UNIT TITLE: **Calculus**
LEVEL: **THREE**
CREDIT VALUE: **3**
UNIT CODE: **WJF975**
UNIT TYPE: **Ungraded**

(Access/A2 – revised May 2017)

This unit has 2 learning outcomes.

LEARNING OUTCOMES	**ASSESSMENT CRITERIA**
The learner will:	**The learner can[1]:**
1. Demonstrate how differential calculus can be used to solve higher order problems requiring greater accuracy.	1.1 Describe the use and principal methods of differentiation and perform calculations based on these principles. 1.2 Explain the use of differential calculus in a range of applications and the importance of functions, rate of change and gradient in the process and use differentiation to solve problems. 1.3 Find the differential coefficient of simple trigonometric and exponential functions to solve simple rate of change problems.
2. Demonstrate how integral calculus can be used to solve higher order problems requiring greater accuracy.	2.1 Explain how integration can be seen as the reverse/inverse of differentiation and the types of routine and non-routine functions involved in the process. 2.2 Consider the use of integration as a summating tool and its use in a range of applications 2.3 Use numerical and approximation integration methods.

Indicative Content[2]:

1. Demonstrate how differential calculus can be used to solve higher order problems requiring greater accuracy.

1.1 Differential calculus to calculate change with respect to variables such as time, distance or speed. Functions, many-one and one-one mapping.

1.2 The gradient of a curve and graphical differentiation, Leibniz and engineering notation, differentiation, the second derivative, rate of change and turning points.

1.3 Differentiation of simple trigonometric and exponential functions, standard derivatives. Applications: velocity/acceleration of a moving object, heat flow, radioactive decay, hydraulic flow rates, minimising production costs.

[1] Insert additional rows if more Assessment Criteria are required to evidence a Learning Outcome
[2] Provide guidance in terms of recommended curriculum content

2. Demonstrate how integral calculus can be used to solve higher order problems requiring greater accuracy.

2.1 Integral calculus to find the length of arcs, surface areas or volumes of non-standard shapes and to operate as the inverse of differential calculus (anti-differentiation), the summing process, finding the whole from its parts. Symbolic representation, algebraic expressions and the constant of integration. Types of function: polynomial, trigonometric (sine and cosine), reciprocal and exponential. Routine functions, integration in one step. Non-routine functions requiring manipulation, indefinite integrals, definite integrals, integration by substitution and by parts.

2.2 Integral calculus as a summating tool, area under a curve from first principles, strip theory. Area under a curve as a summation between the limits applied to the function. Mean value and root mean square (RMS) value of periodic functions. Applications, work done, distance travelled, mean and RMS values of waveforms in electrical circuits.

2.3 Numerical integration and approximate methods:

2.4 By series, use of the trapezoidal, mid-ordinate and Simpson's rule. Area under a curve obtained by integrating the function. Numerical integration using a spreadsheet.

Recommended Assessment Method (s)[3]:

Methodology	Insert √	Methodology	Insert √
Essay		Tutor Observation	
Presentation		Experiment	
Report		Practical Demonstration	
Exam	√	Other (provide details in additional details box)	

Additional Details:

For university entry, assessment by unseen examinations is preferred and the learner will be expected to know basic formulae.

Indicative reading:[4]

1. PEARCE, C., BALL, H., KENT, M. and HIPKISS, K. (2017) *Edexcel A-level Mathematics.* Harper Collins.
2. STROUD, K.A. and BOOTH, D.J. (2013) *Engineering Mathematics*. 7th Ed. Palgrave Macmillan.
3. http://www.mathcentre.ac.uk
4. http://www.mathtutor.ac.uk

[3] One or more of these methods may be employed in evidencing the Learning Outcomes and Assessment Criteria for the unit. However, please note that these methods do not preclude other means of evidencing Learning Outcomes and Assessment Criteria and are only **RECOMMENDED** means of assessment

[4] Please add key URLs and/or key texts/articles for the unit