendulum, physical pendulum, torsional pendulum, combination of harmonious vibrations (parallel and perpendicular)* ● *(task-1: Problem & Solving)*	12

	pendulum and are able to demonstrate them, and are able to calculate the combination of harmonious vibrations (parallel and perpendicular)		
	Praktikum Mahasiswa mampu menggunakan getaran, hukum Hooke pada konsep bandul matematis dan bandul fisis. ***Practicum*** *Students are able to use vibration, Hooke's law on the concept of a mathematical pendulum and physical pendulum.*	**Non-tes:** ● Praktikum di dampingi oleh asisten lab. ● Mencatat Data hasil praktikum, acc asisten. **Tes:** ● Tes pendahuluan lisan. ● Laporan akhir ● presentasi **Non-test:** ● *Practicum accompanied by lab assistants.* ● *Record data on practicum results, assistant acc.* ***Test:*** ● *Verbal preliminary test* ● *Final report presentation*	5
	Asistensi Mahasiswa mampu menerapkan konsep gerak harmonis sederhana, energi gerak harmonis sederhana, bandul matematis, bandul fisis, bandul punter serta mampu menghitung gabungan getaran selaras (sejajar dan tegak lurus) ***Assistance*** *Students are able to apply the concept of simple harmonic motion, simple harmonic motion energy, mathematical pendulum, physical pendulum, punter pendulum and able to calculate the combination of harmonious vibrations*	**Non-tes :** ● Tanya-jawab lisan ● Menyalin jawaban soal-soal yang dibahas oleh asisten selama perkuliahan **Tes :** - Keaktifan dan ketepatan jawaban atas pertanyaan yang diajukan oleh asisten ***Non-test :*** ● *Verbal questions and answers* ● *Copying the answers of the questions discussed by the assistant during lectures* ***Test:*** *Activeness and accuracy of answers to questions asked by the assistant*	2

	(parallel and perpendicular)		
7	**Sub-CPMK7:** Mahasiswa mampu menggunakan konsep elastisitas, teori hidrostatis yang meliputi: tekanan hidrostatis, prinsip Pascal, Archimedes, Tegangan Permukaan dan Kapilaritas. Mampu menggunakan konsep hidrodinamika yang meliputi: persamaan kontinyuitas dan Bernoulli. ***Sub-CPMK7:*** *Students are able to use the concept of elasticity, hydrostatic theory which includes: hydrostatic pressure, Pascal's principle, Archimedes, Surface Tension and Capillary. Able to use hydrodynamic concepts which include: continuity and Bernoulli equations.*	**Kreteria:** Menggunakan pedoman penskoran **Non-tes :** ● Meringkas materi kuliah; ● Tanya-jawab lisan ● Menyalin contoh soal **Tes :** ● Latihan soal ***Criteria :*** *Using Marking Scheme* ***Non-test :*** ● *Summarize the lecture material* ● *Verbal questions and answers* ● *Copying sample questions* ***Test :*** ● *Exercises*	5
		Kriteria: Rubrik Modul praktikum Fisika Dasar 1 **Non-tes:** ● Praktikum di dampingi oleh asisten lab. ● Mencatat Data hasil praktikum, acc asisten. **Tes :** ● Tes pendahuluan lisan. ● Laporan akhir ● presentasi ***criteria:*** *Rubric* *Physics 1 practicum module* ***Non-test:*** ● *Practicum accompanied by lab assistants.* ● *Record data on practicum results, assistant acc.* ***test*** ● *Verbal preliminary test* ● *Final report* ● *presentation*	
	Asistensi Mahasiswa mampu menggunakan konsep dan teori hidrostatis, prinsip Pascal, Archimedes, Tegangan	**Non-tes:** ● Tanya-jawab lisan ● Menyalin jawaban soalsoal yang dibahas oleh asisten selama perkuliahan. **Tes:**	2

	Permukaan, Bernoulli dalam menyelesaikan masalahmasalah mekanika fluida ***Assistance*** *Students are able to use hydrostatic concepts and theories, Pascal's principles, Archimedes, Surface Tension, Bernoulli in solving fluid mechanics problems.*	● Keaktifan dan ketepatan jawaban atas pertanyaan yang diajukan oleh asisten ***Non-test:*** ● *Verbal questions and answers* ● *Copying the answers of the questions discussed by the assistant during lectures.* ***Test:*** *Activeness and accuracy of answers to questions asked by the assistant*	
		Total bobot penilaian ***Total assessment load***	**100%**

- **Indikator Pencapaian CPL Pada MK / *Indicator of PLO achievement charged to the course***

CPL yang dibebankan pada MK / *PLO charged to the course*	**CPMK / *Course Learning Outcome (CLO)***	**Minggu ke / *Week***	**Bentuk Asesmen / *Form of Assessment***	**Bobot / *Load* (%)**
CPL-06 / *PLO-06*	CPMK 1 / *CLO 1*		Tugas 1 / *Task 1*	10
			Tugas 2 / *Task 2*	3
			Tugas 3 / *Task 3*	3
			Tugas 4 / *Task 4*	12
CPL-03 / *PLO-03*	CPMK 2 / *CLO 2*		Praktikum-1 / *Practicum 1*	5
			Praktikum-2 / *Practicum 2*	5
			Praktikum-3 / *Practicum 3*	5
			Praktikum-4 / *Practicum 4*	5
			Praktikum-5 / *Practicum 5*	5
CPL-03 / *PLO-03*	CPMK 3 / *CLO 3*		Kuis 1 / *Quiz 1*	7
			Mid Exam	20
			Final Exam	20
				∑ = 100%

No	Form of Assessment	PLO-01	PLO-02	PLO-03	PLO-04	PLO-05	PLO-06	PLO-07	PLO-08	PLO-09	PLO-10	PLO-11	PLO-12	Total
1	*Task 1*						0.1							**0.1**
2	*Task 2*						0.03							**0.03**
3	*Task 3*						0.03							**0.03**
4	*Task 4*						0.12							**0.12**
5	*Practicum*			0.25										**0.25**
6	*Quiz*	0.07												**0.07**
7	*Mid Exam*	0.2												**0.2**
8	*Final Exam*	0.2												**0.2**
	Total	0.47		0.25			0.28							**1**