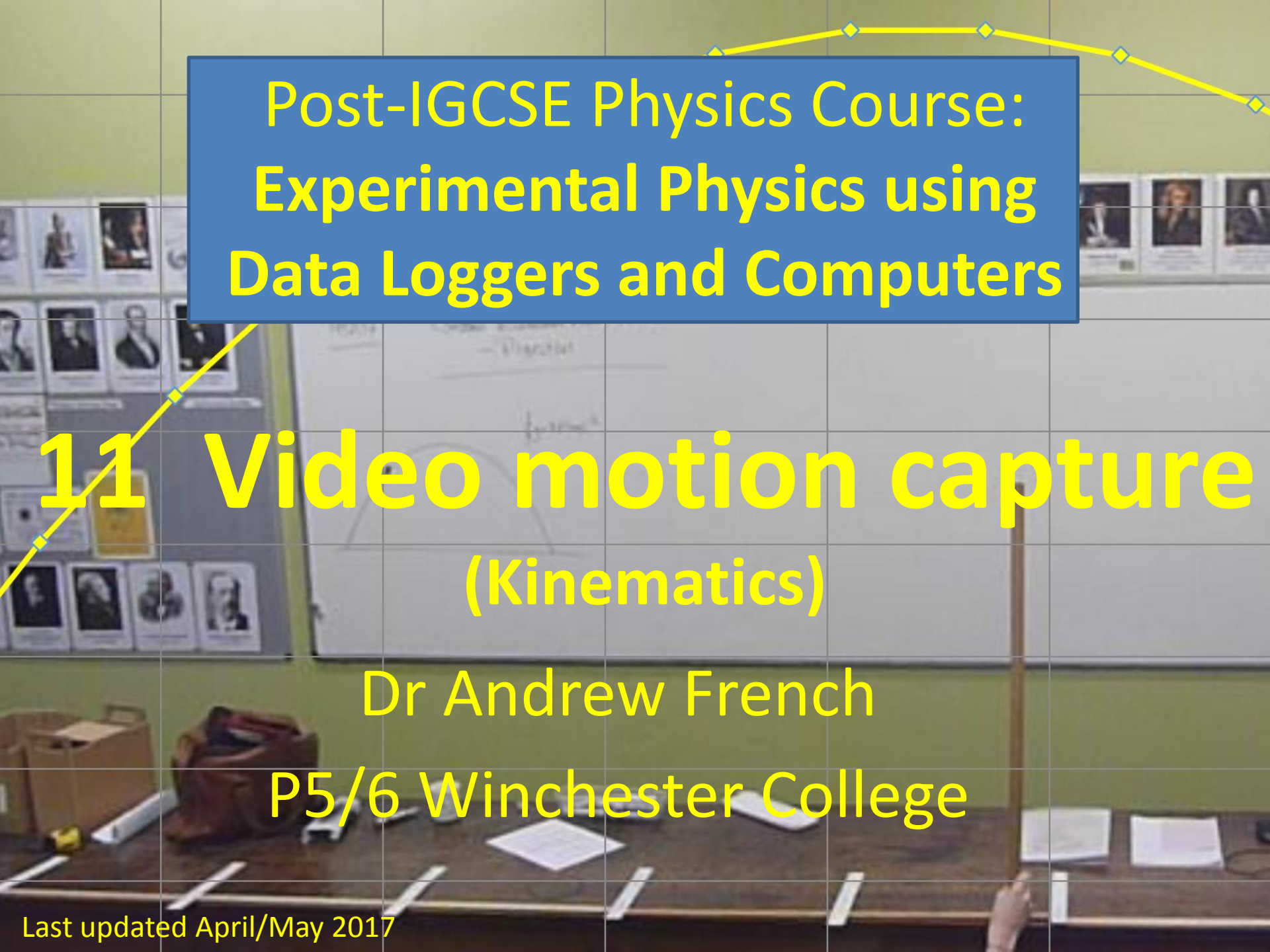

Post-IGCSE Physics Course:
Experimental Physics using Data Loggers and Computers

11 Video motion capture

(Kinematics)

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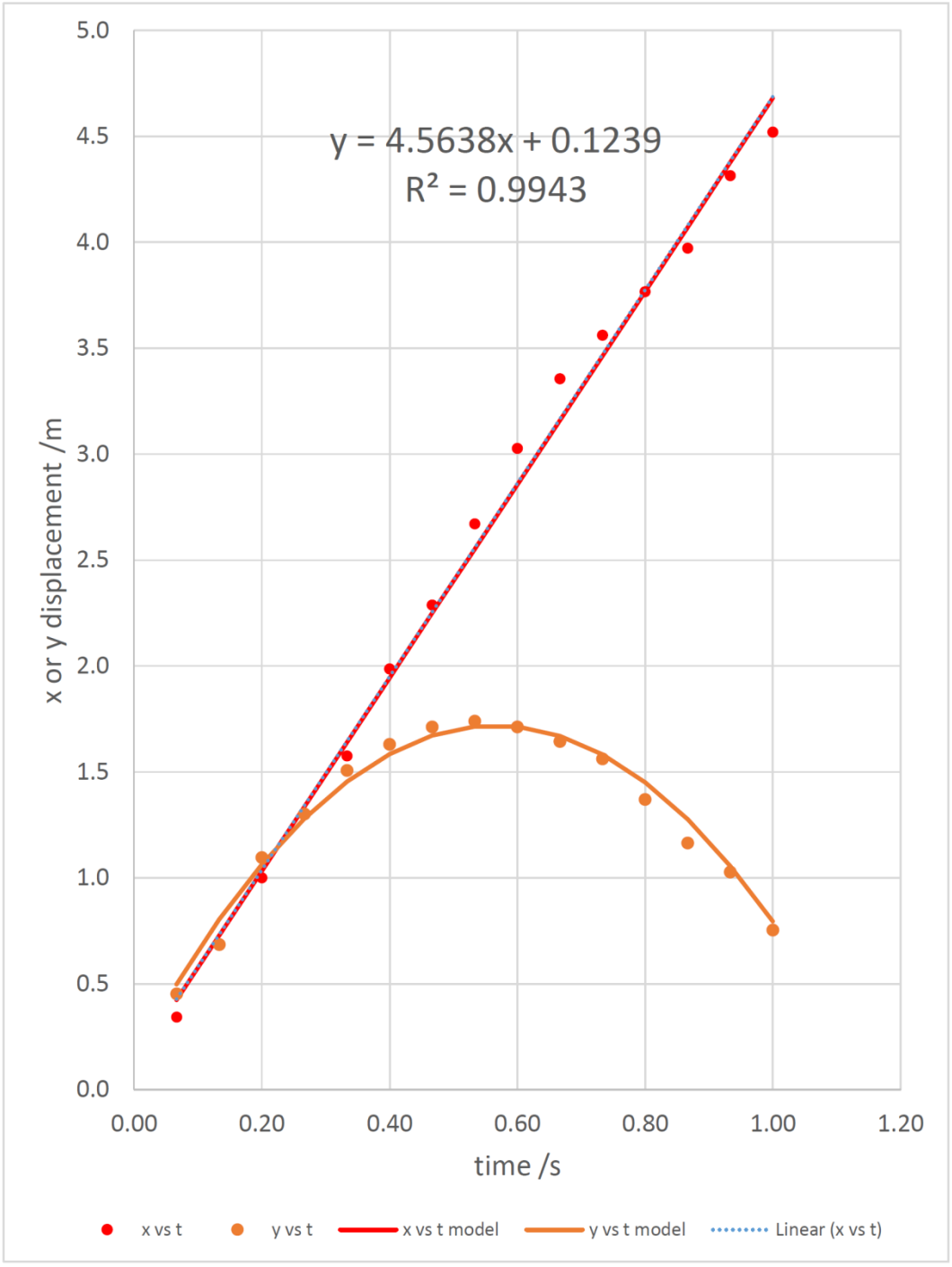
Experimental setup and analysis

Throw a ball over a 5m distance, with a metre rule clearly visible. Video using a digital camera at 30 frames per second. Open the resulting movie file in **Quicktime** and manually skip through the frames.
Use a ruler to record the ball position relative to the computer screen and then calibrate to metres using the metre stick. Analyse in Excel, and overlay a screenshot with the x vs y parabola as shown above.

		screen		reality		XUVAT model	
click #	**t /s**	**x /cm**	**y/cm**	**x /m**	**y /m**	**x /m**	**y /m**
2	0.07	2.5	3.3	0.3	0.5	0.42	0.5
4	0.13	5.0	5.0	0.7	0.7	0.73	0.8
6	0.20	7.3	8.0	1.0	1.1	1.03	1.06
8	0.27	9.5	9.5	1.3	1.3	1.34	1.28
10	0.33	11.5	11.0	1.6	1.5	1.64	1.46
12	0.40	14.5	11.9	2.0	1.6	1.94	1.59
14	0.47	16.7	12.5	2.3	1.7	2.25	1.67
16	0.53	19.5	12.7	2.7	1.7	2.55	1.71
18	0.60	22.1	12.5	3.0	1.7	2.86	1.71
20	0.67	24.5	12.0	3.4	1.6	3.16	1.67
22	0.73	26.0	11.4	3.6	1.6	3.46	1.58
24	0.80	27.5	10.0	3.8	1.4	3.77	1.45
26	0.87	29.0	8.5	4.0	1.2	4.07	1.28
28	0.93	31.5	7.5	4.3	1.0	4.38	1.06
30	1.00	33.0	5.5	4.5	0.8	4.68	0.8

30FPS video recording

1 click = 1/30 s



Displacement vs time equations (ignore drag, only include weight)

$$x = x_0 + u_x t$$

$$y = y_0 + u_y t - \frac{1}{2} g t^2$$

Initial velocities /ms^-1

ux	**4.56**
uy	**5.55**

launch speed / ms^-1
7.183

g	**9.81**	gravitational acceleration
x0	**0.12**	initial x value
y0	**0.15**	initial y value

Find x velocity using a line of best fit to x vs t data.

Perform a similar process using $y + \frac{1}{2} g t^2$ vs time to find the initial y component (vertical) velocity.