RIH SP015

Contents

Lectures

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER I SESSION 2022/2023

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<tr><td>Thursday
8/4/2022
10am-
11am
DK2</td><td>K1</td><td>1.1a Define dimension.
1.2a Define scalar and vector quantities.
1.3a State the significant figures of a given number.
1.3e State the sources of uncertainty in the results of an experiment.</td><td>Q&A
Discussions</td><td><table><tr><th>*Appendix</th><th>SCORE</th></tr><tr><td>i</td><td>3</td></tr><tr><td>ii</td><td>3</td></tr><tr><td>iii</td><td>4</td></tr><tr><td>iv</td><td>4</td></tr><tr><td>v</td><td>4</td></tr></table></td><td>All objectives achieved. Students are able to understand the materials of the topic.</td></tr>
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KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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<tr><td>Thursday
8/11/2022
10am-
11am
DK2</td><td>K1</td><td>1.1a Define dimension.
2.1b Interpret the physical meaning of displacement-time, velocity-time and acceleration-time graphs.
2.3a Describe projectile motion launched at an angle, 0 as well as special cases when 0=0 degrees</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
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KETUA UNIT FIZIK
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<tr><td>Thursday
8/18/2022
10am-
11am
DK2</td><td>K1</td><td>2.3a Describe projectile motion launched at an angle, 0 as well as special cases when 0=0 degrees
3.1a Define momentum and impulse, J = FΔt
3.2a State the principle of conservation of linear momentum.
3.2c Differentiate elastic and inelastic collisions. (remarks: similarities & differences)</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
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KETUA UNIT FIZIK
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<tr><td>Thursday
8/25/2022
10am-11am
DK2</td><td>K1</td><td>3.3a Identify the forces acting on a body in different situations:
i. Weight, W; ii. Tension, T; iii. Normal force, N; iv. Friction, f; and v. External force (pull or push), F.
3.4a State Newton's laws of motion.</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
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<tr><td>Thursday
9/1/2022
10am-11am
DK2</td><td>K1</td><td>4.1a State the physical meaning of dot (scalar) product for work : W = F.s = Fs cos θ
4.1b Define and apply work done by a constant force.
4.2a Define and use: i. Gravitational potential energy, U = mgh ii. Elastic potential energy for spring, U = kx2 iii. Kinetic energy, K = 0.5mv 2
4.2b State the principle of conservation of energy.</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
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KETUA UNIT FIZIK
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10am-
11am
DK2</td><td>K1</td><td>4.2d State and apply work-energy theorem, W = ΔK
4.3a Define and use average power, P-av = ΔW/Δt and instantaneous power, P = F • v
5.1a Define and use: i. angular displacement, θ ii. period, T iii. frequency, f iv. angular velocity, ω
5.2a Describe uniform circular motion.</td><td>Q&A
Discussions</td><td><table><tr><th>*Appendix</th><th>SCORE</th></tr><tr><td>i</td><td>4</td></tr><tr><td>ii</td><td>3</td></tr><tr><td>iii</td><td>3</td></tr><tr><td>iv</td><td>4</td></tr><tr><td>v</td><td>3</td></tr></table></td><td>All objectives achieved. Students are able to understand the materials of the topic.</td></tr>
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9/22/2022
10am-
11am
DK2</td>
<td>K1</td>
<td>5.3a Explain centripetal acceleration and centripetal force, ac =v2/r=rω2=vω and FC = mv2/r=mrω2=mvω
6.1a Define and use: iangular displacement, θ; ii. average angular velocity, ωav, iii. instantaneous angular velocity, ω; iv. average angular acceleration, αav; and v. instantaneous angular acceleration, α.
6.2a State the physical meaning of cross (vector) product for torque, = rFsinθ
6.2b Define and apply torque.
6.2c State conditions for equilibrium of rigid body, ΣF = 0, Στ = 0</td>
<td>Q&A
Discussions</td>
<td>
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10am-
11am
DK2</td><td>K1</td><td>6.3a Define and use moment of inertia, I = mr2
6.3d State and use net torque, Στ = la
6.4a Explain and use angular momentum, L = Ico
6.4b State and use principle of conservation of angular momentum.</td><td>Q&A
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10/6/2022
10am-
11am
DK2</td><td>K1</td><td>7.1a Explain SHM.
7.1d Emphasise the relationship between total SHM energy and amplitude.</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
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<tr><td>Thursday
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10am-11am
DK2</td><td>K1</td><td>7.4a Define wavelength.
7.4b Define and use wave number, k = 2π/λ</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
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<tr><td>Thursday
10/20/2022
10am-11am
DK2</td><td>K1</td><td>7.4d Distinguish between particle vibrational velocity and wave propagation velocity.
7.5a State the principle of superposition of waves for the constructive and destructive interferences.</td><td>Q&A
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<tr><td colspan="2">CODE / COURSE</td><td colspan="4">SP015</td></tr>
<tr><td colspan="2">WEEK</td><td colspan="4">12</td></tr>
<tr><td colspan="2">CHAPTER</td><td colspan="4">7: OSCILLATIONS AND WAVES
8: PHYSICS OF MATTER</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Lecture</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO 1: Describe basic concepts of mechanics, waves, heat and thermodynamics</td></tr>
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DATE
TIME
VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
<tr><td>Thursday
10/27/2022
10am-11am
DK2</td><td>K1</td><td>7.5c Compare between progressive waves and standing waves.
7.7a State Doppler Effect for sound waves.
8.1c Explain elastic and plastic deformations.</td><td>Q&A
Discussions</td><td><table><tr><th>*Appendix</th><th>SCORE</th></tr><tr><td>i</td><td>4</td></tr><tr><td>ii</td><td>4</td></tr><tr><td>iii</td><td>4</td></tr><tr><td>iv</td><td>3</td></tr><tr><td>v</td><td>4</td></tr></table></td><td>All objectives achieved. Students are able to understand the materials of the topic.</td></tr>
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KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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<tr><td colspan="2">WEEK</td><td colspan="4">13</td></tr>
<tr><td colspan="2">CHAPTER</td><td colspan="4">8: PHYSICS OF MATTER</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Lecture</td></tr>
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<tr><td>Thursday
11/3/2022
10am-11am
DK2</td><td>K1</td><td>8.2a Define and use Young's Modulus, Y= σ/ε</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
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<tr><td>Thursday
11/10/2022
10am-11am
DK2</td><td>K1</td><td>8.3a Define heat conduction.</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
*Appendix</th><th>SCORE</th></tr><tr><td>i</td><td>3</td></tr><tr><td>ii</td><td>3</td></tr><tr><td>iii</td><td>3</td></tr><tr><td>iv</td><td>4</td></tr><tr><td>v</td><td>4</td></tr></table></td><td>All objectives achieved. Students are able to understand the materials of the topic.</td></tr>
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<tr><td colspan="2">WEEK</td><td colspan="4">15</td></tr>
<tr><td colspan="2">CHAPTER</td><td colspan="4">8: PHYSICS OF MATTER</td></tr>
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<tr><td>Thursday
11/17/2022
10am-11am
DK2</td><td>K1</td><td>8.4a Define coefficient of linear expansion, α, area expansion, β and volume expansion, γ</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
*Appendix</th><th>SCORE</th></tr><tr><td>i</td><td>3</td></tr><tr><td>ii</td><td>3</td></tr><tr><td>iii</td><td>3</td></tr><tr><td>iv</td><td>4</td></tr><tr><td>v</td><td>3</td></tr></table></td><td>All objectives achieved. Students are able to understand the materials of the topic.</td></tr>
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<tr><td colspan="2">WEEK</td><td colspan="4">16</td></tr>
<tr><td colspan="2">CHAPTER</td><td colspan="4">9: KINETIC THEORY OF GASES AND THERMODYNAMICS</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Lecture</td></tr>
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<tr><td>Thursday
11/24/2022
10am-11am
DK2</td><td>K1</td><td>9.1a State the assumptions of kinetic theory of gases.
9.1b Describe root mean square (rms) speed of gas molecules vrms=(<v2>)0.5
9.2a Explain and use translational kinetic energy of a molecule, Ktr = (3/2)(R/NA)(T)=(3/2)kT</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
*Appendix</th><th>SCORE</th></tr><tr><td>i</td><td>4</td></tr><tr><td>ii</td><td>4</td></tr><tr><td>iii</td><td>4</td></tr><tr><td>iv</td><td>3</td></tr><tr><td>v</td><td>3</td></tr></table></td><td>All objectives achieved. Students are able to understand the materials of the topic.</td></tr>
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<tr><td>Thursday
12/1/2022
10am-
11am
DK2</td><td>K1</td><td>9.2b Define degree of freedom.
9.2c Identify number of degrees of freedom, for monoatomic, diatomic and polyatomic gas molecules.
9.2d State the principle of equipartition of energy.
9.2e Discuss internal energy of gas.</td><td>Q&A
Discussions</td><td><table><tr><th>*Appendix</th><th>SCORE</th></tr><tr><td>i</td><td>3</td></tr><tr><td>ii</td><td>4</td></tr><tr><td>iii</td><td>4</td></tr><tr><td>iv</td><td>4</td></tr><tr><td>v</td><td>3</td></tr></table></td><td>All objectives achieved. Students are able to understand the materials of the topic.</td></tr>
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<tr><td>Thursday
12/8/2022
10am-11am
DK2</td><td>K1</td><td>9.3a State the First Law of Thermodynamics, ΔU=Q - W
9.4a Define the following thermodynamic processes: i. Isothermal; ii. Isochoric; iii. Isobaric and iv. Adiabatic.
9.4b Analyse P-V graph for all the thermodynamic processes.</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
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Tutorials

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER I SESSION 2022/2023

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<tr><td colspan="2">CHAPTER</td><td colspan="4">1: PHYSICAL QUANTITIES AND MEASUREMENTS</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Tutorial</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO2: Solve problems related to mechanics, waves, matter, heat and thermodynamics.</td></tr>
<tr><td colspan="2">SLT</td><td>F2F (hour):</td><td>1</td><td>NF2F (hour):</td><td>1</td></tr>
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<tr>
<td>K2 (Mon)
K2 (01/08/2022)
T3 (11am - 12pm),T4B (12pm -1pm), T4A (2pm-3pm)
T3 (MF),T4B (MF), T4A (BT3)</td>
<td>K2</td>
<td>1.1b: Determine the dimensions of derived quantities.
1.1c: Verify the homogeneity of equations using dimensional analysis.</td>
<td>Discussion and Sample Problem Practice</td>
<td>
<table>
<tr><th>*Appendix</th><th>SCORE</th></tr>
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<td>T3 & T4B (Tues), T4A (Wed)
T3 & T4B (02/08/2022), T4A (03/08/2022)
T3 (12pm - 1pm),T4B (2pm - 3pm), T4A (2pm-3pm)
T3 (DK1),T4B (MF), T4A (BT3)</td>
<td>K2</td>
<td>1.2b: Resolve vector into two perpendicular components (x and y axes).
1.2c: Determine resultant of vectors. (remarks: limit to three vectors only).</td>
<td>Discussion and Sample Problem Practice</td>
<td>
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<tr>
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T3 (04/08/2022) & T4 (05/08/2022)
T3 (2pm - 3pm),T4B (10am - 11am), T4A (9am-10am)
T3 (DK1),T4B (MF), T4A (MF)</td>
<td>K2</td>
<td>1.3b: Use the rules for stating the significant figures at the end of a calculation (addition, subtraction, multiplication or division).
1.3c: Determine the uncertainty for average value and derived quantities.
1.3d: Calculate basic combination (propagation) of uncertainties.
1.3f: Draw a linear graph and determine its gradient, y-intercept and its respective uncertainties. (remarks: using Least Square Method LSM to determine uncertainties)
1.3g: Measure and determine the uncertainty of physical quantities.(Experiment I : Measurement and uncertainty)</td>
<td>Discussion and Sample Problem Practice</td>
<td>
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<tr><th>ITEM
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<tr><td colspan="2">CHAPTER</td><td colspan="4">2: KINEMATICS OF MOTIONS</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Tutorial</td></tr>
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K2 (08/08/2022)
T3 (11am - 12pm),T4B (12pm -1pm), T4A (2pm-3pm)
T3 (MF),T4B (MF), T4A (BT3)</td>
<td>K2</td>
<td>2.1c: Determine the distance travelled, displacement, velocity and acceleration from appropriate graphs.</td>
<td>Discussion and Sample Problem Practice</td>
<td>
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SEMESTER I SESSION 2022/2023

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T3 (DK1),T4B (MF), T4A (BT3)</td>
<td>K2</td>
<td>2.1c: Determine the distance travelled, displacement, velocity and acceleration from appropriate graphs.</td>
<td>Discussion and Sample Problem Practice</td>
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Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
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<td>K2</td>
<td>2.2a: Derive and apply equations of motion with uniform acceleration v = u + at ; v 2 = u 2 + 2as ; s = ut + -at 2 ; s = 1/2(u + v)t</td>
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<td>3.2b: Apply the principle of conservation of momentum in elastic and inelastic collisions in 2D collisions.</td>
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<td>3.3b: Sketch free body diagram.
3.3c: Determine static and kinetic friction, fs=μN</td>
<td>Discussion and Sample Problem Practice</td>
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<td>3.4b: Apply Newton's laws of motion. *include static and dynamic equilibrium for Newton 's first law motion</td>
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<tr><td colspan="2">MODE</td><td colspan="4">Tutorial</td></tr>
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<td>K2</td>
<td>3.4b: Apply Newton's laws of motion. *include static and dynamic equilibrium for Newton 's first law motion</td>
<td>Discussion and Sample Problem Practice</td>
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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
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<td>K2</td>
<td>4.1c: Determine work done from a force-displacement graph.</td>
<td>Discussion and Sample Problem Practice</td>
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T3 (MF),T4B (MF), T4A (BT3)</td>
<td>K2</td>
<td>5.1a Define and use: i. angular displacement, θ ii. period, T iii. frequency, f iv. angular velocity, ω</td>
<td>Discussion and Sample Problem Practice</td>
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T3 (DK1),T4B (MF), T4A (BT3)</td>
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<td>5.2b: Convert units between degrees, radian, and revolution or rotation.</td>
<td>Discussion and Sample Problem Practice</td>
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T3 (DK1),T4B (MF), T4A (MF)</td>
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<td>5.3b: Solve problems related to centripetal force for uniform circular motion cases: horizontal circular motion, vertical circular motion and conical pendulum.
*exclude banked curve</td>
<td>Discussion and Sample Problem Practice</td>
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T3 (MF),T4B (MF), T4A (BT3)</td>
<td>K2</td>
<td>6.1b: Analyse parameters in rotational motion with their corresponding quantities in linear motion: s = rθ, v = rω, at=rα, ac =v2/r=rω2
6.1c: Solve problem related to rotational motion with constant angular acceleration: ω=ωo+αt, θ = ωo+0.5αt2, ω2=ωo2+2αθ, θ= 0.5(ωo+ω)t</td>
<td>Discussion and Sample Problem Practice</td>
<td>
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Endorsed by,

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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
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<tr><td colspan="2">WEEK</td><td colspan="4">9</td></tr>
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<tr><td colspan="2">MODE</td><td colspan="4">Tutorial</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO2: Solve problems related to mechanics, waves, matter, heat and thermodynamics.</td></tr>
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T3 & T4B (04/10/2022), T4A (05/10/2022)
T3 (12pm - 1pm),T4B (2pm - 3pm), T4A (2pm-3pm)
T3 (DK1),T4B (MF), T4A (BT3)</td>
<td>K2</td>
<td>6.2d: Solve problems related to equilibrium of a uniform rigid body.*limit to 5 forces</td>
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CHAPTER		6: ROTATION OF RIGID BODY			
MODE		Tutorial			
CLO		CLO2: Solve problems related to mechanics, waves, matter, heat and thermodynamics.			
SLT		**F2F (hour):**	1	**NF2F (hour):**	1
DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
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<td>K2</td>
<td>6.3b: Use the moment of inertia of a uniform rigid body. (sphere, cylinder, ring, disc, and rod).
6.3c: Determine the moment of inertia of a flywheel. (Experiment 4: Rotational motion of rigid body)</td>
<td>Discussion and Sample Problem Practice</td>
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<td>6.4a Explain and use angular momentum, L = Ico
6.4b State and use principle of conservation of angular momentum.</td>
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CHAPTER		6: ROTATION OF RIGID BODY			
MODE		Tutorial			
CLO		CLO2: Solve problems related to mechanics, waves, matter, heat and thermodynamics.			
SLT		**F2F (hour):**	1	**NF2F (hour):**	1
DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
T3 (Thurs) & T4 (Fri) T3 (13/10/2022) & T4 (14/10/2022) T3 (2pm - 3pm),T4B (10am - 11am), T4A (9am-10am) T3 (DK1),T4B (MF), T4A (MF)	K2	6.4a Explain and use angular momentum, L = Ico 6.4b State and use principle of conservation of angular momentum.	Discussion and Sample Problem Practice	**ITEM** ***Appendix*** / **SCORE** **i** 4 **ii** 3 **iii** 4 **iv** 4 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

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T3 (11am - 12pm),T4B (12pm -1pm), T4A (2pm-3pm)
T3 (MF),T4B (MF), T4A (BT3)</td>
<td>K2</td>
<td>7.1b: Apply SHM displacement equation, y = A sin (ωt)
7.1c: Derive and use equations: i. velocity, v = ωA cos ωt = ω(A2-y2)0.5 ii. acceleration, a = -ω2A sin ωt = -ωy2 (remarks: No calculus. Derive use algebra and trigonometry method, refer reference book Cutnell) iii. kinetic energy, K = 0.5m ω(A2-y2) iv.
7.1e: Apply equations of velocity, acceleration, kinetic energy and potential energy for SHM.</td>
<td>Discussion and Sample Problem Practice</td>
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T3 (DK1),T4B (MF), T4A (BT3)</td>
<td>K2</td>
<td>7.2a: Analyse the following graphs: i. displacement-time; ii. velocity-time; iii. acceleration-time; and iv. energy-displacement.</td>
<td>Discussion and Sample Problem Practice</td>
<td>
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T3 (20/10/2022) & T4 (21/10/2022)
T3 (2pm - 3pm),T4B (10am - 11am), T4A (9am-10am)
T3 (DK1),T4B (MF), T4A (MF)</td>
<td>K2</td>
<td>7.3a: Use expression for period of SHM, Tfor simple pendulum and mass-spring system. Simple pendulum : T = 2π(l/g)0.5, mass-spring system : T = 2π(m/k)0.5
7.3b: Determine the acceleration, g due to gravity using simple pendulum. (Experiment 5: SHM)
7.3c: Investigate the effect of large amplitude oscillation to the accuracy of acceleration due to gravity, g obtained from the experiment. (Experiment 5: SHM)</td>
<td>Discussion and Sample Problem Practice</td>
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T3 (MF),T4B (MF), T4A (BT3)</td>
<td>K2</td>
<td>7.4c: Solve problems related to equation of progressive wave, y(x, t) = A sin(ωt ± kx)
7.4e: Use particle vibrational velocity, vy = Aω cos (ωt ± kx)
7.4f: Use wave propagation velocity, v = f λ</td>
<td>Discussion and Sample Problem Practice</td>
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T3 (DK1),T4B (MF), T4A (BT3)</td>
<td>K2</td>
<td>7.4g: Analyse the graphs of: i. displacement—time, y-t ii. displacement—distance, y-x</td>
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<td>T3 (Thurs) & T4 (Fri)
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T3 (DK1),T4B (MF), T4A (MF)</td>
<td>K2</td>
<td>7.5b: Use the standing wave equation,y = 2A cos kx sin ωt</td>
<td>Discussion and Sample Problem Practice</td>
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MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
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T3 (MF),T4B (MF), T4A (BT3)</td>
<td>K2</td>
<td>7.6a: Solve problems related to the fundamental and overtone frequencies for: i. stretched string, fn=(nv)/(2L) and ii. Air columns (open, fn = (nv)/(2L) and closed end fn = (nv)/(4L)
7.6b: Use wave speed in a stretched string, v = (T/μ)0.5</td>
<td>Discussion and Sample Problem Practice</td>
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T3 (DK1),T4B (MF), T4A (BT3)</td>
<td>K2</td>
<td>7.6c: Investigate standing wave formed in a stretched string. (Experiment 6: Standing waves)</td>
<td>Discussion and Sample Problem Practice</td>
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T3 (DK1),T4B (MF), T4A (MF)</td>
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<td>7.6d: Determine the mass per unit length of the string.(Experiment 6: Standing waves)</td>
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T3 (MF),T4B (MF), T4A (BT3)</td>
<td>K2</td>
<td>8.1a: Distinguish between stress, σ = F/A and strain, ε=(ΔL)/(Lo) for tensile and compression force.
8.1b: Analyse the graph of stress-strain, σ - ε for a metal under tension.</td>
<td>Discussion and Sample Problem Practice</td>
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T3 (DK1),T4B (MF), T4A (BT3)</td>
<td>K2</td>
<td>8.1d: Analyse graph of force—elongation, F—ΔL for brittle and ductile materials.
8.2b: Apply strain energy, U = 0.5FΔL from force-elongation graph.</td>
<td>Discussion and Sample Problem Practice</td>
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<td>K2</td>
<td>8.2c: Apply strain energy per unit volume, U/V=(1/2)σε from stress-strain graph.</td>
<td>Discussion and Sample Problem Practice</td>
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KOLEJ MATRIKULASI SARAWAK
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Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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<td>8.4b: Solve problems related to thermal expansion of linear, area and volume (include expansion of liquid in a container), $\Delta L = \alpha L_o \Delta T$, $\Delta A = \beta A_o \Delta T$, $\Delta V = \gamma V_o \Delta T$, $\beta = 2\alpha$, $\gamma = 3\alpha$</td>
<td>Discussion and Sample Problem Practice</td>
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<td>9.1c: Solve problems related to root mean square (rms) speed of gas molecules, vtmr=(3kT/m)0.5=(3RT/M)0.5</td>
<td>Discussion and Sample Problem Practice</td>
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<td>9.1d: Solve problems related to the equations, PV =(1/3)Nm vrms2 and pressure , P=(1/3) ρvrms2</td>
<td>Discussion and Sample Problem Practice</td>
<td><table><tr><th>ITEM
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<td>9.2f: Solve problems related to internal energy, U = (1/2)fNkT</td>
<td>Discussion and Sample Problem Practice</td>
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<td>9.3b: Solve problem related to First Law of Thermodynamics.</td>
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T3 (DK1),T4B (MF), T4A (BT3)</td>
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<td>9.4b Analyse P-V graph for all the thermodynamic processes.</td>
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<td>K2</td>
<td>9.5a: Derive equation of work done in isothermal, isochoric and isobaric processes from P-V graph.
9.5b: Solve problem related to work done in: i. isothermal process, W = nRT In (Vf / Vi) ii. isobaric process, W = P(Vf - Vi) iii. isochoric process, W = 0</td>
<td>Discussion and Sample Problem Practice</td>
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Labs

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K2T4 (11am - 1pm); K2T3 (11am - 1pm)
K2T4 (Makmal Fizik); K2T3 (Makmal Fizik)</td>
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<td>1: Measurement and Safety
1.3g: Measure and determine the uncertainty of physical quantities.(Experiment I : Measurement and uncertainty)</td>
<td>Experimental Work</td>
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<td>2: Free Fall & Projectile Motion
2.3c: Determine the acceleration due to gravity, g using free fall and projectile motion.
(Experiment 2: Free fall and projectile motion)</td>
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PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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<td>3: Energy
4.3b: Verify the law of conservation of energy.(Experiment 3: Energy)</td>
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<td>K2</td>
<td>4: Rotational Motion of Rigid Body
6.3c: Determine the moment of inertia of a flywheel. (Experiment 4: Rotational motion of rigid body)</td>
<td>Experimental Work</td>
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<td>K2</td>
<td>5: Simple Harmonic Motion
7.3b: Determine the acceleration, g due to gravity using simple pendulum. (Experiment 5: SHM)
7.3c: Investigate the effect of large amplitude oscillation to the accuracy of acceleration due to gravity, g obtained from the experiment. (Experiment 5: SHM)</td>
<td>Experimental Work</td>
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<td>K2</td>
<td>6: Standing Waves
7.6c: Investigate standing wave formed in a stretched string. (Experiment 6: Standing waves)
7.6d: Determine the mass per unit length of the string.(Experiment 6: Standing waves)</td>
<td>Experimental Work</td>
<td>
<table>
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KETUA UNIT FIZIK
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KEMENTERIAN PENDIDIKAN MALAYSIA

Appendix A

LIST OF SELECTED FORMULAE
SENARAI RUMUS TERPILIH

1. $v = u + at$
2. $s = ut + \frac{1}{2}at^2$
3. $v^2 = u^2 + 2as$
4. $s = \frac{1}{2}(u + v)t$
5. $p = mv$
6. $J = F\Delta t$
7. $J = \Delta p = mv - mu$
8. $f = \mu N$
9. $W = \vec{F} \cdot \vec{s} = Fs\cos\theta$
10. $K = \frac{1}{2}mv^2$
11. $U = mgh$
12. $U_s = \frac{1}{2}kx^2 = \frac{1}{2}Fx$
13. $W = \Delta K$
14. $P_{av} = \dfrac{\Delta W}{\Delta t}$
15. $P = \vec{F} \cdot \vec{v} = Fv\cos\theta$
16. $a_c = \frac{v^2}{r} = r\omega^2 = v\omega$
17. $F_c = \frac{mv^2}{r} = mr\omega^2 = mv\omega$
18. $s = r\theta$
19. $v = r\omega$
20. $a_t = r\alpha$
21. $\omega = \omega_o + \alpha t$
22. $\theta = \omega_o t + \dfrac{1}{2}\alpha t^2$
23. $\theta = \frac{1}{2}(\omega_o + \omega)t$
24. $\omega^2 = \omega_o^{\ 2} + 2\alpha\theta$
25. $\tau = rF\sin\theta$
26. $I = \sum mr^2$
27. $I_{\text{solid sphere}} = \dfrac{2}{5}MR^2$
28. $I_{\text{solid cylinder/disc}} = \dfrac{1}{2}MR^2$
29. $I_{\text{ring}} = MR^2$
30. $I_{\text{rod}} = \dfrac{1}{12}ML^2$
31. $\sum\tau = I\alpha$

LIST OF SELECTED FORMULAE
SENARAI RUMUS TERPILIH

32. $L = I\omega$

33. $y = A\sin\omega t$

34. $v = \omega A\cos\omega t = \pm\omega\sqrt{A^2 - y^2}$

35. $a = -\omega^2 A\ \sin\omega t = -\omega^2 y$

36. $K = \frac{1}{2}m\omega^2(A^2 - y^2)$

37. $U = \frac{1}{2}m\omega^2 y^2$

38. $E = \frac{1}{2}m\omega^2 A^2$

39. $\omega = \frac{2\pi}{T} = 2\pi f$

40. $T = 2\pi\sqrt{\frac{l}{g}}$

41. $T = 2\pi\sqrt{\frac{m}{k}}$

42. $k = \frac{2\pi}{\lambda}$

43. $v = f\lambda$

44. $y(x,t) = A\sin(\omega t \pm kx)$

45. $v_y = A\omega\cos\ (\omega t \pm kx)$

46. $y = 2A\cos kx\sin\omega t$

47. $f_n = \frac{nv}{2L}$

48. $f_n = \frac{n}{2L}\sqrt{\frac{T}{\mu}}$

49. $f_n = \frac{nv}{4L}$

50. $v = \sqrt{\frac{T}{\mu}}$

51. $\mu = \frac{m}{L}$

52. $f_a = \left(\frac{v \pm v_o}{v \mp v_s}\right) f$

53. $\sigma = \frac{F}{A}$

54. $\varepsilon = \frac{\Delta L}{L_o}$

55. $Y = \frac{\sigma}{\varepsilon}$

56. $U = \frac{1}{2}F\Delta L$

57. $\frac{U}{V} = \frac{1}{2}\sigma\varepsilon$

58. $\frac{Q}{t} = -kA\left(\frac{\Delta T}{L}\right)$

59. $\Delta L = \alpha L_o \Delta T$

60. $\Delta A = \beta A_o \Delta T$

61. $\Delta V = \gamma V_o \Delta T$

62. $\beta = 2\alpha$

LIST OF SELECTED FORMULAE
SENARAI RUMUS TERPILIH

63. $\gamma = 3\alpha$

64. $n = \dfrac{m}{M} = \dfrac{N}{N_A}$

65. $v_{rms} = \sqrt{\langle v^2 \rangle}$

66. $v_{rms} = \sqrt{\dfrac{3kT}{m}} = \sqrt{\dfrac{3RT}{M}}$

67. $PV = \frac{1}{3} N m {v_{rms}}^2$

68. $P = \frac{1}{3} \rho {v_{rms}}^2$

69. $K_{tr} = \dfrac{3}{2}\left(\dfrac{R}{N_A}\right)T = \dfrac{3}{2}kT$

70. $U = \dfrac{1}{2} fNkT = \dfrac{1}{2} fnRT$

71. $\Delta U = Q - W$

72. $W = nRT \ln \frac{V_f}{V_i} = nRT \ln \frac{P_i}{P_f}$

73. $W = \int P dV = P(V_f - V_i)$

74. $W = \int P dV = 0$

SP025 RIH

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LECTURE

KOLEJ MATRIKULASI SARAWAK
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10am
DK2</td><td>K2</td><td>1.1a: State Coulomb's Law
1.1b: Sketch the electric force diagram
1.2a: Define and use electric field strength</td><td>Q&A
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<tr><td>Monday
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DK2</td><td>K2</td><td>1.2c: Sketch the electric field strength diagram
1.3a: Define electric potential
1.3b: Define and sketch equipotential lines and surfaces of an isolated charge and a uniform electrc field.</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
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DK2</td><td>K2</td><td>2.1a: Define and use capacitance
2.2a: State physical meaning of time constant
2.2b: Sketch and explain the characteristics of Q-t and I-t graph for charging and discharging of a capacitor</td><td>Q&A
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DK2</td><td>K2</td><td>2.3a: Define dielectric constant
2.3b: Describe the effects of dielectric on a parallel plate capacitor</td><td>Q&A
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<tr><td colspan="2">CHAPTER</td><td colspan="4">3: Electric Current And Direct Current Circuits</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Lecture</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO 1: Describe basic concepts of mechanics, waves, heat and thermodynamics</td></tr>
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TIME
VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
<tr><td>Monday
1/30/2023
10am
DK2</td><td>K2</td><td>3.1a: Describe tmicroscopic model of current.
3.1b: Define electric current
3.2a: State ohm's law
3.2b: Define resisitvity
3.3a: Explain the effect of temperature on electrical resistance in metals</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
*Appendix</th><th>SCORE</th></tr><tr><td>i</td><td>3</td></tr><tr><td>ii</td><td>3</td></tr><tr><td>iii</td><td>4</td></tr><tr><td>iv</td><td>4</td></tr><tr><td>v</td><td>4</td></tr></table></td><td>All objectives achieved. Students are able to understand the materials of the topic.</td></tr>
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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
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<tr><td>Monday
2/6/2023
10am
DK2</td><td>K2</td><td>3.4a: Define emf and internal resistance of a battery
3.4b: State factors that influence the internal resistance
3.4c: Explain the relationship between emf of a battery and potential difference acorss battery terminals
3.6a: State Kirchhoff's Rules
3.8a: Explain the principle of potential divider; 3.9a: Explain principles of potentiometer and its applications</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
*Appendix</th><th>SCORE</th></tr><tr><td>i</td><td>4</td></tr><tr><td>ii</td><td>3</td></tr><tr><td>iii</td><td>3</td></tr><tr><td>iv</td><td>3</td></tr><tr><td>v</td><td>4</td></tr></table></td><td>All objectives achieved. Students are able to understand the materials of the topic.</td></tr>
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<tr><td colspan="2">WEEK</td><td colspan="4">7</td></tr>
<tr><td colspan="2">CHAPTER</td><td colspan="4">4: Magnetism</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Lecture</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO 1: Describe basic concepts of mechanics, waves, heat and thermodynamics</td></tr>
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TIME
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<tr><td>Monday
2/13/2023
10am
DK2</td><td>K2</td><td>4.1a: Define magnetic field
4.1b: Identify magnetic field sources
4.1c: Sketch magnetic field lines for bar magnet, current carrying conductor (straight wire, circular coil and solenoid) and Earth magnetic field
4.2a: Sketch and determine resultant magnetic field diagram at a point
4.3a: Explain magnetic force, F=qvB</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
*Appendix</th><th>SCORE</th></tr><tr><td>i</td><td>3</td></tr><tr><td>ii</td><td>4</td></tr><tr><td>iii</td><td>4</td></tr><tr><td>iv</td><td>3</td></tr><tr><td>v</td><td>3</td></tr></table></td><td>All objectives achieved. Students are able to understand the materials of the topic.</td></tr>
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<tr><td>Monday
2/20/2023
10am
DK2</td><td>K2</td><td>4.3c: Describe circular motion of a charge in uniform magnetic field
4.4a: Explain magnetic force, F =Ilb
4.5a: Explain magnetic force per unit length of two parallel current carrying conductors
4.6a: Explain the motion of a moving charged particle in magnetic field and electric field for v, B and E perpendicular to each other.</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
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<tr><td colspan="2">CHAPTER</td><td colspan="4">5: Electromagnetic Induction</td></tr>
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<tr><td>Monday
2/27/2023
10am
DK2</td><td>K2</td><td>5.1a: Define magnetic flux
5.2a: Explain induced emf by using Faraday's experiment
5.2b: State Faraday's Law</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
*Appendix</th><th>SCORE</th></tr><tr><td>i</td><td>3</td></tr><tr><td>ii</td><td>3</td></tr><tr><td>iii</td><td>3</td></tr><tr><td>iv</td><td>4</td></tr><tr><td>v</td><td>3</td></tr></table></td><td>All objectives achieved. Students are able to understand the materials of the topic.</td></tr>
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<tr><td>Monday
3/13/2023
10am
DK2</td><td>K2</td><td>5.2c: Sate Lenz's Law to determien the direction of induced current.
5.3a: Define self-inductance
5.5a: Define mutual inductance</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
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<tr><td colspan="2">MODE</td><td colspan="4">Lecture</td></tr>
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<tr><td>Monday
3/20/2023
10am
DK2</td><td>K2</td><td>6.1a: Define alternating current
6.1b: Sketch and interprest sinusoidal AC waveform
6.2a: Define root mean square current and voltage for AC source</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
*Appendix</th><th>SCORE</th></tr><tr><td>i</td><td>4</td></tr><tr><td>ii</td><td>4</td></tr><tr><td>iii</td><td>3</td></tr><tr><td>iv</td><td>4</td></tr><tr><td>v</td><td>3</td></tr></table></td><td>All objectives achieved. Students are able to understand the materials of the topic.</td></tr>
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<tr><td colspan="2">CHAPTER</td><td colspan="4">6: Alternating Current</td></tr>
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<tr><td>Monday
3/27/2023
10am
DK2</td><td>K2</td><td>6.3a: Sketch and use phasor diagram and sinusoidal waveform to show the phase relationship between current and voltage for a single component circuit of resistos, capacitor and inductor.
6.3c: Define capacitive reactance, inductive reactance, impedance and phase angle
6.3d: Explain graphically the dependence of resistance, capacitive reactance, inductive reactance, impedance and frequency and relate it to resonance.</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
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<tr><td>Monday
4/3/2023
10am
DK2</td><td>K2</td><td>7.1a: State radius of curvature for spherical mirror
7.1b: Sketch ray diagrams with a minimum of two rays to determine the characteristics of image formed by spherical mirrors
7.4a: State Huygen's Principle
7.4b: Sketch and explain the wavefront of light after passing through a single slit and obstacle using Huygen's principle
7.5a: Define coherence</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM *Appendix</th><th>SCORE</th></tr><tr><td>i</td><td>3</td></tr><tr><td>ii</td><td>4</td></tr><tr><td>iii</td><td>4</td></tr><tr><td>iv</td><td>4</td></tr><tr><td>v</td><td>3</td></tr></table></td><td>All objectives achieved. Students are able to understand the materials of the topic.</td></tr>
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<tr><td>Monday
4/10/2023
10am
DK2</td><td>K2</td><td>7.5b: State the conditions for interference of light
7.5c: State the conditions of constructive and destructive interference for inphase and antiphas sources
7.7a: Identify the occurnce of phase change upon reflection
7.7b: Describe with the aid of a diagram the interference of light in thin films at normal incidence
7.7c: Explain the application of thin films</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
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<tr><td>Monday
4/17/2023
10am
DK2</td><td>K2</td><td>7.8a: Define diffraction
7.8b: Explain the diffraction of a single slit with the aid of a diagram
7.9a: Explain the formation of diffraction with the aid of a diagram</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
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<tr><td colspan="2">CHAPTER</td><td colspan="4">8: Wave Properties Of Particle</td></tr>
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TIME
VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
<tr><td>Monday
4/24/2023
10am
DK2</td><td>K2</td><td>8.1a: State the wave-particle duality
8.2a: Describe the observations of electron diffractions in Davisson-Germer experiment
8.2b: Explain the wave behaviour of electron in an electron microscope
8.2c: State the advantages of electron microscope compared to optical microscope</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
*Appendix</th><th>SCORE</th></tr><tr><td>i</td><td>4</td></tr><tr><td>ii</td><td>4</td></tr><tr><td>iii</td><td>3</td></tr><tr><td>iv</td><td>4</td></tr><tr><td>v</td><td>4</td></tr></table></td><td>All objectives achieved. Students are able to understand the materials of the topic.</td></tr>
</table>

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

<table>
<tr><td colspan="2">LECTURER</td><td colspan="4">SHAFIQ RASULAN</td></tr>
<tr><td colspan="2">CODE / COURSE</td><td colspan="4">SP015</td></tr>
<tr><td colspan="2">WEEK</td><td colspan="4">17</td></tr>
<tr><td colspan="2">CHAPTER</td><td colspan="4">9: Nuclear And Particle Physics</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Lecture</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO 1: Describe basic concepts of mechanics, waves, heat and thermodynamics</td></tr>
<tr><td colspan="2">SLT</td><td>F2F (hour):</td><td>1</td><td>NF2F (hour):</td><td>1</td></tr>
<tr><td>DAY
DATE
TIME
VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
<tr><td>Monday
5/1/2023
10am
DK2</td><td>K2</td><td>9.1a: Define mass defect
9.1b: Define binding energy;
9.1d: Sketch and describe graph of binding energy per nucleon against nucleon number
9.2a: Explain alpha, beta plus, beta minus and gamma decays
9.2b: State decay law
9.2c: Define activity and decay constant</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
*Appendix</th><th>SCORE</th></tr><tr><td>i</td><td>3</td></tr><tr><td>ii</td><td>3</td></tr><tr><td>iii</td><td>4</td></tr><tr><td>iv</td><td>4</td></tr><tr><td>v</td><td>3</td></tr></table></td><td>All objectives achieved. Students are able to understand the materials of the topic.</td></tr>
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PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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LESSON PLAN
SEMESTER II SESSION 2022/2023

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<tr><td colspan="2">CODE / COURSE</td><td colspan="4">SP015</td></tr>
<tr><td colspan="2">WEEK</td><td colspan="4">18</td></tr>
<tr><td colspan="2">CHAPTER</td><td colspan="4">9: Nuclear And Particle Physics</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Lecture</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO 1: Describe basic concepts of mechanics, waves, heat and thermodynamics</td></tr>
<tr><td colspan="2">SLT</td><td>F2F (hour):</td><td>1</td><td>NF2F (hour):</td><td>1</td></tr>
<tr><td>DAY
DATE
TIME
VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
<tr><td>Monday
5/8/2023
10am
DK2</td><td>K2</td><td>9.2e: Define half-life
9.3a: State the thermionic emission
9.3b: Explain the acceleration of particle by electric and magnetic field
9.3c: State the role of electric and magnetic filed in particle accelerators (linac and cyclotron) and detectors (general principles of ionisation and deflection only).; 9.3d: State the need for high energies required to investigate the structure of nucle
9.4a: Explain the standard quzrk lepton model particles (baryons, meson, leptons and hadrons);
9.4b: Explain the corresponding antiparticle for every particle.</td><td>Q&A
Discussions</td><td><table><tr><th>ITEM
*Appendix</th><th>SCORE</th></tr><tr><td>i</td><td>4</td></tr><tr><td>ii</td><td>3</td></tr><tr><td>iii</td><td>4</td></tr><tr><td>iv</td><td>3</td></tr><tr><td>v</td><td>3</td></tr></table></td><td>All objectives achieved. Students are able to understand the materials of the topic.</td></tr>
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KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

TUTORIALS

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	1				
CHAPTER	1: ELECTROSTATICS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Mon); K2T4A (Tues); K2T4B (Tues) K2T3 (02/01/2023); K2T4 (03/01/2023) K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM) K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)	K2	1.1c: Apply Coulomb's Law for a system of point charges	Class Discussion & Sample Problem Practice	**ITEM** **Appendix* / **SCORE** **i** 3 **ii** 4 **iii** 4 **iv** 3 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	1				
CHAPTER	1: ELECTROSTATICS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Wed); K2T4A (Wed); K2T4B (Wed) K2 (04/01/2023) K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM) K2T3 (BT1); K2T4A (MF); K2T4B (MF)	K2	1.2a: Define and use electric field strength. Refer to equation 2 in appendix A. 1.2b: Use equation for point charge. Refer to equation 3 in appendix A. 1.2d: Determine the electric field strength for a system of charges.	Class Discussion & Sample Problem Practice	**ITEM** ***Appendix*** / **SCORE** **i** 4 **ii** 4 **iii** 3 **iv** 4 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

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PENSYARAH FIZIK
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SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	1				
CHAPTER	1: ELECTROSTATICS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs) K2 (05/01/2023) K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM) K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)	K2	1.3a: Define electric potential. Refer to equation 4 in appendix A. 1.3c: Use equation for a point charge and a system of charges. Refer to equation 5 in appendix A. 1.3d: Apply potential difference between two points. Refer to equation 6 in appendix A. 1.3e: Apply the change in potential energy between two points in electric field. . Refer to equation 7 in appendix A. 1.3f: Apply potential energy of a system of point charges up to maximum 3 charges. . Refer to equation 8 in appendix A.	Class Discussion & Sample Problem Practice	**ITEM** **Appendix* / **SCORE** **i** 3 **ii** 4 **iii** 3 **iv** 4 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

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SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	2				
CHAPTER	1: ELECTROSTATICS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Mon); K2T4A (Tues); K2T4B (Tues) K2T3 (09/01/2023); K2T4 (10/01/2023) K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM) K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)	K2	1.4a: Analyse the motion of a charge qualitatively and quantitatively in a uniform electric field for each of the following cases - stationary charge, charge moving perpendicularly to the field, charge moving parallel to the field and charge in dynamic equilibrium 1.4b: use equation 9 from Appendix A for uniform electric field.	Class Discussion & Sample Problem Practice	**ITEM** **Appendix* / **SCORE** **i** 3 **ii** 3 **iii** 4 **iv** 3 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

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SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN			
CODE / COURSE	SP025			
WEEK	2			
CHAPTER	2: CAPACITORS AND DIELECTRICS			
MODE	Tutorials			
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.			
SLT	**F2F (hour):**	1	**NF2F (hour):**	1

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Wed); K2T4A (Wed); K2T4B (Wed) K2 (11/01/2023) K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM) K2T3 (BT1); K2T4A (MF); K2T4B (MF)	K2	2.1a: Define and use capacitance. . Refer to equation 10 in appendix A. 2.1b: Determine the effective capacitance of capacitors in series and parallel. Refer to equation 11 and 12 in appendix A. 2.1c: Apply energy stored in a capacitor. Refer to equation 13 in appendix A.	Class Discussion & Sample Problem Practice	**ITEM** ***Appendix*** / **SCORE** **i** 3 **ii** 4 **iii** 4 **iv** 4 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

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LESSON PLAN
SEMESTER II SESSION 2022/2023

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<tr><td colspan="2">CHAPTER</td><td colspan="4">2: CAPACITORS AND DIELECTRICS</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Tutorials</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO2: Solve problems of electricity, magnetism, optics and modern physics.</td></tr>
<tr><td colspan="2">SLT</td><td>F2F (hour):</td><td>1</td><td>NF2F (hour):</td><td>1</td></tr>
<tr><td>DAY
DATE
TIME
VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
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<td>K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs)
K2 (12/01/2023)
K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM)
K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)</td>
<td>K2</td>
<td>2.2a: State physical meaning of time constant and use equation 13 in appendix A.
2.2c: Use equation 15 for discharging and equation 16 for charging from appendix A.</td>
<td>Class Discussion & Sample Problem Practice</td>
<td>
<table>
<tr><th>ITEM
*Appendix</th><th>SCORE</th></tr>
<tr><td>i</td><td>4</td></tr>
<tr><td>ii</td><td>3</td></tr>
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SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	3				
CHAPTER	2: CAPACITORS AND DIELECTRICS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Mon); K2T4A (Tues); K2T4B (Tues) K2T3 (16/01/2023); K2T4 (17/01/2023) K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM) K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)	K2	2.3a: Define and use dielectric constant. Refer to equation 17 in appendix A. 2.3c: Apply capacitance of air filled parallel plate capacitor. Refer to equation 18 in appendix A.	Class Discussion & Sample Problem Practice	**ITEM** ***Appendix*** / **SCORE** **i** 3 **ii** 4 **iii** 4 **iv** 4 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

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PENSYARAH FIZIK
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<tr><td colspan="2">CHAPTER</td><td colspan="4">2: CAPACITORS AND DIELECTRICS</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Tutorials</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO2: Solve problems of electricity, magnetism, optics and modern physics.</td></tr>
<tr><td colspan="2">SLT</td><td>F2F (hour):</td><td>1</td><td>NF2F (hour):</td><td>1</td></tr>
<tr><td>DAY
DATE
TIME
VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
<tr>
<td>K2T3 (Wed); K2T4A (Wed); K2T4B (Wed)
K2 (18/01/2023)
K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM)
K2T3 (BT1); K2T4A (MF); K2T4B (MF)</td>
<td>K2</td>
<td>2.3d: Determine capacitance with dielectric. Refer to equation 19 in appendix A.</td>
<td>Class Discussion & Sample Problem Practice</td>
<td>
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KETUA UNIT FIZIK
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LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	3				
CHAPTER	3: ELECTRIC CURRENT AND DIRECT CURRENT CIRCUITS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	
DAY **DATE** **TIME** **VENUE**	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs) K2 (19/01/2023) K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM) K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)	K2	3.1c: Use electric current, Refer to equation 21 in appendix A.	Class Discussion & Sample Problem Practice	**ITEM** ***Appendix*** / **SCORE** **i** 4 **ii** 4 **iii** 4 **iv** 3 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

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PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
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LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	4				
CHAPTER	3: ELECTRIC CURRENT AND DIRECT CURRENT CIRCUITS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Mon); K2T4A (Tues); K2T4B (Tues) K2T3 (23/01/2023); K2T4 (24/01/2023) K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM) K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)	K2	3.2a: State and use Ohm's Law. Refer to equation 22 in appendix A. 3.2b: Define and use resistivity. Refer to equation 23 in appendix A.	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 3 **ii** 3 **iii** 3 **iv** 4 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

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PENSYARAH FIZIK
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KEMENTERIAN PENDIDIKAN MALAYSIA

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<tr><td colspan="2">WEEK</td><td colspan="4">4</td></tr>
<tr><td colspan="2">CHAPTER</td><td colspan="4">3: ELECTRIC CURRENT AND DIRECT CURRENT CIRCUITS</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Tutorials</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO2: Solve problems of electricity, magnetism, optics and modern physics.</td></tr>
<tr><td colspan="2">SLT</td><td>F2F (hour):</td><td>1</td><td>NF2F (hour):</td><td>1</td></tr>
<tr><td>DAY
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<tr>
<td>K2T3 (Wed); K2T4A (Wed); K2T4B (Wed)
K2 (25/01/2023)
K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM)
K2T3 (BT1); K2T4A (MF); K2T4B (MF)</td>
<td>K2</td>
<td>3.3b: Use equation 24 from appendix A.</td>
<td>Class Discussion & Sample Problem Practice</td>
<td>
<table>
<tr><th>ITEM
*Appendix</th><th>SCORE</th></tr>
<tr><td>i</td><td>4</td></tr>
<tr><td>ii</td><td>3</td></tr>
<tr><td>iii</td><td>4</td></tr>
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<tr><td>v</td><td>3</td></tr>
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</td>
<td>All objectives achieved. Students are able to understand the materials of the topic.</td>
</tr>
</table>

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN			
CODE / COURSE	SP025			
WEEK	4			
CHAPTER	3: ELECTRIC CURRENT AND DIRECT CURRENT CIRCUITS			
MODE	Tutorials			
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.			
SLT	**F2F (hour):**	1	**NF2F (hour):**	1

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs) K2 (26/01/2023) K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM) K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)	K2	3.4d: Use terminal voltage, Refer to equation 25 in appendix A.	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 3 **ii** 4 **iii** 3 **iv** 3 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	5				
CHAPTER	3: ELECTRIC CURRENT AND DIRECT CURRENT CIRCUITS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Mon); K2T4A (Tues); K2T4B (Tues) K2T3 (30/01/2023); K2T4 (31/01/2023) K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM) K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)	K2	3.5a: Determine the effective resistance of resistors in series and parallel. Refer to equation 26 and 27 in appendix A.	Class Discussion & Sample Problem Practice	**ITEM** ***Appendix*** / **SCORE** **i** 3 **ii** 3 **iii** 4 **iv** 3 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	5				
CHAPTER	3: ELECTRIC CURRENT AND DIRECT CURRENT CIRCUITS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Wed); K2T4A (Wed); K2T4B (Wed) K2 (01/02/2023) K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM) K2T3 (BT1); K2T4A (MF); K2T4B (MF)	K2	3.6a: State and apply Kirchhoff's Rules	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 3 **ii** 4 **iii** 4 **iv** 4 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	5				
CHAPTER	3: ELECTRIC CURRENT AND DIRECT CURRENT CIRCUITS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs) K2 (02/02/2023) K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM) K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)	K2	3.6a: State and apply Kirchhoff's Rules	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 4 **ii** 3 **iii** 4 **iv** 3 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	6				
CHAPTER	3: ELECTRIC CURRENT AND DIRECT CURRENT CIRCUITS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Mon); K2T4A (Tues); K2T4B (Tues) K2T3 (06/02/2023); K2T4 (07/02/2023) K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM) K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)	K2	3.7a: Use power equation, Refer to equation 28 in appendix A. 3.7b: Use electrical energy, Refer to equation 29 in appendix A.	Class Discussion & Sample Problem Practice	**ITEM** **Appendix* / **SCORE** **i** 3 **ii** 4 **iii** 3 **iv** 4 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

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PENSYARAH FIZIK
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LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	6				
CHAPTER	3: ELECTRIC CURRENT AND DIRECT CURRENT CIRCUITS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Wed); K2T4A (Wed); K2T4B (Wed) K2 (08/02/2023) K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM) K2T3 (BT1); K2T4A (MF); K2T4B (MF)	K2	3.8b: Use equation of potential divider. Refer to equation 30 in appendix A.	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 4 **ii** 4 **iii** 4 **iv** 4 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

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KETUA UNIT FIZIK
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KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

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<tr><td colspan="2">WEEK</td><td colspan="4">6</td></tr>
<tr><td colspan="2">CHAPTER</td><td colspan="4">3: ELECTRIC CURRENT AND DIRECT CURRENT CIRCUITS</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Tutorials</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO2: Solve problems of electricity, magnetism, optics and modern physics.</td></tr>
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<tr><td>DAY
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VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
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<td>K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs)
K2 (09/02/2023)
K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM)
K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)</td>
<td>K2</td>
<td>3.9b: Use related equations for potentiometer, Refer to equation 31 in appendix A.</td>
<td>Class Discussion & Sample Problem Practice</td>
<td>
<table>
<tr><th>ITEM
*Appendix</th><th>SCORE</th></tr>
<tr><td>i</td><td>3</td></tr>
<tr><td>ii</td><td>3</td></tr>
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<tr><td>v</td><td>3</td></tr>
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KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	7				
CHAPTER	3: ELECTRIC CURRENT AND DIRECT CURRENT CIRCUITS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Mon); K2T4A (Tues); K2T4B (Tues) K2T3 (13/02/2023); K2T4 (14/02/2023) K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM) K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)	K2	3.9b: Use related equations for potentiometer, Refer to equation 31 in appendix A.	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 3 **ii** 3 **iii** 3 **iv** 4 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	7				
CHAPTER	4: MAGNETISM				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Wed); K2T4A (Wed); K2T4B (Wed) K2 (15/02/2023) K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM) K2T3 (BT1); K2T4A (MF); K2T4B (MF)	K2	4.2a: Sketch and determine the resultant magnetic field diagram at a point 4.2b: Determine the direction of magnetic field by using right hand rule	Class Discussion & Sample Problem Practice	**ITEM** (***Appendix***) / **SCORE** **i** 3 **ii** 3 **iii** 3 **iv** 3 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	7				
CHAPTER	4: MAGNETISM				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs) K2 (16/02/2023) K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM) K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)	K2	4.2c: Determine the magnitude of magnetic field for long straight wire, at the center of solenoid, at the centre of circular coil and at the end of solenoid. Refer to equation 32 -34 from appendix A.	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 4 **ii** 3 **iii** 3 **iv** 4 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

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PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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KOLEJ MATRIKULASI SARAWAK
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LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	8				
CHAPTER	4: MAGNETISM				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Mon); K2T4A (Tues); K2T4B (Tues) K2T3 (20/02/2023); K2T4 (21/02/2023) K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM) K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)	K2	4.3a: Explain and use magnetic force. Refer to equation 36 in appendix A. 4.3b: Determine the direction of magnetic force. 4.3d: Use relationship of magnetic force equals to centripetal force.	Class Discussion & Sample Problem Practice	**ITEM** ***Appendix*** / **SCORE** **i** 4 **ii** 4 **iii** 4 **iv** 4 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

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PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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KETUA UNIT FIZIK
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LESSON PLAN
SEMESTER II SESSION 2022/2023

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VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
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K2 (22/02/2023)
K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM)
K2T3 (BT1); K2T4A (MF); K2T4B (MF)</td>
<td>K2</td>
<td>4.4a: Explain and use magnetic force, refer to equation 37 from appendix A.
4.4b: Determine the direction of force.</td>
<td>Class Discussion & Sample Problem Practice</td>
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<tr><th>ITEM
*Appendix</th><th>SCORE</th></tr>
<tr><td>i</td><td>4</td></tr>
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KEMENTERIAN PENDIDIKAN MALAYSIA

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SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	8				
CHAPTER	4: MAGNETISM				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs) K2 (23/02/2023) K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM) K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)	K2	4.5a: Explain magnetic force per unit length of two parallel current carrying conductors. 4.5b: Apply magnetic force per unit length equation. Refer to equation 38 from appendix A.	Class Discussion & Sample Problem Practice	**ITEM** ***Appendix*** / **SCORE** **i** / 3 **ii** / 3 **iii** / 4 **iv** / 4 **v** / 4	**All objectives achieved. Students are able to understand the materials of the topic.**

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PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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KETUA UNIT FIZIK
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KOLEJ MATRIKULASI SARAWAK
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SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN			
CODE / COURSE	SP025			
WEEK	9			
CHAPTER	4: MAGNETISM			
MODE	Tutorials			
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.			
SLT	**F2F (hour):**	1	**NF2F (hour):**	1

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Mon); K2T4A (Tues); K2T4B (Tues) K2T3 (27/02/2023); K2T4 (28/02/2023) K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM) K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)	K2	4.5a: Explain magnetic force per unit length of two parallel current carrying conductors. 4.5b: Apply magnetic force per unit length equation. Refer to equation 38 from appendix A.	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 4 **ii** 4 **iii** 4 **iv** 3 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

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<tr><td colspan="2">CHAPTER</td><td colspan="4">4: MAGNETISM</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Tutorials</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO2: Solve problems of electricity, magnetism, optics and modern physics.</td></tr>
<tr><td colspan="2">SLT</td><td>F2F (hour):</td><td>1</td><td>NF2F (hour):</td><td>1</td></tr>
<tr><td>DAY
DATE
TIME
VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
<tr>
<td>K2T3 (Wed); K2T4A (Wed); K2T4B (Wed)
K2 (01/03/2023)
K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM)
K2T3 (BT1); K2T4A (MF); K2T4B (MF)</td>
<td>K2</td>
<td>4.6b: Use velocity equation (equation 40 from appendix A), in a velocity selector.</td>
<td>Class Discussion & Sample Problem Practice</td>
<td>
<table>
<tr><th>ITEM
*Appendix</th><th>SCORE</th></tr>
<tr><td>i</td><td>3</td></tr>
<tr><td>ii</td><td>3</td></tr>
<tr><td>iii</td><td>3</td></tr>
<tr><td>iv</td><td>4</td></tr>
<tr><td>v</td><td>4</td></tr>
</table>
</td>
<td>All objectives achieved. Students are able to understand the materials of the topic.</td>
</tr>
</table>

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	9				
CHAPTER	5: ELECTROMAGNETIC INDUCTION				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs) K2 (02/03/2023) K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM) K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)	K2	5.1a: Define and use magnetic flux. Refer to equation 41 from appendix A. 5.1b: Use magnetic flux linkage, Refer to equation 42 from appendix A.	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 4 **ii** 3 **iii** 3 **iv** 3 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	10				
CHAPTER	5: ELECTROMAGNETIC INDUCTION				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Mon); K2T4A (Tues); K2T4B (Tues) K2T3 (13/03/2023); K2T4 (14/03/2023) K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM) K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)	K2	5.2b: State and use Faraday's Law, Refer to equation 43 from appendix A. 5.2c: State and use Lenz's law to determine the direction of induced current	Class Discussion & Sample Problem Practice	**ITEM** ***Appendix*** / **SCORE** **i** 3 **ii** 4 **iii** 4 **iv** 4 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

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<tr><td colspan="2">CODE / COURSE</td><td colspan="4">SP025</td></tr>
<tr><td colspan="2">WEEK</td><td colspan="4">10</td></tr>
<tr><td colspan="2">CHAPTER</td><td colspan="4">5: ELECTROMAGNETIC INDUCTION</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Tutorials</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO2: Solve problems of electricity, magnetism, optics and modern physics.</td></tr>
<tr><td colspan="2">SLT</td><td>F2F (hour):</td><td>1</td><td>NF2F (hour):</td><td>1</td></tr>
<tr><td>DAY
DATE
TIME
VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
<tr>
<td>K2T3 (Wed); K2T4A (Wed); K2T4B (Wed)
K2 (15/03/2023)
K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM)
K2T3 (BT1); K2T4A (MF); K2T4B (MF)</td>
<td>K2</td>
<td>5.2d: Apply induced emf in a straight conductor, a coil and a rotating coil. Refer to equations 45-47 from appendix A.</td>
<td>Class Discussion & Sample Problem Practice</td>
<td>
<table>
<tr><th>ITEM
*Appendix</th><th>SCORE</th></tr>
<tr><td>i</td><td>4</td></tr>
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PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	10				
CHAPTER	5: ELECTROMAGNETIC INDUCTION				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs) K2 (16/03/2023) K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM) K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)	K2	5.3b: Apply self inductance for coil and solenoid. Refer to equations 49-51 from appendix A.	Class Discussion & Sample Problem Practice	**ITEM** **Appendix* / **SCORE** **i** 4 **ii** 3 **iii** 3 **iv** 4 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	11				
CHAPTER	5: ELECTROMAGNETIC INDUCTION				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Mon); K2T4A (Tues); K2T4B (Tues) K2T3 (20/03/2023); K2T4 (21/03/2023) K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM) K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)	K2	5.4a: Apply the energy stored in an inductor, Refer to equation 52 from appendix A.	Class Discussion & Sample Problem Practice	**ITEM** **Appendix* / **SCORE** **i** 4 **ii** 3 **iii** 4 **iv** 4 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

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KETUA UNIT FIZIK
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KEMENTERIAN PENDIDIKAN MALAYSIA

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SEMESTER II SESSION 2022/2023

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<tr><td colspan="2">CODE / COURSE</td><td colspan="4">SP025</td></tr>
<tr><td colspan="2">WEEK</td><td colspan="4">11</td></tr>
<tr><td colspan="2">CHAPTER</td><td colspan="4">5: ELECTROMAGNETIC INDUCTION</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Tutorials</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO2: Solve problems of electricity, magnetism, optics and modern physics.</td></tr>
<tr><td colspan="2">SLT</td><td>F2F (hour):</td><td>1</td><td>NF2F (hour):</td><td>1</td></tr>
<tr><td>DAY
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TIME
VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
<tr>
<td>K2T3 (Wed); K2T4A (Wed); K2T4B (Wed)
K2 (22/03/2023)
K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM)
K2T3 (BT1); K2T4A (MF); K2T4B (MF)</td>
<td>K2</td>
<td>5.5b: Use mutual inductance equation. Refer to equation 53 from appendix A.</td>
<td>Class Discussion & Sample Problem Practice</td>
<td>
<table>
<tr><th>ITEM
*Appendix</th><th>SCORE</th></tr>
<tr><td>i</td><td>4</td></tr>
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KEMENTERIAN PENDIDIKAN MALAYSIA

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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	11				
CHAPTER	6: ALTERNATING CURRENT				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs) K2 (23/03/2023) K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM) K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)	K2	6.1c: Use sinusoidal voltage and current equations. Refer to equations 54 & 55 from appendix A.	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 3 **ii** 4 **iii** 3 **iv** 3 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	12				
CHAPTER	6: ALTERNATING CURRENT				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Mon); K2T4A (Tues); K2T4B (Tues) K2T3 (27/03/2023); K2T4 (28/03/2023) K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM) K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)	K2	6.2b: Use equations for rms voltage and rms current. Refer to equations 56-57 from appendix A.	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 4 **ii** 3 **iii** 3 **iv** 4 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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KETUA UNIT FIZIK
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LESSON PLAN
SEMESTER II SESSION 2022/2023

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<tr><td colspan="2">CODE / COURSE</td><td colspan="4">SP025</td></tr>
<tr><td colspan="2">WEEK</td><td colspan="4">12</td></tr>
<tr><td colspan="2">CHAPTER</td><td colspan="4">6: ALTERNATING CURRENT</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Tutorials</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO2: Solve problems of electricity, magnetism, optics and modern physics.</td></tr>
<tr><td colspan="2">SLT</td><td>F2F (hour):</td><td>1</td><td>NF2F (hour):</td><td>1</td></tr>
<tr><td>DAY
DATE
TIME
VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
<tr>
<td>K2T3 (Wed); K2T4A (Wed); K2T4B (Wed)
K2 (29/03/2023)
K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM)
K2T3 (BT1); K2T4A (MF); K2T4B (MF)</td>
<td>K2</td>
<td>6.3a: Sketch and use phasor diagram and sinusoidal waveform to show the phase relationship between current and voltage for a single component circuit ofresistor, capacitor, and inductor
6.3b: Use phasor diagram to analyse voltage, current, and impedance of series circuit of RL, RC and RLC.</td>
<td>Class Discussion & Sample Problem Practice</td>
<td>
<table>
<tr><th>ITEM
*Appendix</th><th>SCORE</th></tr>
<tr><td>i</td><td>4</td></tr>
<tr><td>ii</td><td>4</td></tr>
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<tr><td>iv</td><td>4</td></tr>
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LESSON PLAN
SEMESTER II SESSION 2022/2023

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<tr><td colspan="2">WEEK</td><td colspan="4">12</td></tr>
<tr><td colspan="2">CHAPTER</td><td colspan="4">6: ALTERNATING CURRENT</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Tutorials</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO2: Solve problems of electricity, magnetism, optics and modern physics.</td></tr>
<tr><td colspan="2">SLT</td><td>F2F (hour):</td><td>1</td><td>NF2F (hour):</td><td>1</td></tr>
<tr><td>DAY
DATE
TIME
VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
<tr>
<td>K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs)
K2 (30/03/2023)
K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM)
K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)</td>
<td>K2</td>
<td>6.3c: Define and use capacitive reactance, inductive reactance, impedance, and phase angle. Refer to equations 58-62 from appendix A.</td>
<td>Class Discussion & Sample Problem Practice</td>
<td>
<table>
<tr><th>ITEM
*Appendix</th><th>SCORE</th></tr>
<tr><td>i</td><td>3</td></tr>
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SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	13				
CHAPTER	6: ALTERNATING CURRENT				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Mon); K2T4A (Tues); K2T4B (Tues) K2T3 (03/04/2023); K2T4 (04/04/2023) K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM) K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)	K2	6.4a: Apply in AC circuit consisting of R, RC, RL and RLC in series average power (also known as power loss that only occurs in resistor), instantaneous power, and power factor. Refer to equations 63-65 from appendix A.	Class Discussion & Sample Problem Practice	**ITEM** (***Appendix***) / **SCORE** **i** 4 **ii** 4 **iii** 3 **iv** 3 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
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LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN			
CODE / COURSE	SP025			
WEEK	13			
CHAPTER	7: OPTICS			
MODE	Tutorials			
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.			
SLT	**F2F (hour):**	1	**NF2F (hour):**	1

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Wed); K2T4A (Wed); K2T4B (Wed) K2 (05/04/2023) K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM) K2T3 (BT1); K2T4A (MF); K2T4B (MF)	K2	7.1a: State radius of curvature for spherical mirror. Refer to equation 66 from appendix A. 7.1c: Use mirror equation, for real object only, (positive f and R for concave mirror; and negative f and R for convex mirror). Refer to equation 67 from appendix A. 7.1d: Apply magnification. Refer to equation 68 from appendix A.	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 4 **ii** 3 **iii** 3 **iv** 3 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

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PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	13				
CHAPTER	7: OPTICS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs) K2 (06/04/2023) K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM) K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)	K2	7.2a: Use equation for spherical surface. (positive R for convex surface; negative R for concave surface). Refer to equation 69 from appendix A.	Class Discussion & Sample Problem Practice	**ITEM** (***Appendix***) / **SCORE** **i** 3 **ii** 3 **iii** 3 **iv** 4 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN			
CODE / COURSE	SP025			
WEEK	14			
CHAPTER	7: OPTICS			
MODE	Tutorials			
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.			
SLT	**F2F (hour):**	1	**NF2F (hour):**	1

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Mon); K2T4A (Tues); K2T4B (Tues) K2T3 (10/04/2023); K2T4 (11/04/2023) K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM) K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)	K2	7.3a: Use thin lens equation, for real object only. : (positive f for convex lens; negative f for concave lens). Refer to equation 67 from appendix A. 7.3b: Determine the focal length of a convex lens (Experiment 5)	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 4 **ii** 4 **iii** 4 **iv** 3 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	14				
CHAPTER	7: OPTICS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Wed); K2T4A (Wed); K2T4B (Wed) K2 (12/04/2023) K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM) K2T3 (BT1); K2T4A (MF); K2T4B (MF)	K2	7.3c: Use lens maker's equation. Refer to equation 70 from appendix A. 7.3d: Apply magnification. Refer to equation 68 from appendix A.	Class Discussion & Sample Problem Practice	**ITEM** ***Appendix*** / **SCORE** **i** 4 **ii** 4 **iii** 3 **iv** 4 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	14				
CHAPTER	7: OPTICS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs) K2 (13/04/2023) K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM) K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)	K2	7.3e: Use the thin lens formula for a combination of two convex lenses.	Class Discussion & Sample Problem Practice	**ITEM** ***Appendix*** / **SCORE** **i** 3 **ii** 3 **iii** 4 **iv** 3 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	15				
CHAPTER	7: OPTICS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Mon); K2T4A (Tues); K2T4B (Tues) K2T3 (17/04/2023); K2T4 (18/04/2023) K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM) K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)	K2	7.6a: Use equation for bright fringes (maxima); and equation for dark fringes (minima). Refer to equations 71 & 72 from appendix A.	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 3 **ii** 3 **iii** 3 **iv** 4 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

<table>
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<tr><td colspan="2">CODE / COURSE</td><td colspan="4">SP025</td></tr>
<tr><td colspan="2">WEEK</td><td colspan="4">15</td></tr>
<tr><td colspan="2">CHAPTER</td><td colspan="4">7: OPTICS</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Tutorials</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO2: Solve problems of electricity, magnetism, optics and modern physics.</td></tr>
<tr><td colspan="2">SLT</td><td>F2F (hour):</td><td>1</td><td>NF2F (hour):</td><td>1</td></tr>
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VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
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K2 (19/04/2023)
K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM)
K2T3 (BT1); K2T4A (MF); K2T4B (MF)</td>
<td>K2</td>
<td>7.6b: Use equation 73 from appendix A and explain the effect of changing any of the variables.</td>
<td>Class Discussion & Sample Problem Practice</td>
<td>
<table>
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*Appendix</th><th>SCORE</th></tr>
<tr><td>i</td><td>3</td></tr>
<tr><td>ii</td><td>4</td></tr>
<tr><td>iii</td><td>4</td></tr>
<tr><td>iv</td><td>3</td></tr>
<tr><td>v</td><td>3</td></tr>
</table>
</td>
<td>All objectives achieved. Students are able to understand the materials of the topic.</td>
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PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	15				
CHAPTER	7: OPTICS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs) K2 (20/04/2023) K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM) K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)	K2	7.7a: Identify the occurrence of phase change upon reflection. (from lower to higher refractive index, phase change = pi rad or path difference = 0.5*wavelength) 7.7c: Use the following equations for reflected light with no phase difference (non-reflective coating) – Constructive interference (equation 74), Destructive interference (equation 75). Refer to equations 74-75 from appendix A.	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 3 **ii** 3 **iii** 4 **iv** 3 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	16				
CHAPTER	7: OPTICS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Mon); K2T4A (Tues); K2T4B (Tues) K2T3 (24/04/2023); K2T4 (25/04/2023) K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM) K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)	K2	7.7d: Use the following equations for reflected light of phase difference pi rad (reflective coating) – Constructive interference (equation 75), Destructive interference (equation 74). Refer to equations 74 - 75from appendix A.	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 4 **ii** 4 **iii** 4 **iv** 4 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	16				
CHAPTER	7: OPTICS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Wed); K2T4A (Wed); K2T4B (Wed) K2 (26/04/2023) K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM) K2T3 (BT1); K2T4A (MF); K2T4B (MF)	K2	7.8a: Define diffraction. 7.8c: Use equation for dark fringes (minima) and equation for bright fringes (maxima), where m = ±1, ±2, ±3,… Refer to equations 76-77 from appendix A.	Class Discussion & Sample Problem Practice	**ITEM** ***Appendix*** / **SCORE** **i** 4 **ii** 3 **iii** 4 **iv** 3 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	16				
CHAPTER	7: OPTICS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs) K2 (27/04/2023) K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM) K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)	K2	7.9b: Apply equation 78 -79 from appendix A	Class Discussion & Sample Problem Practice	**ITEM** (***Appendix***) / **SCORE**: **i** 4; **ii** 3; **iii** 3; **iv** 4; **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
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LESSON PLAN
SEMESTER II SESSION 2022/2023

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<tr><td colspan="2">CODE / COURSE</td><td colspan="4">SP025</td></tr>
<tr><td colspan="2">WEEK</td><td colspan="4">17</td></tr>
<tr><td colspan="2">CHAPTER</td><td colspan="4">8: WAVE PROPERTIES OF PARTICLE</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Tutorials</td></tr>
<tr><td colspan="2">CLO</td><td colspan="4">CLO2: Solve problems of electricity, magnetism, optics and modern physics.</td></tr>
<tr><td colspan="2">SLT</td><td>F2F (hour):</td><td>1</td><td>NF2F (hour):</td><td>1</td></tr>
<tr><td>DAY
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VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
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<td>K2T3 (Mon); K2T4A (Tues); K2T4B (Tues)
K2T3 (01/05/2023); K2T4 (02/05/2023)
K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM)
K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)</td>
<td>K2</td>
<td>8.1b: Use de Broglie wavelength, refer to equations 84-85 in Appendix A.</td>
<td>Class Discussion & Sample Problem Practice</td>
<td><table><tr><th>ITEM
*Appendix</th><th>SCORE</th></tr><tr><td>i</td><td>3</td></tr><tr><td>ii</td><td>3</td></tr><tr><td>iii</td><td>4</td></tr><tr><td>iv</td><td>3</td></tr><tr><td>v</td><td>3</td></tr></table></td>
<td>All objectives achieved. Students are able to understand the materials of the topic.</td>
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PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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SEMESTER II SESSION 2022/2023

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<tr><td colspan="2">WEEK</td><td colspan="4">17</td></tr>
<tr><td colspan="2">CHAPTER</td><td colspan="4">8: WAVE PROPERTIES OF PARTICLE</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Tutorials</td></tr>
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<tr><td colspan="2">SLT</td><td>F2F (hour):</td><td>1</td><td>NF2F (hour):</td><td>1</td></tr>
<tr><td>DAY
DATE
TIME
VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
<tr>
<td>K2T3 (Wed); K2T4A (Wed); K2T4B (Wed)
K2 (03/05/2023)
K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM)
K2T3 (BT1); K2T4A (MF); K2T4B (MF)</td>
<td>K2</td>
<td>9.1a: Define and use mass defect, equation 87 in Appendix A
9.1b: Define and use binding energy, equation 88 in Appendix A</td>
<td>Class Discussion & Sample Problem Practice</td>
<td>
<table>
<tr><th>ITEM
*Appendix</th><th>SCORE</th></tr>
<tr><td>i</td><td>4</td></tr>
<tr><td>ii</td><td>3</td></tr>
<tr><td>iii</td><td>3</td></tr>
<tr><td>iv</td><td>4</td></tr>
<tr><td>v</td><td>3</td></tr>
</table>
</td>
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KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
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SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	17				
CHAPTER	9: NUCLEAR AND PARTICLE PHYSICS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs) K2 (04/05/2023) K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM) K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)	K2	9.1c: Determine binding energy per nucleon, equations 86 & 88 in Appendix A	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 4 **ii** 3 **iii** 4 **iv** 4 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
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SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	18				
CHAPTER	9: NUCLEAR AND PARTICLE PHYSICS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Mon); K2T4A (Tues); K2T4B (Tues) K2T3 (08/05/2023); K2T4 (09/05/2023) K2T3 (3PM - 4PM); K2T4A (2PM - 3PM); K2T4B (3PM - 4PM) K2T3 (DK1); K2T4A (DK2); K2T4B (DK2)	K2	9.2b: State and use decay law, equation 89 in Appendix A	Class Discussion & Sample Problem Practice	**ITEM** **Appendix* / **SCORE** **i** 3 **ii** 4 **iii** 4 **iv** 4 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

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KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

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<tr><td colspan="2">CHAPTER</td><td colspan="4">9: NUCLEAR AND PARTICLE PHYSICS</td></tr>
<tr><td colspan="2">MODE</td><td colspan="4">Tutorials</td></tr>
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<tr><td colspan="2">SLT</td><td>F2F (hour):</td><td>1</td><td>NF2F (hour):</td><td>1</td></tr>
<tr><td>DAY
DATE
TIME
VENUE</td><td>CLASS</td><td>LEARNING OUTCOME</td><td>T&L STRATEGIES & TOOLS</td><td>REFLECTION</td><td>REMARKS</td></tr>
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<td>K2T3 (Wed); K2T4A (Wed); K2T4B (Wed)
K2 (10/05/2023)
K2T3 (2PM - 3PM); K2T4A (11AM -12PM); K2T4B (12PM - 1PM)
K2T3 (BT1); K2T4A (MF); K2T4B (MF)</td>
<td>K2</td>
<td>9.2c: Define and determine activity, A and decay constant, Z. (consider decay curve)</td>
<td>Class Discussion & Sample Problem Practice</td>
<td>
<table>
<tr><th>ITEM
*Appendix</th><th>SCORE</th></tr>
<tr><td>i</td><td>3</td></tr>
<tr><td>ii</td><td>3</td></tr>
<tr><td>iii</td><td>4</td></tr>
<tr><td>iv</td><td>3</td></tr>
<tr><td>v</td><td>3</td></tr>
</table>
</td>
<td>All objectives achieved. Students are able to understand the materials of the topic.</td>
</tr>
</table>

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	18				
CHAPTER	9: NUCLEAR AND PARTICLE PHYSICS				
MODE	Tutorials				
CLO	CLO2: Solve problems of electricity, magnetism, optics and modern physics.				
SLT	**F2F (hour):**	1	**NF2F (hour):**	1	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOME**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T3 (Thurs); K2T4A (Thurs); K2T4B (Thurs) K2 (11/05/2023) K2T3 (9AM - 10AM); K2T4A (12PM - 1PM); K2T4B (11AM -12PM) K2T3 (DK2); K2T4A (BT1); K2T4B (BT1)	K2	9.2d: Use equations 90 - 91 from appendix A 9.2e: Define and use half-life, equation 92 in Appendix A.	Class Discussion & Sample Problem Practice	**ITEM** (*Appendix*) / **SCORE** **i** 3 **ii** 3 **iii** 3 **iv** 3 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

LABS

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN			
CODE / COURSE	SP025			
WEEK	2			
CHAPTER	2: CAPACITORS AND DIELECTRICS			
MODE	Practical			
CLO	CLO3: Apply the appropriate scientific laboratory skills in physics experiments			
SLT	**F2F (hour):**	2	**NF2F (hour):**	-

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOMES**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T4 (Tuesday); K2T3 (Friday) K2T4 (13/01/2023); K2T3 (10/01/2023) K2T4 (11am - 12pm); K2T3 (9am-11am) K2T4 (Makmal Fizik); K2T3 (Makmal Fizik)	K2	1: Capacitor 2.2d: Determine the time constant of an RC Circuit. 2.2e: Determine the capacitance of a capacitor using an RC Circuit	Experimental Work	**ITEM** ***Appendix*** / **SCORE** **i** 4 **ii** 4 **iii** 3 **iv** 4 **v** 4	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	5				
CHAPTER	3: ELECTRIC CURRENT AND DIRECT CURRENT CIRCUITS				
MODE	Practical				
CLO	CLO3: Apply the appropriate scientific laboratory skills in physics experiments				
SLT	**F2F (hour):**	2	**NF2F (hour):**	-	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOMES**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T4 (Tuesday); K2T3 (Friday) K2T4 (03/02/2023); K2T3 (31/01/2023) K2T4 (11am - 12pm); K2T3 (9am-11am) K2T4 (Makmal Fizik); K2T3 (Makmal Fizik)	K2	2: Ohm's Law 3.2c: Sketch V-I graph 3.2d: Verify Ohm's Law 3.2e: Determine the effective resistance of resistors in series and parallel by graphing method.	Experimental Work	**ITEM** ***Appendix*** / **SCORE** **i** 3 **ii** 3 **iii** 4 **iv** 3 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN			
CODE / COURSE	SP025			
WEEK	6			
CHAPTER	3: ELECTRIC CURRENT AND DIRECT CURRENT CIRCUITS			
MODE	Practical			
CLO	CLO3: Apply the appropriate scientific laboratory skills in physics experiments			
SLT	**F2F (hour):**	2	**NF2F (hour):**	-

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOMES**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T4 (Tuesday); K2T3 (Friday) K2T4 (10/02/2023); K2T3 (07/02/2023) K2T4 (11am - 12pm); K2T3 (9am-11am) K2T4 (Makmal Fizik); K2T3 (Makmal Fizik)	K2	3: Potentiometer 3.9c: Determine the internal resistance of a dry cell by using potentiometer	Experimental Work	**ITEM** (*Appendix*) / **SCORE** **i** 4 **ii** 4 **iii** 3 **iv** 4 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	8				
CHAPTER	4: MAGNETISM				
MODE	Practical				
CLO	CLO3: Apply the appropriate scientific laboratory skills in physics experiments				
SLT	**F2F (hour):**	2	**NF2F (hour):**	-	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOMES**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T4 (Tuesday); K2T3 (Friday) K2T4 (24/02/2023); K2T3 (21/02/2023) K2T4 (11am - 12pm); K2T3 (9am-11am) K2T4 (Makmal Fizik); K2T3 (Makmal Fizik)	K2	4: Magnetic Field 4.1d: Determine the horizontal component of the earth magnetic field.	Experimental Work	**ITEM** ***Appendix*** / **SCORE** **i** 4 **ii** 3 **iii** 4 **iv** 3 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN			
CODE / COURSE	SP025			
WEEK	10			
CHAPTER	7: OPTICS			
MODE	Practical			
CLO	CLO3: Apply the appropriate scientific laboratory skills in physics experiments			
SLT	**F2F (hour):**	2	**NF2F (hour):**	-

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOMES**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T4 (Tuesday); K2T3 (Friday) K2T4 (17/03/2023); K2T3 (14/03/2023) K2T4 (11am - 12pm); K2T3 (9am-11am) K2T4 (Makmal Fizik); K2T3 (Makmal Fizik)	K2	5: Geometrical Optics 7.3b: Determine the focal length of a convex lens (Experiment 5).	Experimental Work	**ITEM** ***Appendix*** / **SCORE** **i** 4 **ii** 3 **iii** 4 **iv** 4 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

KOLEJ MATRIKULASI SARAWAK
LESSON PLAN
SEMESTER II SESSION 2022/2023

LECTURER	SHAFIQ RASULAN				
CODE / COURSE	SP025				
WEEK	11				
CHAPTER	7: OPTICS				
MODE	Practical				
CLO	CLO3: Apply the appropriate scientific laboratory skills in physics experiments				
SLT	**F2F (hour):**	2	**NF2F (hour):**	-	

DAY DATE TIME VENUE	**CLASS**	**LEARNING OUTCOMES**	**T&L STRATEGIES & TOOLS**	**REFLECTION**	**REMARKS**
K2T4 (Tuesday); K2T3 (Friday) K2T4 (24/03/2023); K2T3 (21/03/2023) K2T4 (11am - 12pm); K2T3 (9am-11am) K2T4 (Makmal Fizik); K2T3 (Makmal Fizik)	K2	6: Diffraction Grating 7.9c: Determine the wavelength of laser beam using a diffraction grating 7.9d: Determine the number of diffraction grating lines per unit length.	Experimental Work	**ITEM** (*Appendix*) / **SCORE** **i** 3 **ii** 4 **iii** 4 **iv** 4 **v** 3	**All objectives achieved. Students are able to understand the materials of the topic.**

Prepared by,

SHAFIQ BIN RASULAN
PENSYARAH FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

Endorsed by,

MOHD AIMAN BIN MOHD ADLI
KETUA UNIT FIZIK
KOLEJ MATRIKULASI SARAWAK
KEMENTERIAN PENDIDIKAN MALAYSIA

APPENDIX A

Appendix A.

LIST OF SELECTED FORMULAE

1. $F = \dfrac{Qq}{4\pi\varepsilon_o r^2} = \dfrac{kQq}{r^2}$
2. $E = \dfrac{F}{q_o}$
3. $E = \dfrac{kQ}{r^2}$
4. $V = \dfrac{W}{q_o}$
5. $V = \dfrac{kQ}{r}$
6. $\Delta U = q\Delta V$
7. $U = k\left(\dfrac{q_1 q_2}{r_{12}}\right)$
8. $U = k\left(\dfrac{q_1 q_2}{r_{12}} + \dfrac{q_1 q_3}{r_{13}} + \dfrac{q_2 q_3}{r_{23}}\right)$
9. $E = \dfrac{\Delta V}{d}$
10. $C = \dfrac{Q}{V}$
11. $\dfrac{1}{C} = \dfrac{1}{C_1} + \dfrac{1}{C_2} + \dfrac{1}{C_3} + \ldots + \dfrac{1}{C_n}$
12. $C = C_1 + C_2 + C_3 + \ldots + C_n$
13. $U = \dfrac{1}{2}CV^2 = \dfrac{1}{2}QV = \dfrac{1}{2}\dfrac{Q^2}{C}$
14. $\tau = RC$
15. $Q = Q_o e^{\frac{-t}{RC}}$
16. $Q = Q_o\left(1 - e^{\frac{-t}{RC}}\right)$
17. $\varepsilon_r = \dfrac{\varepsilon}{\varepsilon_o}$
18. $C_o = \dfrac{\varepsilon_o A}{d}$
19. $C = \varepsilon_r C_o$
20. $I = \dfrac{dQ}{dt}$
21. $Q = ne$
22. $V = IR$
23. $\rho = \dfrac{RA}{l}$
24. $R = R_o\left[1 + \alpha\left(T - T_o\right)\right]$
25. $V = \varepsilon - Ir$
26. $R = R_1 + R_2 + R_3 + \ldots + R_n$
27. $\dfrac{1}{R} = \dfrac{1}{R_1} + \dfrac{1}{R_2} + \dfrac{1}{R_3} + \ldots + \dfrac{1}{R_n}$
28. $P = IV, P = I^2R, P = \dfrac{V^2}{R}$
29. $E = IVt$
30. $V_1 = \left(\dfrac{R_1}{R_1 + R_2 + \ldots.. R_n}\right)V$

31. $\frac{\varepsilon_1}{\varepsilon_2} = \frac{l_1}{l_2}$

32. $B = \frac{\mu_o I}{2\pi r}$

33. $B = \frac{\mu_o I}{2r}$

34. $B = \mu_o nI$

35. $B = \frac{1}{2}\mu_o nI$

36. $F = qvB\sin\theta$

37. $F = IlB\sin\theta$

38. $\frac{F}{l} = \frac{\mu_o I_1 I_2}{2\pi d}$

39. $\tau = NIAB\sin\theta$

40. $v = \frac{E}{B}$

41. $\phi = BA\cos\theta$

42. $\Phi = N\phi$

43. $\varepsilon = -\frac{d\phi}{dt}$

44. $\varepsilon = Blv\sin\theta$

45. $\varepsilon = -NA\frac{dB}{dt}$

46. $\varepsilon = -NB\frac{dA}{dt}$

47. $\varepsilon = NAB\omega\sin\omega t$

48. $\varepsilon = -L\left(\frac{dI}{dt}\right)$

49. $L = \frac{N\phi}{I}$

50. $L_{\text{coil}} = \frac{\mu_o N^2 A}{2r}$

51. $L_{\text{solenoid}} = \frac{\mu_o N^2 A}{l}$

52. $U = \frac{1}{2}LI^2$

53. $M = \frac{\mu_o N_1 N_2 A}{l}$

54. $V = V_o\sin\omega t$

55. $I = I_o\sin\omega t$

56. $I_{rms} = \frac{I_o}{\sqrt{2}}$

57. $V_{rms} = \frac{V_o}{\sqrt{2}}$

58. $X_C = \frac{1}{2\pi fC}$

59. $X_L = 2\pi fL$

60. $Z = \sqrt{R^2 + (X_L - X_C)^2}$

61. $\phi = \tan^{-1}\left(\frac{X_L - X_C}{R}\right)$

62. $\cos\phi = \frac{R}{Z}$

63. $P_{\text{av}} = I_{\text{rms}} V_{\text{rms}} \cos\phi$

64. $P_{\text{inst}} = IV$

65. $\cos\phi = \dfrac{P_{\text{r}}}{P_{\text{a}}} = \dfrac{P_{\text{av}}}{I_{\text{rms}} V_{\text{rms}}}$

66. $R = 2f$

67. $\dfrac{1}{f} = \dfrac{1}{u} + \dfrac{1}{v}$

68. $m = \dfrac{h_{\text{i}}}{h_{\text{o}}} = -\dfrac{v}{u}$

69. $\dfrac{n_1}{u} + \dfrac{n_2}{v} = \dfrac{n_2 - n_1}{R}$

70. $\dfrac{1}{f} = \left(\dfrac{n_{\text{material}}}{n_{\text{medium}}} - 1\right)\left(\dfrac{1}{R_1} - \dfrac{1}{R_2}\right)$

71. $y_m = \dfrac{m\lambda D}{d}$

72. $y_m = \dfrac{\left(m + \dfrac{1}{2}\right)\lambda D}{d}$

73. $\Delta y = \dfrac{\lambda D}{d}$

74. $2nt = m\lambda$

75. $2nt = \left(m + \dfrac{1}{2}\right)\lambda$

76. $y_n = \dfrac{n\lambda D}{a}$

77. $y_n = \dfrac{\left(n + \dfrac{1}{2}\right)\lambda D}{a}$

78. $d\sin\theta = n\lambda$

79. $d = \dfrac{1}{N}$

80. $E = hf = \dfrac{hc}{\lambda}$

81. $\dfrac{1}{2} m v^2{}_{\text{max}} = eV_{\text{s}} = hf - hf_{\text{o}}$

82. $W_{\text{o}} = hf_{\text{o}}$

83. $K_{\text{max}} = eV_s = hf - W_{\text{o}}$

84. $\lambda = \dfrac{h}{p}$

85. $\lambda = \dfrac{h}{\sqrt{2meV}}$

86. $A = Z + N$

87. $\Delta m = \left(Zm_{\text{p}} + Nm_{\text{n}}\right) - m_{\text{nucleus}}$

88. $E_{\text{B}} = \Delta mc^2$

89. $\dfrac{dN}{dt} = -\lambda N$

90. $N = N_{\text{o}} e^{-\lambda t}$

91. $A = A_{\text{o}} e^{-\lambda t}$

92. $T_{\frac{1}{2}} = \dfrac{\ln 2}{\lambda}$