RENCANA PEMBELAJARAN SEMESTER (RPS)
FISIKA DASAR I (4 SKS)

	INSTITUT TEKNOLOGI SEPULUH NOPEMBER (ITS) FAKULTAS ….. DEPARTEMEN …..	**Kode Dokumen** *Document code*
	RENCANA PEMBELAJARAN SEMESTER *Semester Learning Plan*	

MATA KULIAH (MK) *Course*	KODE *Code*	Rumpun MK *Course cluster*	BOBOT (sks) *Credits*		SEMESTER *Semester*	Tgl Penyusunan *Compilation Date*
Fisika Dasar I *Physics I*	SF184101	SKPB	3	1	I	1 Januari 2021

OTORISASI / PENGESAHAN *AUTHORIZATION / ENDORSEMENT*	Dosen Pengembang RPS *Developer Lecturer of Semester Learning Plan*	Koordinator RMK *Course Cluster Coordinator*	Ka PRODI *Head of Department*

Capaian Pembelajaran *Learning Outcomes*	CPL-PRODI yang dibebankan pada MK *PLO Program Charged to The Course*	
	KU1	Menerapkan pemikiran logis, kritis, sistematis, dan inovatif dalam konteks pengembangan atau implementasi ilmu pengetahuan dan/atau teknologi sesuai dengan bidang keahliannya *Applying logical, critical, systematic, and innovative thinking in the context of developing or implementing science and / or technology in accordance with their field of expertise*

	KU2	mampu menunjukkan kinerja mandiri, bermutu, dan terukur; *Able to demonstrate independent, quality, and measurable performance*
	S9	menunjukkan sikap bertanggung jawab atas pekerjaan di bidang keahliannya secara mandiri; *Show an attitude of responsibility for work in their field of expertise independently*
	Capaian Pembelajaran Mata Kuliah (CPMK) – Bila CP MK sebagai kemampuan pada tiap tahap pembelajaran CP MK = Sub CP MK *Course Learning Outcome (CLO) - If CLO as an ability of each learning stage, then CLO = Lesson Learning Outcome (LLO)*
	CPMK1	mampu menerapkan pemikiran logis, kritis, sistematis, dan inovatif dalam menyelesaikan masalah dan implementasi ilmu fisika I. *Applying logical, critical, systematic, and innovative thinking to solve problems and implementing Physics I*
	CPMK2	mampu menunjukkan kinerja mandiri, bermutu, dan terukur; *able to demonstrate independent, quality, and measurable performance*
	CPMK3	menunjukkan sikap bertanggung jawab atas pekerjaan di bidang keahliannya secara mandiri; *show an attitude of responsibility for work in their field of expertise independently*
Peta CPL – CP MK ***Map of PLO - CLO***	*Tuliskan peta matriks antara CPL dengan CPMK (Sub CP MK)* *Write out the matrix mapping between PLO and CLO (Sub PLO)*

	KU1	KU2	S9
Sub-CPMK1	√		
Sub-CPMK2	√	√	√
Sub-CPMK3	√	√	√
Sub-CPMK4	√	√	√
Sub-CPMK5	√	√	√
Sub-CPMK6	√	√	√
Sub-CPMK7	√	√	√
Sub-CPMK8	√	√	√

Deskripsi 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.

Praktikum yang dilakukan meliputi: (1)bandul fisis, (2)bandul matematis, (3)konstanta pegas, (4)viskositas cairan, (5)gerak peluru, (6)koefisien gesek, (7) momen inersia.

In this course, students will learn to understand the basic laws of physics, particle kinematics; Particle dynamics; Work and energy; Rotational motion; Vibration and fluid mechanics, through simple mathematical descriptions and introducing examples of the use of concepts, and analyzing material in the form of practicum.

The practicum includes: (1) physical pendulum, (2) mathematical pendulum, (3) spring constant, (4) liquid viscosity, (5) bullet motion, (6) friction coefficient, (7) moment inertia

Bahan Kajian:
Materi pembelajaran

Course Materials:

Besaran dan vektor: Besaran dasar, besaran turunan, satuan, konversi satuan, besaran skalar dan vektor, operasi matematika pada vektor secara geometris dan analitis

Kinematika partikel: Pergeseran posisi, kecepatan, percepatan, gerak lurus, gerak lengkung (parabola dan melingkar); gerak relatif.

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 ;

Kerja dan energi: konsep kerja, energi kinetik, energi potensial (gravitasi dan pegas), teorema kerja energi, hukum kekekalan energi mekanik,

Impuls dan Momentum: impuls, momentum, tumbukan (elastis dan tidak elastis),;

Dinamika rotasi: Pergeseran sudut, kecepatan sudut dan percepatan sudut, momen gaya (torsi), pusat massa, kesetimbangan momen gaya, momen inersia, energi kinetik rotasi, gerak menggelinding, hukum kekekalan energi (translasi dan rotasi)

	Getaran: gerak harmonis sederhana, energi gerak harmonis sederhana, bandul matematis, bandul fisis, bandul puntir, gabungan getaran selaras (sejajar dan tegak lurus); **Mekanika fluida**: tekanan hidrostatika, prinsip Pascal, prinsip Archimedes, tegangan permukaan, persamaan kontinuitas, persamaan Bernoulli, viskositas. *Quantities and vectors: base quantities, derived quantities, units, units conversion, scalar and vector quantities, mathematical operations on vectors geometrically and analytically* *Particle kinematics: displacement, velocity, acceleration, linear motion, angular motion (parabolic and circular); relative motion.* *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;* *Work and energy: the concept of work, kinetic energy, potential energy (gravity and spring), work energy theorem, the law of conservation of mechanical energy,* *Impulse and Momentum: impulse, momentum, collision (elastic and inelastic), center of mass;* *Rotational dynamics: Angular displacement, angular velocity and angular acceleration, force moment (torque), force moment equilibrium, moment of inertia, rotational kinetic energy, rolling motion, energy conservation law (translation and rotation)* *Vibration: simple harmonic motion, energy of simple harmonic motion, mathematical pendulum, physical pendulum, torsional pendulum, combination of harmonious vibrations (parallel and perpendicular);* *Fluid mechanics: hydrostatic pressure, Pascal's principle, Archimedes principle, surface tension, continuity equation, Bernoulli's equation, viscosity.*
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:* *5.* Halliday, Resnic, Jearl Walker; 'Fundamental of Physics'. John Wiley and Sons, 10th ed, New York, 2014 6. Tipler, PA, 'Physics for Scientists and Engineers ',6th ed, W.H. Freeman and Co, New York, 2008
Dosen Pengampu	

Lecturers	
Mata kuliah syarat *Prerequisites*	-

Mg Ke- / *Week*	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) / *Final ability of each learning stage (LLO)*	Penilaian / *Assesment*		Bantuk Pembelajaran; Metode Pembelajaran; Penugasan Mahasiswa; / *Form of Learning; Learning Method; Student Assignment;*		Materi Pembelajaran / *Learning Material*	Bobot Penilaian (%)/ *Assesment Load (%)*
		Indikator / *Indicator*	Kriteria & Teknik / *Criteria & Techniques*	Tatap Muka (5)	Daring (6)		
(1)	(2)	(3)	(4)			(7)	(8)
1	Sub-CPMK1: Mampu menjelaskan dan menggunakan besaran, satuan, dan vektor, serta mampu menerapkan operasi matematika pada vektor secara geometris dan analitis untuk menyelesaikan permasalahan vektor. *LLO1:* *Able to explain and use quantities, units and vectors, and be able to*	1.1 Ketepatan menjelaskan besaran fisis dan sistem satuan 1.2 Ketepatan menjelaskan ciri besaran skalar dan besaran vektor serta menerapkan dan menggunakan aljabar vektor 1.1 *Accuracy in explaining physical*	**Kriteria**: Menggunakan rubrik analitik dan pedoman penskoran (*Marking Scheme*) **Teknik non-test**: • Meringkas materi kuliah; **Teknik test**: • Tanya jawab lisan	• **Kuliah**: • **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 besaran	• **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; https://www.youtube.com/watch?v=xEHZArgLlUo&list=PLyQ	**Besaran dan vektor**: Sistem Satuan Internasional (SI), perubahan satuan, besaran dasar, besaran turunan, vektor dan skalar, komponen vektor, vektor satuan,	10%

apply mathematical operations on vectors geometrically and analytically to solve vector problems.	quantities and unit systems
	1.2 *Accuracy in describing the features of scalar quantities and vector quantities and applies and uses vector algebra*
		• Latihan menyelesaikan soal-soal mengenai besaran fisika, satuan, besaran skalar, besaran vektor serta aljabar vektor
		• (Tugas-1: Problem & Solving)
		
		Criteria:
		Using analytical rubrics and scoring guidelines (Marking Scheme)
		
		Non-test technique:
		• *Summarize the lecture material;*
			fisika, satuan, besaran skalar, besaran vektor serta aljabar vektor
			[PT+BM:(1+1)x(2x60")]
			
			• ***Lectures:***
			• ***Discussion,***
			  [TM: 1x(2x50")]
			  •***Assignment-1:*** *Compile a lecture summary and work on sample practice questions given in the lecture*
			[PT+BM:(1+1)x(2x60")]
			• ***Exercise*** *Exercise on application of physical quantities, vector quantities and vector algebra*
			[PT+BM:(1+1)x(2x60")]
				SN7X0ro23IUORJBSD BH8AUWZ1mQBna& index=4&t=0s;
				https://www.youtube.com/watch?v=ZAeLlaFxR_o&list=PLyQSN7X0ro23IUORJBSDBH8AUWZ1mQBna&index=5&t=0s;
				https://www.youtube.com/watch?v=ZCFPNl-Ved4&list=PLyQSN7X0ro23IUORJBSDBH8AUWZ1mQBna&index=6&t=0s
				• 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**
					penambahan vektor, perkalian vektor
					
					Quantities and vectors: International Systems of Units (SI), unit conversion, base quantities, derived quantities, scalar and vector, vector components, unit vector, vector addition, vector multiplication
					
					Pustaka : *References*	

| | | | *Test technique*:
• *Oral questions and answers*
• *Exercises on physical quantities, units, scalar quantities, vector quantities and vector algebra*
• *(Assignment-1: Problem & Solving)* | | Latihan menyelesaikan soal-soal aplikasi besaran fisika, satuan, besaran skalar, besaran vektor serta aljabar vektor

[PT+BM:(1+1)x(2x60")]

• *Face-to-Face virtual lectures (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=xEH | • Halliday,R., et all, 2014
• Douglas C. Giancoli, 2014
• Serway, 2004
• Tim Dosen Fisika ITS | |

				ZArgLlUo&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=ZCFPNl-Ved4&list=PLyQSN7X0ro23IUORJBSDBH8AUWZ1mQBna&index=6&t=0s ● *Discussion;* **[TM: 1x(2x50")]** *Assignment-1: Compile a lecture summary and work on sample practice questions given in the lecture* ***[PT+BM:(1+1)x(2x60")]*** ● ***Excersise***		

				Exercise on the application of physical quantities, vector quantities and vector algebra **[PT+BM:(1+1)x(2x60")]**			
2,3	Sub-CPMK2: Mampu mendefinisikan Pergeseran posisi, kecepatan, percepatan gerak lurus dan melengkung secara grafis dan matematis serta mendemontrasikannya (P). LLO2: *Be able to define position shift, velocity, straight and curved motion acceleration graphically and mathematically and demonstrate it (P).*	1.1. Ketepatan menjelaskan prinsip Pergeseran posisi, kecepatan, percepatan 1.2. Ketepatan menjelaskan prinsip gerak lurus, gerak lengkung (parabola dan melingkar); gerak relatif *1.1. Accuracy in explaining the principle of displacement,*	**Kriteria**: Pedoman Penskoran (*Marking Scheme*) **Teknik non-test**: • Meringkas materi kuliah • Tanya-jawab lisan • Menyalin contoh soal **Teknik test**: Latihan soal *Criteria*: *Scoring guidelines*	• **Kuliah**: • **Diskusi**, **[TM: 2x(3x50")]** 1.3. • **Kuis-1**: Menyelesaikan soal-soal posisi, kecepatan, percepatan • **Latihan soal:** menghitung percepatan suatu benda yang dipengaruhi oleh resultan gaya. • **Latihan soal** menguraikan persamaan gerak lurus, gerak lengkung (parabola dan melingkar); gerak relatif.	• **Kuliah tatap muka maya**; **[TM: 2x(3x50")]** • **MyITS-Classroom**: Sumber belajar: https://www.youtube.com/watch?v=RIGMaw8gsic; • Kuis-1: Daring dg MyITS Classroom; • **Latihan soal:** menghitung posisi, kecepatan dan percepatan benda berdasar komponen vektor . • **Latihan soal** menguraikan persamaan gerak lurus, gerak lengkung (parabola	**Kinematika partikel**: Pergeseran posisi, kecepatan, percepatan, gerak lurus, gerak lengkung (parabola dan melingkar); gerak relatif. *Position, speed, acceleration, straight motion, curved motion*	2%

| | | velocity and acceleration
1.2. *Accuracy in explaining the principle of linear motion, angular motion (parabolic and circular); relative motion* | (*Marking Scheme*)
Non-test technique*:*
• *Summarize the lecture material*
• *Oral questions and answers*
• *Transcribe exercise*

Test technique*:*
Exercise | **[PT+BM:(2+2)x(3x60")]**

• ***Lecture****:*
• ***Discussion****,*
[TM: 2x(3x50")]
1.3.　• ***Quiz-1****: Exeercise on position, speed and acceleration*

• ***Exercise:*** *calculate the acceleration of an object which is affected by the resultant of force*
• ***Exercise*** *describe equations of linear motion, angular motion (parabola and circular); relative motion.*
[PT+BM:(2+2)x(3x60")] | dan melingkar); gerak relatif.

[PT+BM:(2+2)x(3x60")]

• ***Face-to-face virtual lectures****;*
[TM: 2x(3x50")]
• ***MyITS-Classroom****:* Learning resources: https://www.youtube.com/watch?v=RIGMaw8gsic;
• *Quiz-1: Online with MyITS Classroom;*
• ***Exercise:*** *calculate position, speed and acceleration of an object based on vector component.*
• ***Exercise*** *describe equations of linear motion, angular motion (parabola and* | (*parabola and circular); relative motion.* | |

					circular); relative motion. **[PT+BM:(2+2)x(3x60")]**		
		1.3. Ketepatan menghitung penyelesaian soal-soal yang berhubungan. Pergeseran posisi, kecepatan, percepatan, gerak lurus, gerak lengkung (parabola dan melingkar); gerak relatif *1.3. Accuracy in calculating the problem solutions related to displacement, velocity, acceleration, linear motion, angular motion (parabolic*	**Kriteria**: Pedoman Penskoran (*Marking Scheme*) **Teknik non-test**: • Tanya-jawab lisan • Menyalin jawaban soal-soal yang dibahas selama perkuliahan **Teknik test**: • Quis 1 • Latihan soal • Tugas Rumah *Criteria*:	• **Kuliah**: • **Diskusi**, **[TM: 2x(3x50")]** • **Kuis-1**: 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**	• **Kuliah tatap muka maya**; **[TM: 2x(3x50")]** • **MyITS-Classroom**: Sumber belajar: https://www.youtube.com/watch?v=Po7li9JbEs; • Kuis-1: Daring dg 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 beraturan (GLBB)	**Kinematika partikel**: Pergeseran posisi, kecepatan, percepatan, persamaan gerak lurus berubah beraturan, gerak lurus, gerak lengkung (parabola dan melingkar); gerak relatif. *Particle kinematics*: *Displacement, velocity, acceleration, uniformly*	7%

| | | and circular); relative motion | Scoring guidelines (*Marking Scheme*)

Non-test technique:
• Oral questions and answers
• Transcribe exercises discussed during lectures

Test technique:
• Quiz 1
• Exercise
• Home assignment | Menghitung gerak lurus, gerak lengkung (parabola dan meling-kar); gerak relatif **[PT+BM:(2+2)x(3x60")]**

• *Lecture*:
• *Discussion*, **[TM: 2x(3x50")]**
•*Quiz-1*: Solve problems about position, velocity and acceleration.

• *Exercise:* Calculate average and instantaneous velocity, average and instantaneous acceleration
• *Exercise* Calculating the problem of uniform motion (GLB) and uniformly | • **Latihan soal** Menghitung gerak lurus, gerak lengkung (parabola dan meling-kar); gerak relatif

• *Face-to-face virtual lecture;* **[TM: 2x(3x50")]**
• *MyITS-Classroom*: Learning resources: https://www.youtube.com/watch?v=Po7li9JbEs;
• *Quiz-1: Online with MyITS Classroom;*

• *Exercise:* Calculate the average and instantaneous velocity, average and instantaneous acceleration
• *Exercise:* Calculating the | *accelerated motion equation, linear motion, angular rotation (parabolic and circular); relative motion* | |

				accelerated motion (GLBB) • ***Exercise*** *Calculate linear motion, angular motion (parabolic and circular); relative motion* **[PT+BM:(2+2)x(3x60")]**	*problem of uniform motion (GLB) and uniformly accelerated motion (GLBB)* • ***Exercise*** *Calculate linear motion, angular motion (parabolic and circular); relative motion*		
	Praktikum Sub-CPMK3: Mampu menggunakan konsep dan teori pergeseran posisi, kecepatan, percepatan gerak lurus dan melengkung serta mendemontrasikannya (M-4) *Practicum LLO3: Able to use the concepts and theories of displacement, velocity, linear and angular*	1.4. Ketepatan menghitung dan mendemonstrasikan pergeseran posisi, kecepatan, percepatan *1.4. Accuracy in calculating and demonstrating displacement, velocity and acceleration.*	**Kriteria:** Rubrik Modul praktikum Fisika Dasar 1 **Teknik non-test**: • Praktikum di dampingi oleh asisten lab. • Mencatat Data hasil praktikum, acc asisten. **Teknik test**:	• **Praktikum:** Modul M-..: Gerak, kecepatan dan percepatan 7 jam: Tutorial / Pre-test, Persiapan, Pelaksanaan Praktikum, Penyusunan laporan, Presentasi hasil. • ***Practicum:*** *Module week - : Motion, velocity and acceleration*	• **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**		**5%**

acceleration and demonstrate it (M-4)			• Tes pendahuluan lisan. • Laporan akhir • presentasi ***Criteria:*** *Rubric Physics 1 Practicum module* ***Non-test technique:*** • *Practicum assisted by laboratory assistant* • *Record data on practicum results, acc assistant* ***Test technique:*** • *Oral preliminary test* • *Final report* • *Presentation*	*7 hours: Tutorial / Pre-test, Preparation, Practicum implementation, Report preparation, Result presentation.*	• **Accessing real-time practicum demonstration by the assistant through live streaming** • **Doing practicum independently using animation programs prepared by ITS Team**		

Asistensi Sub-CPMK3: Mampu menggunakan konsep dan teori pergeseran posisi, kecepatan, percepatan gerak lurus dan melengkung serta mendemontrasikannya (P). ***Assistance*** *LLO3: Able to use the concepts and theories of displacement, velocity, linear and angular acceleration and demonstrate it* (P).	1.5. Ketepatan menghitung penyelesaian soal-soal yang berhubungan dengan posisi, kecepatan, percepatan, gerak lurus, gerak lengkung (parabola dan melingkar); gerak relative 1.5. *Accuracy in calculating the problem solutions related to position, velocity, acceleration, linear motion, angular motion (parabolic and circular); relative motion*	**Kriteria**: Pedoman Penskoran (*Marking Scheme*) **Teknik non-test**: • Tanya-jawab lisan • Menyalin jawaban soal-soal yang dibahas oleh asisten selama perkuliahan. **Teknik test**: • Keaktifan dan ketepatan jawaban atas pertanyaan yang diajukan oleh asisten ***Criteria***: *Scoring guidelines*	• **Pembahasan soal – soal terkait** posisi, kecepatan, percepatan, gerak lurus, gerak lengkung (parabola dan melingkar); gerak relatif • **Diskusi**, **[TM: 1x(3x50")]** • *Discussing questions related to position, velocity, acceleration, linear motion, angular motion (parabolic and circular); relative motion* • *Discussion*, **[TM: 1x(3x50")]**	• **Kuliah oleh asisten melalui tatap muka maya**; • **Pembahasan soal melalui myITS Classroom, group Wa, Line, dll**. **[TM: 1x(3x50")]** • **MyITS-Classroom**: Sumber belajar: https://www.youtube.com/watch?v=Po7li9JbEs; • ***Face-to-face virtual lecture by the assistant;*** • ***Discussing questions through***	**Kinematika partikel**: Pergeseran posisi, kecepatan, percepatan, persamaan gerak lurus berubah beraturan, gerak lurus, gerak lengkung (parabola dan melingkar); gerak relatif. ***Particle kinematics***: *Displacement, velocity, acceleration, uniformly accelerated motion equation, linear motion,*	**2%**

		(Marking Scheme) ***Non-test technique***: • *Oral questions and answers* • *Transcribe exercises discussed with the assistant during lectures* ***Test technique***: • *Originality and accuracy of answering questions asked by the assistant*		***myITS Classroom, Wa group, Line, dll.*** ***[TM: 1x(3x50")]*** • ***MyITS-Classroom***: *Learning resources:* https://www. youtube.com/ watch?v=Po7li 9JbEs;	*angular rotation (parabolic and circular); relative motion*	
4,5	Sub-CPMK3: Mampu menggunakan konsep dan teori Newton I, II, dan III untuk menguraikan gaya-gaya pada berbagai sistem benda, serta mendemontrasikannya (P).	1.1. Ketepatan menjelaskan prinsip Hukum Newton I, Hukum Newton II, dan Hukum Newton III 1.2. Ketepatan menjelaskan	**Kriteria**: Pedoman Penskoran *(Marking Scheme)* **Teknik non-test**: • Meringkas materi kuliah	• **Kuliah**: • **Diskusi**, **[TM: 1x(3x50")]** •**Kuis-1**: Menyelesaikan soal-soal Hukum Newton	• **Kuliah tatap muka maya**; **[TM: 1x(3x50")]** • **MyITS-Classroom**: Sumber belajar: • https://www.youtub e.com/watch?v=g55 0H4e5FCY	**Dinamika partikel**: Hukum Newton I, II dan III, macam-macam gaya (gaya	**2%**

LLO3: *Able to use Newton I, II and III concepts and theories to describe forces in various systems of objects, and demonstrate it (P)*	prinsip macam-macam gaya (gaya gravitasi, gaya berat, gaya apung, gaya berat, gaya tegangan tali, gaya normal, gaya gesek, gaya pegas). 1.1. *Accuracy in describing the principles of Newton's first, second and third law* 1.2. *Accuracy in describing the principles of various forces (gravitational force, weight force, buoyant force, tension force, normal force, friction force, spring force)*	• Tanya-jawab lisan • Menyalin contoh soal **Teknik test**: Latihan soal ***Criteria***: *Scoring guidelines (Marking Scheme)* ***Non-test technique***: • *Summarize the lecture material* • *Oral questions and answers* • *Transcribe exercise* ***Test technique***: *Exercise*	• **Latihan soal:** menghitung percepatan suatu benda yang 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(3x60")]** • ***Lecture***: • ***Discussion***, **[TM: 1x(3x50")]** •***Quiz-1***: *Solve problems on Newton's laws* • ***Exercise*** *calculate the acceleration an*	• Kuis-1: Daring dg MyITS Classroom; • **Latihan soal:** menghitung percepatan suatu benda yang 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(3x6 0")]** • ***Face-to-face virtual lecture***; **[TM: 1x(3x50")]** • ***MyITS-Classroom***: *Learning resources:*	gravitasi, gaya berat, gaya tegang tali, gaya normal, gaya gesek dan gaya pegas), kesetimbanga n gaya, penerapan hukum Newton I,II dan. ***Particle dynamics***: *Newton's first, second and third law, types of forces (forces (gravitational force, weight force, buoyant force, tension force, normal*

				object which is affected by the resultant force • *Exercise describes the force components of an object in the horizontal plane, inclined plane and pulley* **[PT+BM:(2+2)x(3x60")]**	• https://www.youtube.com/watch?v=g550H4e5FCY • *Quiz-1: Online with MyITS Classroom;* • *Exercise: calculate the acceleration an object which is affected by the resultant force.* • *Exercise describes the force components of an object in the horizontal plane, inclined plane and pulley* **[PT+BM:(2+2)x(3x60")]**	*force, friction force, spring force), equilibrium of forces, Newton's laws application.*	
		1.3. Ketepatan menghitung penyelesaian soal-soal yang berhubungan dengan Hukum Newton I, Hukum	**Kreteria**: Pedoman Penskoran (*Marking Scheme*) **Teknik non-test**:	• **Kuliah**: • **Diskusi**, **[TM: 2x(3x50")]** • **Kuis-1**: Menyelesaikan soal-soal Hukum Newton	• **Kuliah tatap muka maya**; **[TM: 2x(3x50")]** • **MyITS-Classroom**: Sumber belajar: • https://www.youtube.com/watch?v=RDwXQeWWbz0	**Dinamika partikel**: Hukum Newton I, II dan III, macam-macam gaya (gaya gravitasi,	**7 %**

		Newton II, dan Hukum Newton III *1.3. Accuracy in calculating the problem solutions related to Newton's first, second and third law*	• Tanya-jawab lisan • Menyalin jawaban soal-soal yang dibahas selama perkuliahan **Teknik test**: • Quis 1 • Latihan soal • Tugas Rumah ***Criteria***: *Scoring guidelines (Marking Scheme)* ***Non-test technique***: • *Oral questions and answers* • *Transcribe exercises*	• **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 adanya pengaruh resultan gaya. • **Latihan soal** • Menghitung tegangan tali pada katrol, akibat adanya gaya berat benda. **[PT+BM:(2+2)x(3x60")]**	• Kuis-1: Daring dg MyITS Classroom; • **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 adanya pengaruh resultan gaya. • **Latihan soal** • Menghitung tegangan tali pada katrol, akibat adanya gaya berat benda.	gaya berat, gaya tegang tali, gaya normal, gaya gesek dan gaya pegas), kesetimbangan gaya, penerapan hukum Newton I,II dan. ***Particle dynamics:*** *Newton's first, second and third law, types of forces (forces (gravitational force, weight force, buoyant force, tension force, normal force, friction force, spring*	

			discussed during lectures	• ***Lecture***: • ***Discussion***, ***[TM: 2x(3x50")]***	• ***Face-to-face virtual lecture***; ***[TM: 2x(3x50")]***	*force), equilibrium of forces, Newton's laws application.*	
			Test technique: • *Quiz 1* • *Exercise* • *Home assignment*	•***Quiz-1***: Solve problems on Newton's laws • ***Exercise***: Calculate velocity/friction force of an object on horizontal plane due to the effect of the resultant force • ***Exercise***: Calculate velocity/friction force of an object on inclined plane due to the effect of the resultant force • ***Exercise*** Calculate the rope tension on the pulley due to the object's weight force ***[PT+BM:(2+2)x(3x60")]***	• ***MyITS-Classroom***: *Learning resources:* • https://www.youtube.com/watch?v=RDwXQeWWbz0 • *Quiz-1: Online with MyITS Classroom;* • ***Exercise***: Calculate velocity/friction force of an object on horizontal plane due to the effect of the resultant force • ***Exercise***: Calculate velocity/friction force of an object on inclined plane due to the effect of the resultant force • ***Exercise*** Calculate the rope tension on the		

					pulley due to the object's weight force		
	Praktikum Sub-CPMK3: Mampu menggunakan konsep dan teori Newton I, II, dan III untuk menyelesaikan masalah gaya-gaya dalam fisika, serta mendemontrasikannya (M-4). *Practicum* *LLO3: Able to use Newton I, II and III concepts and theories to describe forces in various systems of objects, and demonstrate it (M-4).*	1.4. Ketepatan menghitung dan mendemonstrasikan koefisien gesek statis dan kinetis *1.4. Accuracy in calculating and demonstrating static and kinetic friction coefficient*	**Kriteria:** Rubrik Modul praktikum Fisika Dasar 1 **Teknik non-test:** • Praktikum di dampingi oleh asisten lab. • Mencatat Data hasil praktikum, acc asisten. **Teknik non-test:** • Tes pendahuluan lisan. • Laporan akhir • Presentasi *Criteria:* *Rubric*	• **Praktikum:** Modul M-4: Gaya gesek 7 jam: Tutorial / Pre-test, Persiapan, Pelaksanaan Praktikum, Penyusunan laporan, Presentasi hasil. • *Practicum:* *Module week - 4:* *Friction force* * 7 hours: Tutorial / Pre-test, Preparation, Practicum implementation, Report preparation, Result presentation.*	• **Mengakses demonstrasi praktimum secara real time yang dilakukan oleh asisten, melalui live streaming** • **Praktikum Mandiri Menggunakan program animasi yang telah disiapkan oleh TIM ITS** • *Accessing real-time practicum demonstration by the assistant through live streaming* *Doing practicum independently using animation programs prepared by ITS Team*		**5%**

			Physics 1 Practicum module ***Non-test technique***: • *Practicum assisted by laboratory assistant* • *Record data on practicum results, acc assistant* ***Test technique***: • *Oral preliminary test* • *Final report* • *Presentation*			
	Asistensi Sub-CPMK3: Mampu menggunakan konsep dan teori Newton I, II, dan III untuk menyelesaikan masalah gaya-gaya dalam fisika, serta mendemontrasikannya (P).	1.5. Ketepatan menghitung penyelesaian soal-soal yang berhubungan dengan Hukum Newton I, Hukum Newton II, dan Hukum Newton III	**Kreteria**: Pedoman Penskoran (*Marking Scheme*) **Teknik non-test**: • Tanya-jawab lisan	• **Pembahasan soal – soal terkait Hukum Newton I, Hukum Newton II, dan Hukum Newton III** • **Diskusi,**	• **Kuliah oleh asisten melalui tatap muka maya;** • **Pembahasan soal melalui group Wa, Line, dll**. **[TM: 1x(3x50")]** • **MyITS-Classroom**: Sumber belajar:	**Dinamika partikel**: Hukum Newton I, II dan III, macam-macam gaya (gaya gravitasi,	**2%**

	Assistance *LLO3: Able to use Newton I, II and III concepts and theories to describe forces in various systems of objects, and demonstrate it (P).*	1.5. *Accuracy in calculating the problem solutions related to Newton's first, second and third law*	• Menyalin jawaban soal-soal yang dibahas oleh asisten selama perkuliahan. **Teknik test**: • Keatifan dan ketepatan jawaban atas pertanyaan yang diajukan oleh asisten **Criteria**: *Scoring guidelines (Marking Scheme)* **Non-test technique**: • *Oral questions and answers* • *Transcribe exercises discussed with*	**[TM: 2x(3x50")]** • ***Discussing questions related to Newton's first, second and third law*** • ***Discussion***, **[TM: 2x(3x50")]**	https://www.youtube.com/watch?v=wrhT5xGS-f8 • ***Face-to-face virtual lecture by the assistant;*** • ***Discussing questions through myITS Classroom, Wa group, Line, dll.*** **[TM: 1x(3x50")]** • ***MyITS-Classroom***: *Learning resources:* https://www.youtube.com/watch?v=wrhT5xGS-f8	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 first, second and third law, types of forces (forces (gravitational force, weight force, buoyant force, tension force, normal force, friction*

						force, spring force), equilibrium of forces, Newton's laws application.	
			the assistant during lectures ***Test technique***: *Originality and accuracy of answering questions asked by the assistant*				
6,7	Sub-CP MK-4: Mahasiswa memahami azas kerja dan energi mekanik, hukum kekekalan energi mekanik, impuls, momentum, kekekalan momentum, dan menerapkannya kedalam penyelesaian soal *LLO4:* *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*	4.1 Ketepatan Menjelaskan kerja dan energi: konsep kerja, energi kinetik, energi potensial (gravitasi dan pegas) (TM 12) *4.1 Accuracy in describing work and energy: Ketepatan Menjelaskan kerja dan energi: concept of work, kinetic energy, potential energy (gravity and spring)*	**Kriteria**: Pedoman Penilaian **Teknik non-test**: • Penjelasan materi kuliah • Diskusi dan tanya-jawab • Mengerjakan latihan soal bersama-sama di buku tentang konsep kerja dan energi **Teknik test**: Latihan soal & Tugas	• **Kuliah**: • **Diskusi**, **[TM: 1x(2x50")]** •**Tugas**: Menyelesaikan soal-soal konsep kerja, Energi Potensial Gravitasi dan Energi Potensial Pegas • **Latihan soal**: Menghitung Kerja Oleh Gaya konservatif dan non konsevatif **BM:2x(2x60")]**	• **Kuliah tatap muka daring (zoom)**; **[TM: 1x(2x50")]** • **MyITS-Classroom**: https://www.youtube.com/watch?v=zVRH9d5PW8g Tugas: Daring dg MyITS Classroom; • **Latihan soal**: menghitung kerja oleh gaya konservatif dan non konservatif, menghitung energi kinetik, potensial gravitasi dan potensial pegas **BM:2x(2x60")]**	**Kerja dan Energi**: Menjelaskan Konsep kerja Energi Kinetik Energi Potensial Gravitasi Energi Potensial Energi Kinetik ***Work and Energy***: *Explain the concept of work kinetic energy*	3%

| | | 5 (TM 12) | **Criteria**: Scoring guidelines **Non-test technique**:
• Explanation of course material
• Discussions and questions and answers
• Practice the problems about the concept of work and energy in the book together

 Test technique: Exercise & assignment | • **Lecture**:
• **Discussion**, **[TM: 1x(2x50")]**

•**Assignment**: Solve problems on the concept of work, potential gravity energy and potential spring energy

• **Exercise**: Calculate the work by conservative and nonconservative forces

BM:2x(2x60")] | • **Face-to-face virtual lecture (zoom)**; **[TM: 1x(2x50")]**
• **MyITS-Classroom**: https://www.youtube.com/watch?v=zVRH9d5PW8g
Assignment: Online with MyITS Classroom;
• **Exercise**: Calculate the work by conservative and nonconservative forces, calculate kinetic energy, potential gravity and potential spring **BM:2x(2x60")]** | potential energy gravity energy kinetic potential energy

 Pustaka: References:
• Halliday,R., et all, 2014
• Douglas C. Giancoli, 2014
• Serway, 2004
Tim Dosen Fisika ITS | |
| | | 4.2 Ketepatan menjelaskan kerja dan energi: teorema kerja | **Kriteria**: Pedoman Penilaian **Teknik non-test**: | • **Kuliah**:
• **Diskusi**, **[TM: 1x(2x50")]** | • **Kuliah tatap muka daring (zoom)**; **[TM: 1x(2x50")]** | **Kerja dan Energi**: menjelaskan kerja dan | **3%** |

| | | energi, hukum kekekalan energi mekanik (TM 13)

4.2 *Accuracy in describing work and energy; work-energy theorem, the law of conservation of mechanical energy* (TM 13) | • Penjelasan materi kuliah
• Diskusi dan tanya-jawab
• Mengerjakan latihan soal bersama-sama di buku tentang hukum kekekalan energi

Teknik test: Latihan soal & Tugas

Criteria: *Scoring guidelines* **Non-test technique**: • *Explanation of course material* | •**Tugas**: Mengitung tentang hukum kekekalan energi

• **Latihan soal**: Mengitung tentang hukum kekekalan energi

[BM:2x(2x60")]

• *Lecture*:
• *Discussion*, *[TM: 1x(2x50")]*

•*Assignment*: Calculate the law of conservation of energy
• *Exercise*: Calculate the law of conservation of energy

BM:2x(2x60")] | • **MyITS-Classroom**: https://www.youtube.com/watch?v=HR5iEX3Sy1k Tugas: Daring dg MyITS Classroom;
• **Latihan soal**: Mengitung tentang hukum kekekalan energi

[BM:2x(2x60")]

• *Face-to-face virtual lecture (zoom)*; *[TM: 1x(2x50")]*
• *MyITS-Classroom*: https://www.youtube.com/watch?v=HR5iEX3Sy1k Assignment: Online with MyITS Classroom;
• *Exercise*: Calculate law of conservation of energy **BM:2x(2x60")]** | energi: teorema kerja energi, hukum kekekalan energi mekanik

Work and Energy: *Explain about work and energy; work-energy theorem, the law of conservation of mechanical energy*

Pustaka: References:
• Halliday,R., et all, 2014
• Douglas C. Giancoli, 2014 | |

			• Discussions and questions and answers *• Practice the problems about the law of conservation of energy* ***Test technique***: *Exercise & assignment*			• Serway, 2004 Tim Dosen Fisika ITS	
		4.3 Ketepatan menjelaskan Impuls dan Momentum : impuls, momentum, tumbukan (elastis dan tidak elastis), pusat massa; (TM 14) *4.3 Accuracy in describing impulse and momentum: impulse, momentum, collision (elastic and*	**Kriteria**: Pedoman Penilaian **Teknik non-test**: • Penjelasan materi kuliah • Diskusi dan tanya-jawab • Mengerjakan latihan soal bersama-sama di buku tentang Impuls dan	• **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	• **Kuliah tatap muka daring (zoom)**; **[TM: 1x(2x50")]** • **MyITS-Classroom**: https://www.youtube.com/watch?v=pHJQTtEEX4M Tugas: Daring dg MyITS Classroom; • **Latihan soal:** Menghitung impuls dan momentum, kecepatan benda setelah tumbukan lenting sempurna,	**Kerja dan Energi**: menjelaskan Impuls dan Momentum : impuls, momentum, tumbukan (elastis dan tidak elastis), pusat massa ***Work and energy:***	**3%**

| | | inelastic), center of mass; *(TM 14)* | momentum (tumbukan)

Teknik test: Latihan soal & Tugas

Criteria: *Scoring guidelines* **Non-test technique**:
• *Explanation of course material*
• *Discussions and questions and answers*
• *Practice the problems impulse and momentum (collision)*

Test technique: *Exercise & assignment* | dan momentum, kecepatan benda setelah tumbukan lenting sempurna, sebagian dan tidak lenting sama sekali **[BM:2x(2x60")]**

• **Lecture**:
• **Discussion**, *[TM: 1x(2x50")]*

• **Assignment**: *Solve problems on impulse and momentum, perfectly elastic collision, inelastic collision and perfectly inelastic collision*

• **Exercise:** *Calculate impulse and momentum, object's velocity after perfectly* | sebagian dan tidak lenting sama sekali

[BM:2x(2x60")]

• **Face-to-face virtual lecture (zoom)**; *[TM: 1x(2x50")]*
• **MyITS-Classroom**: https://www.youtube.com/watch?v=pHJQTtEEX4M *Assignment: Online with MyITS Classroom;*
• **Exercise:** *Calculate impulse and momentum, object's velocity after perfectly elastic collision inelastic collision and perfectly inelastic collision*

BM:2x(2x60")] | ***describing*** *impulse and momentum: impulse, momentum, collision (elastic and inelastic), center of mass*

Pustaka: References:
• Halliday,R., et all, 2014
• Douglas C. Giancoli, 2014
• Serway, 2004 Tim Dosen Fisika ITS | |

				elastic collision inelastic collision and perfectly inelastic collision **BM:2x(2x60")]**			
	Asistensi (3) Sub-CP MK-3: Mahasiswa memahami azas kerja dan energi mekanik, hukum kekekalan energi mekanik impuls, momentum, kekekalan momentum, dan menerapkannya kedalam penyelesaian soal *Assistance (3)* *LLO3: Students understand the principles of work and mechanical energy, the law of conservation of impulse mechanical energy, momentum, conservation of momentum, and apply them to solving problems.*	4.4 Ketepatan dalam meyelesaikan dan menghitung soal-soal tentang kosep kerja dan energi, impuls dan mometum (TM 15) *4.4 Accuracy in solving and calculating problems about the concept of work and energy, impulse and momentum (TM 15)*	**Kriteria**: Pedoman Penskoran (*Marking Scheme*) **Teknik non-test**: • Tanya-jawab lisan • Menyalin jawaban soal-soal yang dibahas oleh asisten selama perkuliahan. **Teknik test**: • Keaktifan dan ketepatan jawaban atas	• Pembahasan soal – soal terkait Kerja dan Energi, Impuls dan Momentum • Diskusi, **[TM: 1x(2x50")]** • Discussing questions related to work and energy, impulse and momentum • Discussion, **[TM: 1x(2x50")]**	• **Kuliah oleh asisten melalui tatap muka secara daring**; • **Pembahasan soal melalui zoom, group WA dll** **[TM: 1x(2x50")]** • *Face-to-face online lecture by the assistant*; • *Discussing questions through zoom, WA group, etc* **[TM: 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	**2%**

			pertanyaan yang diajukan oleh asisten			mekanik, Impuls dan Momentum,	
			Criteria: *Scoring guidelines* (*Marking Scheme*) ***Non-test technique***: • *Oral questions and answers* • *Transcribe exercises discussed with the assistant during lectures* ***Test technique***: • *Originality and accuracy of answering questions asked by the assistant*			***Work and energy:*** *Discussing questions about Explaining about work and energy; concept of work, kinetic energy, potential energy (gravity and spring), work-energy theorem, the law of conservation of mechanical energy, impulse and momentum*	

						Pustaka: *References:* • Halliday,R., et all, 2014 • Douglas C. Giancoli, 2014 • Serway, 2004 Tim Dosen Fisika ITS	
8			EVALUASI TENGAH SEMESTER / *MIDTERM EXAM*				
9,10	Sub-CPMK5: 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	1.1 Ketepatan menjelaskan konsep dan teori dinamika rotasi, pusat massa, dan momen inersia, serta penggunaannya 1.2 Ketepatan menerapkan prinsip benda tegar dan gerak menggelinding dalam penyelesaian	**Kriteria**: Menggunakan rubrik analitik dan pedoman penskoran (*Marking Scheme*) **Teknik non-test**: • Meringkas materi kuliah; **Teknik test**:	• **Kuliah**: • **Diskusi**, **[TM: 1x(3x50")]** • **Tugas-5**: Menyusun ringkasan kuliah dan menghitung penyelesaian soal dinamika rotasi dengan kasus dalam fisika. **[PT+BM:(1+1)x(3x60")]** • **Latihan soal**	• **Kuliah tatap muka maya (Zoom)**; • **MyITS-Classroom**: Sumber belajar: https://www.youtube.com/watch?v=fDJeVR0o_w • Diskusi; **[TM: 1x(3x50")]** • Tugas-1: Menyusun ringkasan	**Dinamika rotasi**: Pergeseran sudut, kecepatan sudut dan percepatan sudut, momen gaya (torsi), pusat massa, kesetimbangan momen gaya, momen	12%

	LLO5: *Students are able to understand the concept of solid objects, calculate the moment of inertia, torque, and demonstrate it (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*	soal-soal dinamika rotasi 1.1 Accuracy in describing the concept and theory of rotational dynamics, centre of mass and moment of inertia, as well as the application 1.2 Accuracy in applying the principles of rigid body and rolling motion in solving rotational dynamics problems	• Tanya jawab lisan • Latihan menyelesaikan soal-soal dinamika rotasi dan aplikasinya • (Tugas-5: Problem & Solving) ***Criteria****:* *Using analytic rubric and scoring guidelines (Marking Scheme)* ***Non-test technique****:* • Summarize the lecture material ***Test technique****:*	Latihan menyelesaikan soal-soal dinamika rotasi **[PT+BM:(1+1)x(3x60")]** • ***Lectures****:* • ***Discussion****,* **[TM: 1x(3x50")]** •***Assignment-5****: Compile a lecture summary and calculate the solutions of rotational dynamics problems with cases in physics.* **[PT+BM:(1+1)x(2x60")]** • ***Exercise**** Exercise on rotational dynamics*	kuliah dan dan menghitung penyeleaian soal dinamika rotasi dengan kasus dalam fisika. **[PT+BM:(1+1) x(3x60")]** • **Latihan soal** Latihan menyelesaikan soal-soal dinamika rotasi **[PT+BM:(1+1)x(3x60")]** • **Face-to-Face virtual lectures (Zoom)***;* • **MyITS-Classroom***:* *Learning resources:* https://www.youtube.com/watch?v=fDJeVR0o__w	inersia, energi kinetik rotasi, gerak menggelinding, hukum kekekalan energi (translasi dan rotasi) ***Rotational dynamics:**** Angular displacement, angular velocity and angular acceleration, moment of force (torque), centre of mass, balance of force moment,*	

| | | | | • _Oral questions and answers_
• _Exercises on rotational dynamics and its application_
• _(Assignment-5: Problem & Solving)_ | **[PT+BM:(1+1)x(2x60")]** | • Discussion;
[TM: 1x(3x50")]
Assignment-1:
Compile a lecture summary and calculate the solutions of rotational dynamics problems with cases in physics.
[PT+BM:(1+1)x(3x60")]
• _Exercise_
Exercise on rotational dynamics
[PT+BM:(1+1)x(3x60")] | _moment of inertia, rotational kinetic energy, rolling motion, energy conservation law (translation and rotation)_

Pustaka:
References:
• Halliday,R., et all, 2014
• Douglas C. Giancoli, 2014
• Serway, 2004
Tim Dosen Fisika ITS | |
| | **5%** | 1.3 Ketepatan menghitung dan mendemonstrasika n dinamika rotasi

1.3 Accuracy in calculating and | **Kriteria:**
Menggunakan rubrik holistik

Teknik non-test:
• Menyusun tahapan metode praktikum M5 | • **Praktikum:**
Modul-5 (M5):
Momen Inersia, 7 jam:
Tutorial/ Pre-test, Persiapan, Pelaksanaan Praktikum, Penyusunan laporan, Presentasi hasil. | | • **Praktikum Mandiri**
Memanfaatkan virtual laboratory untuk mempelajari konsep gerak rotasi dari suatu benda, sebagai | | **5%** |

		demonstrating rotational dynamics	(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. **Teknik test**: • Tes pendahuluan lisan. • Membuat laporan akhir • Presentasi hasil ***Criteria:***	• ***Practicum:*** *Module-5 (M%): Moment of inertia, 7 hours: Tutorial / Pre-test, Preparation, Practicum implementation, Report preparation, Result presentation.*	contohnya penggunaan aplikasi PhET (https://phet.colorado.edu/) • ***Independent Practicum*** *Use virtual laboratory to learn the concept of rotational motion of an object, for example using PhET application* (https://phet.colorado.edu/)		

			Using holistic rubric				
			Non-test technique: • *Arranging the stages of practicum method M5 (Moment of Inertia)* • *Practicum M5 (Moment of inertia) assisted by the Physics laboratory assistant.* • *Record data on practicum results according to the variables explained by the assistant*				
	Asisten	1.4 Ketepatan menghitung penyelesaian soal-	**Kriteria:** Menggunakan rubrik analitik	• **Diskusi,** **[TM: 1x(3x50")]** • **Latihan soal**	• **Kuliah dengan asisten melalui**		**4**

Assistance	soal dinamika rotasi melalui asistensi *1.4 Accuracy in calculating the solutions of rotational dynamics problems through assistance*	dan pedoman penskoran (*Marking Scheme*) **Teknik non-test**: • Tanya-jawab lisan • Latihan soal yang dibahas dengan asisten **Teknik test**: • Keaktifan dan ketepatan jawaban atas pertanyaan yang diajukan oleh asisten *Criteria*: *Using analytic rubric and scoring guidelines*	Latihan dan pembahasan penyelesaian soal-soal dinamika rotasi **[PT+BM:(1+1)x(3x60")]** • *Discussion,* **[TM: 1x(3x50")]** • *Exercise* *Exercise and discussing the solution of rotational dynamics problems* **[PT+BM:(1+1)x(3x60")]**	**tatap muka maya (Zoom)**; • Diskusi Online (Chatting) pembahasan soal melalui email, group WA, Line, dll. **[TM: 1x(3x50")]** • **Latihan soal** Latihan dan pembahasan penyelesaian soal-soal dinamika rotasi **[PT+BM:(1+1)x(3x60")]** • *Face-to-face virtual lecture with the assistant (Zoom)*; • Online discussion (Chatting) on solving problems by email, WA group, Line, etc **[TM: 1x(3x50")]** • **Exercise** *Exercise and discussing the*		

			(*Marking Scheme*) ***Non-test technique***: • *Oral questions and answers* • *Discuss exercise with the assistant* ***Test technique***: • *Originality and accuracy of answering questions asked by the assistant*		*solution of rotational dynamics problems* **[PT+BM:(1+1)x(3x60")]**		
11,12	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,	1.1 Ketepatan dalam menerangkan secara tulisan dan verbal dengan tepat terhadap konsep energi pada gerak harmonis sederhana, bandul matematis, bandul	**Kriteria**: Menggunakan rubrik analitik dan pedoman penskoran (*Marking Scheme*) **Teknik non-test**:	• **Kuliah**: • **Diskusi**, **[TM: 1x(2x50")]** • **Tugas-1**: Menyusun ringkasan kuliah dan mengerjakan contoh latihan soal yang diberikan dalam kuliah	• **Kuliah tatap muka maya (Zoom)**; • **MyITS-Classroom**: Sumber belajar: https://www.youtube.com/watch?v=pKKfmthLNmQ	**Getaran**: harmonis sederhana, bandul matematis, bandul fisis, bandul puntir, gabungan	12

serta mampu menghitung gabungan getaran selaras (sejajar dan tegak lurus) *LLO6:* *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)*	fisis, bandul puntir, gabungan getaran selaras (sejajar dan tegak lurus) 1.2 Kemampuan memberikan contoh penerapan konsep harmonis sederhana, bandul matematis, bandul fisis, bandul puntir, gabungan getaran selaras (sejajar dan tegak lurus) dalam kehidupan sehari-hari *1.1 Accuracy in describing in writing and verbally concept of energy in simple harmonic motion, mathematical pendulum, physical pendulum, torsional pendulum,*	• Meringkas materi kuliah; • Memberikan ide sederhana aplikasi **Teknik test**: • 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)	**[PT+BM:(1+1)x(2x60”)]** • **Latihan soal** menyelesaikan soal-soal aplikasi harmonis sederhana, bandul matematis, bandul fisis, bandul puntir, gabungan getaran selaras (sejajar dan tegak lurus) **[PT+BM:(1+1)x(2x60”)]** • *Lecture:* • *Discussion,* **[TM: 1x(2x50”)]** • **Assignment-1**: *Summarize the lecture material and working on sample practice questions given in lecture* **[PT+BM:(1+1)x(2x60”)]** • *Exercise*	https://www.youtube.com/watch?v=aMas-Z8K2-I https://www.youtube.com/watch?v=_o0_IJCnMQE https://www.youtube.com/watch?v=NN--nwtXrsw https://www.youtube.com/watch?v=X6Hz0rPzxvc https://www.youtube.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** menyelesaikan soal-soal aplikasi harmonis sederhana, bandul matematis, bandul	getaran selaras (sejajar dan tegak lurus) *Vibrations:* *simple harmonic motion, mathematical pendulum, physical pendulum, torsional pendulum, combination of harmonious vibrations (parallel and perpendicular)* **Pustaka:** **References:** • Halliday,R., et all, 2014	

		combination of harmonious vibrations (parallel and perpendicular) 1.2 *Ability to provide examples on the application of the concept of simple harmonic motion, mathematical pendulum, physical pendulum, torsional pendulum, combination of harmonious vibrations (parallel and perpendicular) in everyday life.*	***Criteria**: Using analytic rubric and scoring guidelines (Marking Scheme)* ***Non-test technique**:* • *Summarize the lecture material* • *Provide simple application idea* ***Test technique**:* • *Oral questions and answers* • *Exercises on simple harmonic motion, mathematical pendulum, physical*	*Exercises on simple harmonic motion, mathematical pendulum, physical pendulum, torsional pendulum, combination of harmonious vibrations (parallel and perpendicular)* **[PT+BM:(1+1)x(2x60")]**	fisis, bandul puntir, gabungan getaran selaras (sejajar dan tegak lurus) **[PT+BM:(1+1)x(2x60")]** • ***Face-to-face virtual 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.youtube.com/watch?v=X6Hz0rPzxvc https://www.youtube.c	• Douglas C. Giancoli, 2014 • Serway, 2004 Tim Dosen Fisika ITS	

		pendulum, torsional pendulum, combination of harmonious vibrations (parallel and perpendicular)
		• *(Assignment-1: Problem & Solving)*
					om/watch?v=cj4XTyW6ums
					• *Discussion,*
					  [TM: 1x(2x50")]
					• *Assignment-1: Summarize the lecture material and working on sample practice questions given in lecture*
					  [PT+BM:(1+1)x(2x60")]
					• *Exercise Exercises on simple harmonic motion, mathematical pendulum, physical pendulum, torsional pendulum, combination of harmonious vibrations (parallel and perpendicular)*
					  [PT+BM:(1+1)x(2x60")]		

Praktikum Mampu menggunakan getaran, hukum Hooke	1.3. Ketepatan menghitung dan mendemonstrasikan terkait perbedaan	**Kriteria:** Rubrik	• **Praktikum:** Modul G1 dan G2 : Bandul matematis dan Bandul Fisis	• **Praktikum Mandiri Menggunakan program animasi**		**5%**

pada konsep bandul matematis dan bandul fisis. **Practicum** *Able to use vibrations, Hooke law on the concepts of mathematical and physical pendulum.*	sistem bandul matematis dan bandul fisis. *1.3. Accuracy in calculating and demonstrating differences between mathematical and physical pendulum.*	Modul praktikum Fisika Dasar 1 **Teknik non-test**: • Praktikum di dampingi oleh asisten lab. • Mencatat Data hasil praktikum, acc asisten. **Teknik non-test**: • Tes pendahuluan lesan. • Laporan akhir • Presentasi *Criteria:* *Rubric Physics 1 Practicum module* ***Non-test technique**:* *• Practicum assisted by*	7 jam: Tutorial / Pre-test, Persiapan, Pelaksanaan Praktikum, Penyusunan laporan, Presentasi hasil. *• **Practicum**:* *Module G1 and G : Mathematical and physical pendulum* *7 hours: Tutorial / Pre-test, Preparation, Practicum implementation, Report preparation, Result presentation.*	**yang telah disiapkan oleh TIM ITS** • ***Independent practicum using animation programs prepared by ITS Team***	

		laboratory assistant • *Record data on practicum results, acc assistant* ***Test technique***: • *Oral preliminary test* • *Final report Presentation*				
	Asistensi mampu menerapkan konsep gerak harmonis sederhana, energi gerak harmonis sederhana, bandul matematis, bandul fisis, bandul puntir serta mampu menghitung gabungan getaran selaras (sejajar dan tegak lurus) *Assistance* *able to apply the concept of simple harmonic motion, simple harmonic motion*	1.4 Ketepatan menghitung penyelesaian soal-soal berkenaan dengan konsep gabungan dua getaran selaras dan tegak lurus. 1.4 *Accuracy in calculating the problem solutions related to the*	**Kriteria**: Pedoman Penskoran (*Marking Scheme*) **Teknik non-tes**: • Tanya-jawab lisan • Menyalin jawaban soal-soal yang dibahas oleh asisten selama perkuliahan.	• **Pembahasan soal – soal berkenaan energi osilasi dan gabungan dua getaran baik selaras maupun tegak lurus.** • **Diskusi**, **[TM: 1x(3x50")]** • ***Discussing questions related to oscillation energy***	• **Pembahasan soal – soal tatap maya (Zoom, melalui group WA, LINE, dll**.) berkenaan dengan energi osilasi dan gabungan dua getaran **[TM: 1x(3x50")]** • **MyITS-Classroom**: Sumber belajar: • ***Discussing questions virtually (Zoom, through WA group,***	3%

| energy, mathematical pendulum, physical pendulum, torsional pendulum and able to calculate combined harmonious vibrations (parallel and perpendicular) | concept of combining two harmonious and perpendicular motion. | **Teknik tes**:
 • Keatifan dan ketepatan jawaban atas pertanyaan yang diajukan oleh asisten

 Criteria: *Scoring guidelines* (*Marking Scheme*)

 Non-test technique:
 • *Oral questions and answers*
 • *Transcribe exercises discussed with the assistant during lectures*

 Test technique: *Originality and accuracy of* | *and combination of two vibrations both harmonious and perpendicular*
 • **Discussion**, *[TM: 1x(3x50")]* | *Line, etc) about oscillation energy and combination of two vibrations* **[TM: 1x(3x50")]**
 • **MyITS-Classroom**: *Learning resources:* | | |

			answering questions asked by the assistant				
13,14	Sub-CPMK7: 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. _LLO7: 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_	1.5 Ketepatan menjelaskan tentang konsep elastisitas, teori hidrostatis, prinsip Pascal, Archimedes, Tegangan Permukaan dan Kapilaritas 1.6 Ketepatan menghitung penyelesaian soal-soal berkenaan dengan elastisitas, hidrostatis, prinsip Pascal, Archimedes, dan Tegangan Permukaan 1.7 Ketepatan menghitung dan mendemonstrasikan viskositas cairan	**Kriteria**: Pedoman Penskoran (_Marking Scheme_) **Teknik non-tes**: • Meringkas materi kuliah • Tanya-jawab lisan • Menyalin contoh soal **Teknik tes**: Latihan soal **Kriteria**: Rubrik Modul praktikum Fisika Dasar 1 **Teknik non-tes**:	• **Kuliah**: • **Diskusi**, **[TM: 1mgx(3sksx50")]** • **Tugas**: Menyusun ringkasan kuliah dan menghitung berhubungan dengan elastisitas, teori hidrostatis, prinsip Pascal, Archimedes, Tegangan Permukaan dan Kapilaritas **[PT+BM:(1+1)x(3x50")]** **Modul**: Viskositas cairan 7 jam: Tutorial / Pre-tes, Persiapan, Pelaksanaan Praktikum,	• **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 tentang viskositas cairan yang telah disiapkan oleh TIM ITS**	**Mekanika fluida**: elastisitas, tekanan hidrostatika, prinsip Pascal, prinsip Archimedes, tegangan permukaan dan kapilaritas _**Fluid mechanics**: elasticity, hydrostatic pressure, Pascal principle, Archimedes, surface_	5 %

		1.5 *Accuracy in explaining the concept of elasticity, hydrostatic theory, Pascal principle, Archimedes, surface tension and capillarity* 1.6 *Accuracy in calculating the problems solutions related to elasticity, hydrostatic theory, Pascal principle, Archimedes, and surface tension* 1.7 Accuracy in calculating and demonstrating fluid viscosity	• Praktikum di dampingi oleh asisten lab. • Mencatat Data hasil praktikum, acc asisten. **Teknik non-tes**: • Tes pendahuluan lisan. • Laporan akhir • Presentasi *Criteria*: *Scoring guidelines (Marking Scheme)* ***Non-test technique*:** • *Summarize the lecture material* • *Oral questions and answers*	Penyusunan laporan, Presentasi hasil. • ***Lecture*:** • ***Discussion*,** **[TM: 1mgx(3sksx50")]** •***Assignment*:** *Compile a lecture summary and doing calculation related to elasticity, hydrostatic theory, Pascal principle, Archimedes, surface tension and capillarity* **[PT+BM:(1+1)x(3x50")]** **Modul**: Fluid viscosity 7 hours: Tutorial / Pretest, Preparation, Practicum implementation, Report preparation, Result presentation.	• ***Face-to-face virtual lecture*** *(Zoom);* • ***Discussion*;** **[TM: 1x(3x50")]** • ***Assignment*:** *Compile a lecture summary and doing calculation related to elasticity, hydrostatic, Pascal principle, Archimedes, surface tension and capillarity* **[PT+BM:(1+1)x(3x50")]** • ***Independent practicum using animation programs about viscosity prepared by ITS Team***	*tension and capillarity*	

			• *Transcribe exercise* ***Test technique***: *Exercise* ***Criteria***: *Rubric* *Physics 1 Practicum module* ***Non-test technique***: • *Practicum assisted by laboratory assistant* • *Record data on practicum results, acc assistant* ***Test technique***: • *Oral preliminary test* • *Final report Presentation*			

Asistensi Mampu menggunakan konsep dan teori hidrostatis, prinsip Pascal, Archimedes, Tegangan Permukaan, Bernoulli dalam menyelesaikan masalah-masalah mekanika fluida *Assistance* *Able to use hydrostatic concept and theory, Pascal's principle, Archimedes, Bernoulli in solving fluid mechanics problems*	1.8 Ketepatan menghitung penyelesaian soal-soal berkenaan dengan konsep dan teori hidrostatis, prinsip Pascal, Archimedes, Tegangan Permukaan, Bernoulli 1.8 *Accuracy in calculating the problem solutions related to hydrostatic concept and theory, Pascal's principle, Archimedes, Bernoulli*	**Kriteria**: Pedoman Penskoran (*Marking Scheme*) **Teknik non-tes**: • Tanya-jawab lisan • Menyalin jawaban soal-soal yang dibahas oleh asisten selama perkuliahan. **Teknik tes**: Keatifan dan ketepatan jawaban atas pertanyaan yang diajukan oleh asisten *Criteria*: *Scoring guidelines*	• **Pembahasan soal – soal berkenaan** teori elastisitas, hidrostatis, prinsip Pascal, Archimedes, Tegangan Permukaan, Bernoulli dalam menyelesaikan masalah-masalah mekanika fluida • **Diskusi**, **[TM: 1x(3x50")]** • *Discussing questions related to elasticity theory, hydrostatic, Pascal's principle, Archimedes, Surface Tension, Bernoulli in solving fluid mechanics problems* • *Discussion*, **[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 **[TM: 1x(3x50")]** • **MyITS-Classroom**: Sumber belajar: https://www.youtube.com/watch?v=UJ3-Zm1wbIQ • *Discussing questions virtually (Zoom, through WA group, Line, etc) about hydrostatic concept and theory, Pascal's*	**Mekanika fluida**: elastisitas, tekanan hidrostatika, prinsip Pascal, prinsip Archimedes, tegangan permukaan, persamaan kontinuitas, persamaan Bernoulli, viskositas *Fluid mechanics:* *elasticity, hydrostatic pressure, Pascal principle, Archimedes, surface tension,*	2%

			(*Marking Scheme*) ***Non-test technique***: • *Oral questions and answers* • *Transcribe exercises discussed with the assistant during lectures* ***Test technique***: *Originality and accuracy of answering questions asked by the assistant*		*principle, Archimedes, Bernoulli in solving fluid mechanics problems* **[TM: 1x(3x50")]** • **MyITS-Classroom**: *Learning resources:* https://www.youtube.com/watch?v=UJ3-Zm1wbIQ	*continuity equation, Bernoulli equation and viscosity*	
15,16	EVALUASI AKHIR SEMESTER *FINAL EXAM*					100 %

Catatan sesuai dengan SN Dikti Permendikbud No 3/2020:
1. Capaian Pembelajaran Lulusan PRODI (CPL-PRODI) adalah kemampuan yang dimiliki oleh setiap lulusan PRODI yang merupakan internalisasi dari sikap, penguasaan pengetahuan dan ketrampilan sesuai dengan jenjang prodinya yang diperoleh melalui proses pembelajaran.

2. CPL yang dibebankan pada mata kuliah adalah beberapa capaian pembelajaran lulusan program studi (CPL-PRODI) yang digunakan untuk pembentukan/pengembangan sebuah mata kuliah yang terdiri dari aspek sikap, ketrampulan umum, ketrampilan khusus dan pengetahuan.
3. CP Mata kuliah (CPMK) adalah kemampuan yang dijabarkan secara spesifik dari CPL yang dibebankan pada mata kuliah, dan bersifat spesifik terhadap bahan kajian atau materi pembelajaran mata kuliah tersebut.
4. Sub-CP Mata kuliah (Sub-CPMK) adalah kemampuan yang dijabarkan secara spesifik dari CPMK yang dapat diukur atau diamati dan merupakan kemampuan akhir yang direncanakan pada tiap tahap pembelajaran, dan bersifat spesifik terhadap materi pembelajaran mata kuliah tersebut.
5. Indikator penilaian kemampuan dalam proses maupun hasil belajar mahasiswa adalah pernyataan spesifik dan terukur yang mengidentifikasi kemampuan atau kinerja hasil belajar mahasiswa yang disertai bukti-bukti.
6. Kreteria Penilaian adalah patokan yang digunakan sebagai ukuran atau tolok ukur ketercapaian pembelajaran dalam penilaian berdasarkan indikator-indikator yang telah ditetapkan. Kreteria penilaian merupakan pedoman bagi penilai agar penilaian konsisten dan tidak bias. Kreteria dapat berupa kuantitatif ataupun kualitatif.
7. Teknik penilaian: tes dan non-tes.
8. Bentuk pembelajaran: Kuliah, Responsi, Tutorial, Seminar atau yang setara, Praktikum, Praktik Studio, Praktik Bengkel, Praktik Lapangan, Penelitian, Pengabdian Kepada Masyarakat dan/atau bentuk pembelajaran lain yang setara.
9. Metode Pembelajaran: *Small Group Discussion*, *Role-Play & Simulation*, *Discovery Learning*, *Self-Directed Learning*, *Cooperative Learning*, *Collaborative Learning*, *Contextual Learning*, *Project Based Learning*, dan metode lainnya yg setara.
10. Materi Pembelajaran adalah rincian atau uraian dari bahan kajian yg dapat disajikan dalam bentuk beberapa pokok dan sub-pokok bahasan.
11. Bobot penilaian adalah prosentasi penilaian terhadap setiap pencapaian sub-CPMK yang besarnya proposional dengan tingkat kesulitan pencapaian sub-CPMK tsb., dan totalnya 100%.
12. **TM**=Tatap Muka, **PT**=Penugasan Terstuktur, **BM**=Belajar Mandiri.