ISTITUTO D'ISTRUZIONE SUPERIORE
"Enrico Mattei"
ISTITUTO TECNICO COMMERCIALE – LICEO SCIENTIFICO – LICEO delle SCIENZE UMANE
Via delle Rimembranze, 26 – 40068 San Lazzaro di Savena BO
Tel. 051 464510 – 464545 – fax 452735
iis@istitutomattei.bo.it – http://www.istitutomattei.bo.it

PROGRAMMAZIONE DEL GRUPPO DISCIPLINARE A.S. 2020/2021

INDIRIZZO SCOLASTICO: LICEO SCIENTIFICO		
DISCIPLINA: FISICA	**ORE SETT.LI: 3+1**	**CLASSI: TERZE IGCSE**

Anno	***Moduli***	***Syllabus IGCSE***	***Textbook***	***Workbook***	***Periodo***
III	**MOTI in DUE DIMENSIONI** - Vettore spostamento, velocità e accelerazione - Principio di indipendenza dei moti simultanei - Moto parabolico - Moto circolare uniforme	-	Slide/fotocopie	-	1° quad rim.

	LA CARICA ELETTRICA E LA LEGGE DI COULOMB - La carica elettrica - Conduttori ed isolanti - L'elettrizzazione per strofinio, contatto ed induzione. La polarizzazione - La legge di Coulomb - La legge di gravitazione universale; confronto fra le due leggi - Il principio di sovrapposizione - La distribuzione della carica elettrica su una sfera	**Electric charge** **Core** • State that there are positive and negative charges • State that unlike charges attract and that like charges repel • Describe simple experiments to show the production and detection of electrostatic charges • State that charging a body involves the addition or removal of electrons • Distinguish between electrical conductors and insulators and give typical examples **Supplement** • State that charge is measured in coulombs • State that the direction of an electric field at a point is the direction of the force on a positive charge at that point • Describe an electric field as a region in which an electric charge experiences a force • Describe simple field patterns, including the field around a point charge, the field around a charged conducting sphere and the field between two parallel plates (not including end effects) • Give an account of charging by induction • Recall and use a simple electron model to distinguish between conductors and insulators	**Static electricity** ● Charging and discharging ● Explaining static electricity ● Electric field and electric charge	**Static electricity** ● Attraction and repulsion ● Moving charges ● Static at home	1° quad rim.

III	**IL CAMPO ELETTRICO** - Il vettore campo elettrico - Il campo elettrico di una carica puntiforme - Le linee del campo elettrico - Il campo elettrico generato da una distribuzione piana "infinita" di carica - Condensatore a facce piane e parallele e campo elettrico - La schermatura e la carica per induzione - Il flusso del campo elettrico ed il teorema di Gauss	**Supplement** • State that charge is measured in coulombs • State that the direction of an electric field at a point is the direction of the force on a positive charge at that point • Describe an electric field as a region in which an electric charge experiences a force • Describe simple field patterns, including the field around a point charge, the field around a charged conducting sphere and the field between two parallel plates (not including end effects) • Give an account of charging by induction • Recall and use a simple electron model to distinguish between conductors and insulators	**Electrical quantity** ● Current in electric circuits ● Electrical resistance ● More about electrical resistance ● Electricity and energy	**Electrical quantity** ● Current in a circuit ● Current and charge ● Electrical resistance ● Current - voltage characteristics ● Electrical energy and power	1° quad rim.
III	**IL POTENZIALE ELETTRICO E L'ENERGIA POTENZIALE** - L'energia potenziale elettrica - Il potenziale elettrico - La relazione fra campo elettrico e potenziale elettrico - La conservazione dell'energia - Il potenziale elettrico di una carica puntiforme - La sovrapposizione del potenziale elettrico	**Electromotive force** **Core** • State that the electromotive force (e.m.f.) of an electrical source of energy is measured in volts **Supplement** • Show understanding that e.m.f. is defined in terms of energy supplied by a source in driving charge round a complete circuit			2° quad rim.

	- Le superfici equipotenziali ed il campo elettrico - Condensatori e dielettrici: la capacità di un condensatore piano - Immagazzinare l'energia elettrica	**Potential difference** **Core** • State that the potential difference (p.d.) across a circuit component is measured in volts • Use and describe the use of a voltmeter, both analogue and digital **Supplement** • Recall that 1 V is equivalent to 1 J/C			
	LA CORRENTE ELETTRICA CONTINUA - L'intensità della corrente elettrica - La forza elettromotrice - La resistenza e la prima legge di Ohm - La seconda legge di Ohm - Energia e potenza nei circuiti elettrici - Resistenze in serie e in parallelo - Le leggi di Kirchhoff - Circuiti con condensatori - Amperometri e voltmetri	**Resistance** **Core** • State that resistance = p.d. / current and understand qualitatively how changes in p.d. or resistance affect current • Recall and use the equation R = V / I • Describe an experiment to determine resistance using a voltmeter and an ammeter • Relate (without calculation) the resistance of a wire to its length and to its diameter **Supplement** • Sketch and explain the current-voltage characteristic of an ohmic resistor and a filament lamp • Recall and use quantitatively the proportionality between resistance and length, and the inverse proportionality between resistance and cross-sectional area of a wire	**Electric circuits** ● Circuit components ● Combinations of resistors ● Electronic circuits ● Electrical safety	**Electric circuits** ● Circuit components and their symbols ● Diodes ● Resistor combinations ● More resistor combinations ● Light sensor	2° quad rim..

		Electrical working **Core** • Understand that electric circuits transfer energy from the battery or power source to the circuit components then into the surroundings **Supplement** • Recall and use the equations P = IV and E = IVt **Circuit diagrams** **Core** • Draw and interpret circuit diagrams containing sources, switches, resistors (fixed and variable), heaters, thermistors, light-dependent resistors, lamps, ammeters, voltmeters, galvanometers, magnetising coils, transformers, bells, fuses and relays **Supplement** • Draw and interpret circuit diagrams containing diodes **Series and parallel circuits** **Core** • Understand that the current at every point in a series circuit is the same • Give the combined resistance of two or more resistors in series		● Logic state ● Electrical safety	

		• State that, for a parallel circuit, the current from the source is larger than the current in each branch • State that the combined resistance of two resistors in parallel is less than that of either resistor by itself • State the advantages of connecting lamps in parallel in a lighting circuit **Supplement** • Calculate the combined e.m.f. of several sources in series • Recall and use the fact that the sum of the p.d.s across the components in a series circuit is equal to the total p.d. across the supply • Recall and use the fact that the current from the source is the sum of the currents in the separate branches of a parallel circuit • Calculate the effective resistance of two resistors in parallel **Action and use of circuit components** **Core** • Describe the action of a variable potential divider (potentiometer) • Describe the action of thermistors and light dependent resistors and show understanding of their use as input transducers • Describe the action of a relay and show understanding of its use in switching circuits			

		Supplement • Describe the action of a diode and show understanding of its use as a rectifier • Recognise and show understanding of circuits operating as light-sensitive switches and temperature-operated alarms (to include the use of a relay)			
	IL MAGNETISMO - Il campo magnetico e le linee di campo - La forza magnetica esercitata su una carica in movimento - Il moto di particelle cariche in un campo magnetico - La forza magnetica esercitata su un filo percorso da corrente - Spire di corrente e momento torcente magnetico - Correnti elettriche, campi magnetici e legge di Ampere - Spire e solenoidi - Il magnetismo nella materia	**Simple phenomena of magnetism** **Core** • Describe the forces between magnets, and between magnets and magnetic materials • Give an account of induced magnetism • Distinguish between magnetic and nonmagnetic materials • Describe methods of magnetisation, to include stroking with a magnet, use of direct current (d.c.) in a coil and hammering in a magnetic field • Draw the pattern of magnetic field lines around a bar magnet • Describe an experiment to identify the pattern of magnetic field lines, including the direction • Distinguish between the magnetic properties of soft iron and steel • Distinguish between the design and use of permanent magnets and electromagnets **Supplement**	**Magnetism** ● Permanent magnet ● Magnetic fields **Electromagnetic forces** ● The magnetic effect of current ● How electric motors are constructed	**Magnetism** ● Attraction and repulsion ● Make a magnet ● Magnetic fields **Electromagnetic forces** ● Using electromagnetism ● Electron deflection	2° quad rim.

		• Explain that magnetic forces are due to interactions between magnetic fields • Describe methods of demagnetisation, to include hammering, heating and use of alternating current (a.c.) in a coil	● Force on a current- carryng conductors		
	L'INDUZIONE ELETTROMAGNETICA - La forza elettromotrice indotta - Il flusso del campo magnetico - La legge dell'induzione di Faraday - La legge di Lenz - Lavoro meccanico ed energia elettrica - Generatori e motori - Il trasformatore	**Electromagnetic induction** **Core** • Show understanding that a conductor moving across a magnetic field or a changing magnetic field linking with a conductor can induce an e.m.f. in the conductor • Describe an experiment to demonstrate electromagnetic induction • State the factors affecting the magnitude of an induced e.m.f. **a.c. generator** **Core** • Distinguish between d.c. and a.c. **Supplement** • Describe and explain a rotating-coil generator and the use of slip rings • Sketch a graph of voltage output against time for a simple a.c. generator • Relate the position of the generator coil to the peaks and zeros of the voltage output	**Electromagnetic induction** ● Generating electricity ● Power lines and transformers ● How transformers work	**Electromagnetic induction** ● Electricity generation ● Transformers	2° quad rim.

		Transformer **Core** • Describe the construction of a basic transformer with a soft-iron core, as used for voltage transformations • Recall and use the equation (Vp / Vs) = (Np / Ns) • Understand the terms step-up and step-down • Describe the use of the transformer in high voltage transmission of electricity • Give the advantages of high-voltage transmission **Supplement** • Describe the principle of operation of a transformer • Recall and use the equation Ip Vp = Is Vs (for 100% efficiency) • Explain why power losses in cables are lower when the voltage is high **The magnetic effect of a current** **Core** • Describe the pattern of the magnetic field (including direction) due to currents in straight wires and in solenoids • Describe applications of the magnetic effect of current, including the action of a relay **Supplement**			

		• State the qualitative variation of the strength of the magnetic field over salient parts of the pattern • State that the direction of a magnetic field line at a point is the direction of the force on the N pole of a magnet at that point • Describe the effect on the magnetic field of changing the magnitude and direction of the current **Force on a current-carrying conductor** **Core** • Describe an experiment to show that a force acts on a current-carrying conductor in a magnetic field, including the effect of reversing: - the current - the direction of the field **Supplement** • State and use the relative directions of force, field and current • Describe an experiment to show the corresponding force on beams of charged particles **D.c. motor** **Core** • State that a current-carrying coil in a magnetic field experiences a turning effect and that the effect is increased by:			

		- increasing the number of turns on the coil - increasing the current - increasing the strength of the magnetic field **Supplement** • Relate this turning effect to the action of an electric motor including the action of a split-ring commutator			