National	Plan				
	Mon 4	**Mon 5**	**Wed 1**	**Fri 5**	**Over-all**
7/1	Practice Assignment (2018) 1	Practice Assignment 2	Revision Area 1	Revision area 2	51 (42 hours)
14/1	Practice Assignment 3	Practice Assignment 4	Revision Area 3	Revision Area 4	47
21/1	Practice Assignment 5	Practice Assignment 6	Revision Area 5	Revision Area 6	43
28/1	Practice Assignment 7	Practice Assignment 8	Revision Area 7	Revision Area 8	39
4/2	Practice Assignment 9	Practice Assignment 10	Revision Area 9	Revision Area 10	35
11/2	Revision area 11	Revision any topics that need addition-al time	Engineering prelim 1:10 to 3pm Revision based on pupil choice		31
18/2			SQA final Assign-ment 1	Assignment 2	28
25/2	Assignment 3	Assignment 4	Assignment 5	Assignment 6	26
4/3	Assignment 7	Assignment 8	Assignment 9	Assignment 10	22
11/3	Check assignments are labelled correctly for SQA Revision targeted based on prelim 1	Revision targeted based on prelim 1	Revision targeted based on prelim 1	Assignments to the office to be sent to SQA Revision targeted based on prelim 1	18
18/3	Revision targeted based on prelim 1	targeted based on prelim 1	targeted based on prelim 1	targeted based on prelim 1	14
25/3	Prelim 2	Revision general	Revision general	Revision general	10
15/4	Targeted revision based on prelim 2	Targeted revision based on prelim 2	Targeted revision based on prelim 2		6
22/4	Make personal Study plan for Exam leave	Targeted revision based on prelim 2	Pupil identified re-vision	Exam leave start Thursday 25th	3
				Final Exam Friday 17th May 1 to 2:50	

Question paper and assignment

☐ **The systems approach** ☐ ¨ systems and sub-system diagrams

☐ ¨ function of a system in terms of input – process – output and feedback loops

☐ ¨ open- and closed-loop control

☐ ¨ interaction of sub-systems

☐ **Energy and efficiency** ☐ ¨ applying the law of conservation of energy

☐ ¨ calculations involving forms of energy (kinetic, potential, electrical and heat)

☐ ¨ energy transfers, losses and transformations in a system

☐ ¨ energy audits and calculation of overall efficiency

☐ ¨ applied calculations involving efficiency, work done and power using:

☐ Ew =Fd P=E/t, Ek = ½ mv2 Ep = mgh Ee = VIt Eh = cmΔT Efficiency η = Eout/Ein = Pout/Pin

Calculations ☐ ¨ manipulating given formulae to obtain answers

☐ (see the 'Engineering Science Data Booklet National 4/5' for the relevant formulae)

☐ **Engineering roles and disciplines** ☐ ¨ examples of applications of environmental, civil, structural, mechanical, chemical, electrical and electronic engineering

☐ ¨ examples of the contribution of branches of engineering to solve engineering challenges, that integrate branches of engineering

☐ ¨ varied roles of engineers in designing, implementing, testing and controlling complex systems

☐ **Impacts of engineering** ☐ ¨ examples of social and economic impacts (positive and negative) of engineering

☐ ¨ examples of environmental impacts (positive and negative) of engineering

☐ ¨ ways in which engineering solutions contribute to tackling climate change

☐ ¨ explaining how emerging technologies may provide improved solutions to engineering challenges

☐ **Analogue electronic control systems** ☐ ¨ function and purpose within a circuit of: battery, switch, resistor, variable resistor, LDR, thermistor, LED, buzzer, diode, motor, lamp, ammeter and voltmeter

☐ ¨ describing the function of a circuit in terms of input, process and output

☐ ¨ calculations involving the relationship between voltage, current and resistance (Ohm's Law)

☐ ¨ calculations involving resistors in series and parallel

☐ ¨ calculations of voltage, current, and unknown values in a fixed-voltage divider

☐ ¨ designing a voltage divider to provide an input signal for a control circuit

☐ ¨ interpreting information given of characteristics for an LDR and an NTC thermistor ¨ function of relays

☐ ¨ function of a protection diode in an electronic circuit

☐ ¨ explaining the switching function of a transistor

☐ ¨ operating an electronic control circuit, which includes a variable voltage divider, transistor, relay and output transducer

☐ **Digital electronic control systems** ☐ ¨ AND, OR and NOT gates and combinations with up to three inputs, using truth tables, logic diagrams and Boolean expressions

☐ ¨ examples of using microcontrollers in commercial and industrial applications

☐ ¨ advantages and disadvantages of microcontroller-based control systems, compared to a hard-wired electronic equivalent

☐ ¨ using correct symbols (start, stop, input, output, branch and loop) to construct flowcharts showing solutions to simple control programs, involving time delays and continuous and fixed loops

☐ ¨ using suitable commands (high, low, for…next, if…then, pause, end (or their equivalents)) to design programs to solve simple control problems, involving time delays and continuous and fixed loops

☐ **Drive systems** ☐ ¨ motion in mechanical systems: rotary, linear, reciprocating and oscillating

☐ ¨ simple gear train systems, idler gears, diagrams and conventions for representation

☐ ¨ compound gear trains

☐ ¨ calculating speed (velocity) ratio of simple and compound gear trains

☐ ¨ the effects of friction in drive systems

☐ ¨ appropriate British Standards symbols

☐ **Pneumatics** ☐ ¨ symbols and operation of standard pneumatic components (restrictor, uni-directional restrictor, reservoir, 5/2 valve and actuators: diaphragm and solenoid)

☐ ¨ pneumatic time delay circuits

☐ ¨ calculating relationships between force, pressure and area in single-acting and double-acting cylinders

☐ ¨ controlling speed and force

☐ **Structures and forces** ☐ ¨ examples of effects of a force (tensile and compressive)

☐ ¨ concurrent forces and equilibrium

☐ ¨ using triangle of forces and free body diagrams ¨ non-concurrent forces and parallel forces

☐ ¨ moment of a force

☐ ¨ calculations involving the principle of moments

☐ ¨ balance beam, simply-supported beam and reaction forces

☐ **Materials** ☐ ¨ selecting appropriate material for a given application, with justification

☐ ¨ calculating the relationship between direct stress, force and area

☐ ¨ calculating strain