St Bonaventure College and High School
Subject : Physics NSS3
Teaching Schedule (2011-2012)

Duration : 5/9/2011 – 24/2/2012

SP = Scheduled number of period
AP = Actual number of period

Date	Topic	Focus/ Objective (Knowledge & Generic Skills Acquired)	SP	AP	Learning & teaching activities (including IT learning activities)	Homework /Test	Learning Resources	Civic Ed./ Values
5/9 – 14/9	**Alternating currents (a.c.)** **Transformer** **High voltage transmission of electrical energy**	1. Distinguish between direct currents (d.c.) and alternating currents (a.c.) 2. Define r.m.s. of an alternating current as the steady d.c. which converts electric potential energy to other forms in a given pure resistance at the same rate as that of the a.c. 3. Relate the r.m.s. and peak values of an a.c. 4. Describe the structure of a simple transformer and how it works 5. Relate the voltage ratio to turn ratio and apply it to solve problems 6. Examine methods for improving the efficiency of a transformer 7. Discuss the advantages of transmission of electrical energy	8		**Demonstration or Video :** Expt 6a - Current and e.m.f. produced by a small a.c. generator (dynamo) Expt 6b - The effective values of alternating current and voltage Expt 6c - Simple transformer Expt 6d - Measuring the voltage ratio of a transformer Expt 6e - The model power line Model of transmission power line **Simulations :** Mutual inductance Simple transformer	Book 4 P.285 No.3, 5 Chapter Test (Ch 6)	Book 4 Ch 5.1-5.2 Student learning Center	The effects on health of living near high-power transmission cables

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		with a.c. at high voltages 8. Describe various stages of stepping up and down of the voltage in a grid system for power transmission						
15/9 – 23/9	**X-rays** **α, β and γ radiation** **Detection of radiation**	1. Realise X-rays as ionizing electromagnetic radiations of short wavelengths with high penetrating power 2. Realise the emission of X-rays when fast electrons hit a heavy metal target 3. Discuss the uses of X-rays 4. Describe the origin and nature of α,β and γ radiation 5. Compare α,β and γ radiation in term of their penetrating power, ranges, ionizing power, behaviour in electric field and magnetic field, and cloud chamber tracks 6. Detect radiation with a photographic film and GM counter 7. Detect radiation in terms of count rate using a GM counter	8		**Demonstration or Video :** ETV – Radioactivity Expt 1a - Blackening of photographic plate Expt 1b - Ionizing power of radiation Expt 1c - Diffusion cloud chamber Simulation of particle collision The Geiger-Müller (G-M) counter Expt 1d - Penetrating power and range of radiation Expt 1e - Magnetic deflection of beta radiation Measuring background radiation by using a GM counter **Simulations :** Penetrating power Deflection of α, β and γ radiations in a magnetic field	Book 5 P.31 No.7, 11, physics in articles Chapter Test (Ch 1)	Book 5 Ch 1.1-1.2 Student learning Center	

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26/9 – 27/9	**Atomic structure** **Isotopes**	1. Describe the structure of an atom 2. Define atomic number as the number of protons in the nucleus and mass number as the sum of the number of protons and neutrons in the nucleus of an atom 3. Use symbolic notations to represent nuclides 4. Define isotope 5. Realise the existence of radioactive isotopes in some elements	2		**Demonstration or Video :** Gravitational model of Geiger-Marsden scattering experiment **Simulations :** Rutherford-Bohr model of the atom		Book 5 Ch 2.1 Student learning Center	To be aware of the usefulness of models and theories in physics as shown in the atomic model and appreciate the wonders of nature
28/9 – 4/10	**Radioactive decay**	1. Realise the occurrence of radioactive decay in unstable nuclides 2. Represent radioactive transmutations in α,β and γ decays using equations 3. Examine the random nature of radioactive decay 4. State the proportional relationship between the activity of a sample and the number of undecayed nuclei 5. Define half-life as the period of	6		**Demonstration or Video :** Expt 2a - Radioactive decay—a dice analogue Random variation of count rate by using a GM counter and a source Measuring background radiation by using a GM counter **Simulations :** Radioactive decay Radioactive decay and half-life		Book 5 Ch 2.2 Student learning Center	

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		time over which the number of radioactive nuclei decreases by a factor of one-half 6. Determine the half-life of a radioisotope from its decay graph or from numerical data 7. Realise the existence of background radiation 8. Solve problems involving radioactive decay 9. Represent the number of undecayed nuclei by the exponential law of decay 10. Apply the exponential law of decay $N = N_o e^{-kt}$ to solve problems 11. Relate the decay constant and the half-life 12. Discuss uses of radioactive isotopes						
6/10 – 7/10	**Radiation safety**	1. Represent radiation equivalent dose using the unit sievert 2. Discuss potential hazards of ionizing radiation and the ways to minimise the radiation dose absorbed	2			Book 5 P.75 No.4, 14, 18 Chapter Test (Ch 1)	Book 5 Ch 2.3 Student learning Center	Assessing the risks and benefits of using nuclear radiations in medical diagnosis

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		3. Suggest safety precautions in handling radioactive sources						
12/10 – 18/10	**Nuclear fission and fusion** **<u>Mass-energy relationship</u>**	1. Realise the release of energy in nuclear fission and fusion 2. Realise nuclear chain reaction 3. Realise nuclear fusion as the source of solar energy 4. State mass-energy relationship $E = mc^2$ 5. Use atomic mass unit as a unit of energy 6. Determine the energy release in nuclear reactions 7. Apply $E = mc^2$ to solve problems	6		**Video :** Explosion of atomic bomb and hydrogen bomb ETV – Nuclear Energy **Simulations :** Nuclear fission and chain reaction Nuclear fusion	Book 5 P.109 No.8,14 Chapter Test (Ch 3)	Book 5 Ch 3.1 – 3.2 Student learning Center	Comparing the relative costs and benefits from the use of nuclear reactors with other methods of producing electrical power
19/10 – 21/10	**Energy consuming appliances at home**	1. State electricity as the main source for domestic energy 2. Describe the energy conversion involved in electrical appliances 3. Define end-use energy efficiency in terms of the ratio of the amount of useful energy output to energy input	4				Book E3 Ch 1.1 Student learning Center	
24/10 – 28/10	**Lighting**	1. State the different types of lighting used at home 2. Describe how incandescent lamps,	6		**Video :** Expt 1a - Measuring brightness with a light meter Expt 1b - Comparing the efficiency of different types of light		Book E3 Ch 1.2 Student	To be open-minded in evaluating the potential applications of new technologies for improving energy

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		gas discharge lamps and light emitting diodes (LED) work and interpret light emission in terms of energy change in atomic level 3. Discuss cost effectiveness of incandescent lamps, gas discharge lamps and light emitting diodes 4. Realise that the eye response depends on wavelengths 5. Define luminous flux as the energy of light emitted per unit time by a light source 6. Use lumen as a unit of luminous flux 7. Define illuminance as luminous flux falling on unit area of a surface 8. Use lux as a unit of illuminance 9. Use inverse square law and Lambert's cosine law to solve problems involving illuminance 10. Solve problems involving end-use energy efficiency of electric lights			sources **Simulations :** Fluorescent tube lamps P-n junction in an LED		learning Center	efficiency
31/10 – 4/11	**Cooking without fire**	1. Describe how electric hotplates, induction cookers and microwave ovens work in heat	6		**Video :** The induction cooker		Book E3 Ch 1.3	

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		generation 2. Use the power rating of cookers to determine running cost 3. Solve problems involving end-use energy efficiency of cookers 4. Discuss the advantages and disadvantages of electric hotplates, induction cookers and microwave ovens					Student learning Center	
7/11 – 11/11	**Moving heat around**	1. Describe how air-conditioner as a heat pump transfers heat against its natural direction of flow 2. Use kilowatt (kW) as a unit for cooling capacity and solve problems involving cooling capacity 3. Discuss possible ways of using heat generated by central air-conditioning systems	6		**Simulations :** Working principle of an air-conditioner		Book E3 Ch 1.4 Student learning Center	
14/11 – 15/11	**Energy Efficiency Labelling Scheme**	1. Discuss the uses of the Hong Kong Energy Efficiency Labelling Scheme (EELS) for energy-saving 2. Solve problems involving EELS 3. Suggest examples of energy-saving devices	2			Book E3 P.54 No. 1, 4, 6, 7 Chapter Test (Ch 3)	Book E3 Ch 1.5 Student learning Center	To appreciate energy-saving behaviour in daily life and to be committed to good practices for energy consumption
16-22/11	**Mid-term Test**							

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23/11	**Test Evaluation**							
24/11 – 29/11	**Building materials used to improve the energy efficiency**	1. Interpret $\frac{Q}{t} = \kappa \frac{A(T_{hot} - T_{cold})}{d}$ as the rate of energy transfer by conduction and discuss the heat loss in conduction 2. Define thermal transmittance U-value of building materials as $U = \frac{\kappa}{d}$ 3. State the Overall Thermal Transfer Value (OTTV) of a building envelope 4. Solve problems involving conduction in a building 5. Discuss the use of solar control window film in a building 6. Discuss the factors affecting the energy efficiency of buildings	4		**Video :** Expt 2a - Estimating the thermal conductivity of glass Expt 2b - Rates of heat transfer by conduction through windows Expt 2c - Rates of heat transfer by radiation through windows **Simulations :** Energy saving apartment Factors affecting the rate of conduction		Book E3 Ch 2.1 Student learning Center	
30/11 – 2/12	**Electric vehicles**	1. State the main components of the power system of electric vehicles 2. Discuss the use of electric vehicles 3. State the main components of the power system of hybrid vehicles and compare their end-use energy	4		**Video :** Expt 2d - A model of regenerative braking system **Simulations :** Working principle of a hybrid vehicle	Book E3 P.54 No. 2, 5, 11, 12 Chapter Test	Book E3 Ch 2.2 Student learning Center	

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		efficiency to petrol vehicles 4. Discuss the advantages of public transportation systems and give examples				(Ch 2)		
5/12 – 7/12	**Renewable and non-renewable energy sources**	1. Describe the characteristics of renewable and non-renewable energy sources and give examples 2. Define solar constant as the total electromagnetic radiation energy radiated at normal incidence by the Sun per unit time per unit area at the mean distance between the Earth and the Sun after the absorption by the Earth's atmosphere 3. Solve problems involving the solar constant 4. Derive maximum power by wind turbine as $P = \frac{1}{2}\rho A v^3$ and solve problems 5. Describe the energy conversion process for hydroelectric power and solve problems 6. Define binding energy per nucleon	4		**Simulations :** Nuclear reactor		Book E3 Ch 3.1 Student learning Center	To be aware of the finite energy sources available to humans and the need to save electrical energy for a sustainable economy and environmental protection

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		in unit of eV and solve problems 7. Relate the binding energy curve to nuclear fission and fusion 8. Describe the principle of the fission reactor and state the roles of moderator, coolant and control rods 9. Describe how a solar cell works						
8/12 – 9/12	**Environmental impact of energy consumption**	1. Discuss the impact of extraction, conversion, distribution and use of energy on the environment and society 2. Discuss effect of greenhouse gases on global warming 3. Analyse the consumption data for different fuel types in Hong Kong and their specific purposes	2		**Video :** Greenhouse effect and global warming	Book E3 P.54 No. 2, 5(b), 8 Chapter Test (Ch 3)	Book E3 Ch 3.2 Student learning Center	To be aware of the environmental implications of the use of different energy sources and to share the responsibility for sustainable development of Hong Kong
4/1 – 17/1	**Mock Examination**							
19/1	**Exam Evaluation**							
2/2 – 24/2	**Overall revision & drilling of CE/AL past papers**		10					

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