

1. Maklumat Kursus / Course Info

Nama Kursus: Course Name:	Termodinamik / Thermodynamics		
Kod Kursus: Course Code:	SFG3023	Nilai Kredit: Credit Value:	3

2. Sinopsis / Synopsis

Kursus ini membincangkan konsep asas dalam termodinamik. Kandungan kursus termasuk suhu, haba, gas ideal, hukum termodinamik pertama dan kedua serta entropi.

This course discusses fundamental concept in thermodynamics. The content of the course include temperature, heat, ideal gas, first and second law of thermodynamics and entropy.

3. Nama Staff Akademik / Name(s) of Academic Staff

1. Ts. Dr. Muhammad Noorazlan Bin Abd Azis
2. Dr. Afiq bin Radzwan

4. Semester dan Tahun / Semester and Year Offered

Semester: Semester:	1	Tahun: Year:	2
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5. Prasyarat (jika ada) / Prerequisite (if any)

Tiada / None

6. Hasil Pembelajaran Kursus / Course Learning Outcomes (CLO)

CLO1	Menyelesaikan masalah berkaitan haba, sifat-sifat terma dan termodinamik. (C4, PLO2) <i>Solve problems related to heat, thermal properties and thermodynamics. (C4, PLO2)</i>	C4
CLO2	Menulis laporan saintifik berdasarkan tugas amali. (P3, PLO3) <i>Write scientific reports based on practical assignments. (P3, PLO3)</i>	P3

CLO3	Menunjukkan kemahiran bekerja dalam kumpulan yang efektif dalam menyelesaikan tugas yang diberikan. (A3, PLO4) <i>Demonstrate the effective team work skill in completing the given assignment. (A3, PLO4)</i>	A3
CLO4	Mengaplikasikan kemahiran numerasi dalam menyelesaikan masalah berkaitan haba, sifat-sifat terma dan termodinamik. (C3, PLO7) <i>Apply numeracy skills in solving problems related to heat, thermal properties and thermodynamics. (C3, PLO7)</i>	C3

7. Pemetaan Hasil Pembelajaran Kursus kepada Hasil Pembelajaran Program / Mapping of the Course to the Programme Learning Outcomes

CLO	Program Learning Outcomes (PLO)											Teaching Methods	Assessment
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11		
CLO1		✓										• Kuliah / Lecture	• Peperiksaan Akhir / Final Examination
CLO2			✓									• Praktikal / Practical	• Laporan Praktikal / Practical Report
CLO3				✓								• Perbincangan / Discussion	• Tugas (Individu) / Assignment (Individual)
CLO4							✓					• Kuliah / Lecture	• Kuiz Dalam Talian / Online Quiz • Ujian / Test

(Deskripsi ini mesti dibaca bersama dengan Standard 2.1.2, 2.2.1 dan 2.2.2 di Area 2 - muka surat 16 & 18 / This description must be read together with Standards 2.1.2, 2.2.1 and 2.2.2 in Area 2 - pages 16 & 18)

Hasil Pembelajaran Program / Programme Learning Outcomes	
PLO1	Menerangkan pengetahuan teoretikal dan teknikal dalam bidang pendidikan dan fizik. [MQF1] <i>Describe theoretical and technical knowledge in education and physics [MQF1]</i>
PLO2	Mempamerkan keupayaan intelektual melalui aplikasi kemahiran berfikir berkaitan bidang pendidikan dan fizik.[MQF2] <i>Demonstrate intellectual ability through the application of thinking skills related to the field of education and physics . [MQF2]</i>
PLO3	Mengaplikasikan kaedah dan kemahiran praktikal yang sesuai bagi pelaksanaan tugas dalam bidang pendidikan dan fizik. [MQF3A] <i>Apply appropriate methods and practical skills for the implementation of tasks in the field of education and physics . [MQF3A]</i>
PLO4	Berinteraksi secara efektif dengan menggunakan kemahiran interpersonal yang berkesan. [MQF3B] <i>Interact effectively using effective interpersonal skills. [MQF3B]</i>
PLO5	Berkomunikasi secara bertulis dan lisan melalui pelbagai media penyampaian. [MQF3C] <i>Communicate in writing and orally through a variety of delivery media. [MQF3C]</i>
PLO6	Mengintegrasikan pelbagai sumber media dan teknologi digital bagi menyelesaikan tugas. [MQF3D] <i>Integrate various media sources and digital technologies to complete tasks. [MQF3D]</i>

PLO7	Mengaplikasikan kemahiran numerasi dalam penyelesaian masalah. [MQF3E] <i>Apply numeracy skills in problem solving. [MQF3E]</i>
PLO8	Menunjukkan kepimpinan, sikap berautonomi dan kebertanggungjawaban pada pelbagai peringkat pengurusan. [MQF3F] <i>Demonstrates leadership, autonomy and accountability at various levels of management. [MQF3F]</i>
PLO9	Mempamerkan kemajuan diri menerusi pembelajaran berterusan dan pembangunan profesional secara proaktif. [MQF4A] <i>Demonstrate self-improvement through continuous learning and professional development proactively. [MQF4A]</i>
PLO10	Mempamerkan pemikiran dan kemahiran keusahawanan dalam pengurusan projek. [MQF4B] <i>Demonstrate entrepreneurial thinking and skills in project management. [MQF4B]</i>
PLO11	Mematuhi kod etika dalam persekitaran sosial dan amalan profesional. [MQF5] <i>Adhere to a code of ethics in social environment and professional practice. [MQF5]</i>

8. Kemahiran yang boleh dipindahkan (jika berkaitan) / *Transferable Skills (if applicable)*

1	Penyelesaian masalah <i>Problem solving</i>
2	Kerjasama <i>Collaboration</i>
3	Pemerhatian <i>Observation</i>
4	Kerja berkumpulan <i>Team work</i>

9. Pengagihan Jam Pembelajaran Pelajar / *Distribution of Student Learning Time (SLT)*

Week	Course Content Outline	CLO				Conventional						Online				SLT
						Guided Learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	Learning Material		Activities		
		CLO1	CLO2	CLO3	CLO4	L	T	P	O			Guided	Non Guided	Guided	Non Guided	

1 - 3	Suhu dan haba Suhu, haba, pengembangan haba, mekanisme pemindahan haba. Suhu, termometer; kuantiti haba, kapasiti haba tertentu, haba terpendam, molar mendengar kapasiti, contoh proses kalorimetrik; linear, luas dan keluasan kelantangan, pengembangan bimetal, pengembangan sebenar, pengembangan cecair yang jelas; konduktor haba yang baik dan miskin, konduksi melalui pelbagai lapisan; perolakan; radiasi, gelombang mekanikal Temperature and Heat <i>Temperature, heat, thermal expansion, mechanism of heat transfer. Temperature, thermometers; quantity of heat, specific heat capacities, latent heats, molar heat capacities, examples of calorimetric processes; linear, area and volume expansivity, expansion of bimetal, true expansion, apparent expansion of liquid; good and poor heat conductors, conduction through multi-layers; convection; radiation, mechanical waves</i>	✓	✓			0	0	3	0	0	0	2	0	0	0	5
4 - 6	Haba dan sifat bahan Pembolehubah termodinamik, model molekul kinetik gas ideal. Parameter keadaan gas, persamaan gas ideal; tafsiran molekul suhu, tenaga kinetik translasi, titik kritikal, persamaan gas Thermal and Properties of Matter <i>Thermodynamics variables, kinetic molecular model of an ideal gas. Parameters of a gas state, an ideal gas equation; the molecular interpretation of temperature, translational kinetic energy, mean free path, real gases, critical point, equation of state real gases</i>	✓	✓		✓	3	2	3	0	0	7	0	0	0	0	15
7 - 8	Kapasiti Haba bagi Gas Kapasiti molar haba bagi gas, definisi bagi γ, equipartition tenaga, jenis molekul gas, kelajuan molekul, Maxwell-Boltzmann Heat Capacities of Gases <i>Molar heat capacity of gases, the definition of γ, equipartition of energy, types of gas molecules, molecular speeds, Maxwell-Boltzmann</i>	✓		✓		3	0	0	0	0	6	0	0	0	0	9

9 - 10	Hukum termodinamik pertama Hukum termodinamik pertama, kerja, laluan termodinamik, pengembangan bebas, tenaga pendam; rajah pV, jenis proses termodinamik, proses adiabatik untuk gas ideal First Law of Thermodynamics <i>First law of thermodynamics, work done, path between thermodynamic states, free expansion, internal energy; pV diagrams, kinds of thermodynamics processes, adiabatic processes for an ideal gas</i>	✓		✓	✓	6	2	0	0	0	13					21
11 - 12	Hukum Termodinamik Kedua Gambarajah konsep bagi tenaga, takungan haba, kerja, tenaga dalaman, proses termodinamik untuk enjin Otto, Diesel dan Carnot, kecekapan enjin; penyejukan, pekali prestasi, peti sejuk Carnot Second Law of Thermodynamics <i>Energy concept diagram, heat reservoirs, work, internal energy, the thermodynamic processes for Otto, Diesel and Carnot engines, engine efficiency; refrigeration, coefficient of performance, the Carnot refrigerator</i>	✓	✓	✓	✓	6	3	3	0	0	10					22
13	Aplikasi Hukum Termodinamik Kedua: Reaktor Nuklear Tenaga nuklear, bahan radioaktif, kerosakan radioaktif, jenis radiasi Application of Second Law of Thermodynamics: Nuclear reactor <i>Nuclear energy, radioactive materials, radioactive decay, types of radiation</i>	✓				3	0	0	0	0	3					6
14	Entropi Penjelasan secara statistik bagi hukum termodinamik kedua. Entropy <i>The statistical explanation of second law of thermodynamics.</i>	✓				3	0	0	0	0	3					6
TOTAL						24	7	9	0	0	42	2	0	0	0	84

Continuous Assessment		Percentage (%)	Conventional		Online	SLT
			F2F	NF2F		
1	Ujian (Test)	15	3	3		6
2	Kuiz Dalam Talian (Online Quiz)	10	2	3		5
3	Laporan Praktikal (Practical Report)	20	6	6		12
4	Tugasan (Individu) (Assignment (Individual))	15	3	6		9
TOTAL		60	14	18	0	32
Final Assessment		Percentage (%)	Conventional		Online	SLT
			F2F	NF2F		
1	Peperiksaan Akhir (Final Examination)	40	4	0		4
TOTAL		40	4	0	0	4
GRAND TOTAL						120

10. Keperluan Khas / Special Requirement

Makmal sedia ada di Jabatan Fizik untuk kegunaan amali dan tugasan berkumpulan

Existing labs in the Department of Physics for practical use and group assignments

11. Rujukan / Reference

Utama:

Young, H.D. & Freedman, R.A. (2020). University Physics with Modern Physics (15th ed). United States of America: Pearson Education, Inc.

Tambahan:

Cutnell, J.D. & Johnson, K.W. (2012). Physics (9th ed). New York: John Wiley.

Giancoli, D.C. (2011). Physics for Scientists and Engineers with Modern Physics (4th ed). Singapore: Prentice-Hall.

Hewitt, P.G. (2009). Conceptual Physics (11th ed). New Jersey: Addison Wesley.

Knight, R.D. (2013). Physics for Scientists and Engineers with Modern Physics: A Strategic Approach. San Francisco: Wesley.

12. Maklumat Tambahan Lain / Others Additional Information

Senarai tajuk makmal:

1. Suhu dan Haba (Hukum Gas, pengembangan)
2. Kapasiti Haba Khusus
3. Prinsip Pam haba

List of laboratory titles:

1. Temperature and Heat (Gas laws, volume expansion)
2. Specific Heat Capacity
3. The Principle of Heat Pump

13. Pengesahan / Verification

	Disediakan/ Dikemaskini oleh: Prepared/ Updated by:	Disemak oleh: Checked by:
Nama: Name:	TS. DR. MUHAMMAD NOORAZLAN BIN ABD AZIS	DR. MOHD FAUDZI BIN UMAR
Jawatan: Designation:	Penyelaras Kursus Course Coordinator	KETUA JABATAN
Tarikh: Date:	24 MARCH 2024	25 MARCH 2024

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