APPROVED

MATH6060: Maths for Physical Sciences

Module Details

Module Code:	MATH6060
Title:	Maths for Physical Sciences APPROVED
Long Title:	Maths for Physical Sciences
NFQ Level:	Fundamental
Valid From:	Semester 1 - 2018/19 (September 2018)

Duration:	1 Semester

Credits:	5

Field of Study:	4610 - Mathematics

Module Delivered in:	**7 programme(s)**

Module Description:	An introduction to fundamental mathematical calculations and problem solving aimed at consolidating and developing student competence in the mathematical techniques which are central to the Physical Sciences.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
#	**Learning Outcome Description**
LO1	Perform a range of arithmetical calculations necessary for laboratory work in the Physical Sciences.
LO2	Manipulate a wide variety of algebraic expressions, transpose formulae, solve linear and quadratic equations and solve systems of simultaneous equations.
LO3	Use the laws of indices and logarithms to solve related equations arising in applied problems.
LO4	Sketch graphs relating to quantities which are: in direct proportion and in inverse proportion; related linearly, exponentially or logarithmically.
LO5	Reduce equations to linear form and determine parameters from appropriate graphs.
LO6	Sketch sinusoidal waveforms and identify their salient characteristics.
LO7	Perform basic algebraic manipulation of complex numbers and know how to represent them in polar, rectangular and exponential forms.

Dependencies	
Module Recommendations	
Incompatible Modules	
No incompatible modules listed	
Co-requisite Modules	
No Co-requisite modules listed	
Requirements	
No requirements listed	

Indicative Content
The Fundamentals of Arithmetic with Applications Rounding to significant figures. Scientific and Engineering notation. SI units, prefixes, conversion of units including imperial and metric. Ratio and proportion with examples from the Physical Sciences. Application to molarity and concentration. Approximation, error estimation: absolute, relative and percentage error.
Basic Algebra Algebraic manipulation, transposition and simplification of formulae relevant to the Physical Sciences. Solution of linear and quadratic equations. Simultaneous equations with two or three variables.
Indices and Logarithms The laws of indices. Logarithms and their use in the solution of indicial (exponential) equations. Discussion of the number e and natural logarithms.
Functions and Graphs Function notation with particular emphasis on functions of one variable. Independent variable, dependent variable. Graphs of quantities which are in direct proportion and indirect proportion. Graphs of linear functions and quadratic functions. Exponential growth and exponential decay. Reduction of non-linear relations to linear form to allow for the estimation of parameters.
Trigonometry. Angle measurement in degrees and radians. Trigonometric ratios and the unit circle. Pythagoras theorem. Solution of simple trigonometric equations. Graphing sine and cosine waveforms. Characteristics of a waveform: amplitude, period, frequency and phase.
Complex numbers Rectangular, polar and exponential forms.

Module Content & Assessment

Assessment Breakdown	%
Coursework	40.00%
End of Module Formal Examination	60.00%

Assessments

Coursework			
Assessment Type	Short Answer Questions	**% of Total Mark**	20
Timing	Week 5	**Learning Outcomes**	1,2,3
Assessment Description In class test			
Assessment Type	Short Answer Questions	**% of Total Mark**	20
Timing	Week 10	**Learning Outcomes**	4,5,6
Assessment Description In class test			

End of Module Formal Examination			
Assessment Type	Formal Exam	**% of Total Mark**	60
Timing	End-of-Semester	**Learning Outcomes**	1,2,3,4,5,6,7
Assessment Description End-of-Semester Final Examination			

Reassessment Requirement

Repeat examination
Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.

Module Workload

Workload: Full Time

Workload Type	Contact Type	Workload Description	Frequency	Average Weekly Learner Workload	Hours
Lecture	Contact	Exposition of theory with illustrative concrete examples	Every Week	3.00	3
Tutorial	Contact	Student problem solving under guidance of class tutor	Every Week	2.00	2
Independent & Directed Learning (Non-contact)	Non Contact	Study of lecture material and exercise sheets	Every Week	2.00	2
				Total Hours	7.00
				Total Weekly Learner Workload	7.00
				Total Weekly Contact Hours	5.00

Workload: Part Time

Workload Type	Contact Type	Workload Description	Frequency	Average Weekly Learner Workload	Hours
Lecture	Contact	Exposition of theory with illustrative concrete examples	Every Week	2.00	2
Tutorial	Contact	Student problem solving under guidance of class tutor	Every Week	1.00	1
Independent & Directed Learning (Non-contact)	Non Contact	Study of lecture material and exercise sheets	Every Week	4.00	4
				Total Hours	7.00
				Total Weekly Learner Workload	7.00
				Total Weekly Contact Hours	3.00

Module Resources

Recommended Book Resources

John Bird. (2017), Basic Engineering Mathematics, 7th Edition, Routledge, [ISBN: 978-113867370].

Stroud, K.A.; Booth, Dexter J.. (2009), Foundation Mathematics, Palgrave MacMillan, England, p.752, [ISBN: 9780230579071].

Supplementary Book Resources

Alicia Sevilla & Kay Somers. (2007), Quantitative Reasoning: Tools for Today's Informed Citizen, First. Key College Publishing, USA, p.613, [ISBN: 878-1-931914-90-1].

COMAP. (2002), For All Practical Purposes: Mathematical Literacy in Today's World, Sixth. COMAP, USA, [ISBN: 978-0716738176].

James F. Burkhart. (1999), Quantitative and qualitative reasoning skills, Second. Kendall/Hunt Publishing, USA, p.179, [ISBN: 978-0787263782].

Donald Pierce, Don Pierce & Edward B. Wright. (1997), Mathematics for Life: A Foundation Course for Quantitative Literacy, Preliminary. Prentice Hall, [ISBN: 978-0134938592].

Paul Monk and Lindsey J. Munro. Maths for chemistry, [ISBN: 978-0-19-954129-4].

Applying maths in the chemical and biomolecular sciences: an example-based approach, [ISBN: 978-0-19-923091-4].

Philip R. Bevington, D. Keith Robinson. Data reduction and error analysis for the physical sciences, [ISBN: 978-0-07-119926-1].

Supplementary Article/Paper Resources

Mathematical Association of America. (2007), Calculation vs. Context,
http://www.maa.org/ql/calcvscontext.html

Other Resources

Website, CIT Maths Online,
http://mathsonline.cit.ie/

Website, Franco Vivaldi. (2009), Essential Mathematics Web-book,
http://www.maths.qmul.ac.uk/~fv/books/em /

Website, Eric Weisstein. Wolfram MathWorld,
http://www.mathworld.wolfram.com

Website, Wolfram Alpha,
http://www.wolframalpha.com

Module Delivered in

Programme Code	Programme	Semester	Delivery
CR_SCHQA_8	**Bachelor of Science (Honours) in Analytical Chemistry with Quality Assurance**	-1	Mandatory
CR_SESST_8	**Bachelor of Science (Honours) in Environmental Science and Sustainable Technology**	-1	Mandatory
CR_SINEN_8	**Bachelor of Science (Honours) in Instrument Engineering**	-1	Mandatory
CR_SCHEM_7	**Bachelor of Science in Analytical and Pharmaceutical Chemistry**	-1	Mandatory
CR_SPHYS_7	**Bachelor of Science in Applied Physics and Instrumentation**	-1	Mandatory
CR_SPHYS_6	**Higher Certificate in Science in Applied Physics and Instrumentation**	-1	Mandatory
CR_SCHEM_6	**Higher Certificate in Science in Chemistry**	-1	Mandatory