

MA2111: Anailís

Module Details					
Title Short:	Anailís APPROVED				
Language of Instruction:	Irish				
Module Code:	MA2111				
ECTS Credits:	5				
NFQ Level:	8	EQF Level:	6	EHEA Level:	First Cycle
Valid From:	2021-22 (01-09-21 – 31-08-22)				
Teaching Period:	Semester 2				
Module Delivered in	11 programme(s)				
Module Owner:	AISLING MCCLUSKEY				
Module Discipline:	MA_ST_AM - School of Mathematics, Statistics and Applied Mathematics				
Module Level:	Common				
Module Data:	1 - 4 NON LAB				
Module Description:	<p>Mathematical analysis underpins calculus: it is the reason why calculus works, and it provides a toolkit for handling situations in which algorithmic calculus doesn't work. Since calculus in its turn underpins virtually the whole of the mathematical sciences, analytic ideas lie right at the heart of scientific endeavour, so that a confident understanding of the results and techniques that they inform is valuable for a wide range of disciplines, both within mathematics itself and beyond its traditional boundaries. The module sets out to develop understanding and confidence in the central concept of limit and its outworking in the context of sequences, series and functions. Through a comprehensive range of worked examples supporting theory, the module presents the opportunity to strengthen facility with and deepen understanding of the fundamental notions of limit and continuity with a heavy emphasis on learning through doing in-class. The module is suitable for both generalist and specialist mathematics undergraduates. It is a natural precursor for third and fourth year modules such as metric spaces, topology, functional analysis, measure theory as well as financial mathematics subjects. The module will be taught through the medium of Irish but with a heavy emphasis on bilingual instruction to ensure maximum participation and benefit. Assignments and exams/tests will be provided in both Irish and English, and credit given for answers in either (or both) languages. Crucially, the language of mathematics will trump the language of instruction, rendering the module widely accessible. Cé go bhfuil an chúrsa seo trí mheán na Gaeilge, beidh an béim ar an mhata é féin, agus ar dátheangachas ina dhiaidh. Go háirithe, beidh obair bhaile agus an scrúdú ar fáil trí Bhéarla agus trí Ghaeilge.// Tá anailís mhatamaiticiúil mar bhonn agus taca le calcalas: is í an fáth a n-oibríonn calcalas, agus soláthraíonn sí foireann uirlisí chun cásanna a láimhseáil nach n-oibríonn calcalas algartamach iontu. Ó tharla go bhfuil calcalas ina dhiaidh sin mar bhonn agus taca leis na heolaíochtaí matamaiticiúla ar fad beagnach, tá smaointe anailíseacha i gcoirlár na hiarrachta eolaíochta. Mar gheall ar sin, beidh tuiscint mhuiníneach ar na torthaí agus na teicnící a chuireann siad ar an eolas luachmhar do raon leathan disciplíní, laistigh den mhatamaitic araon féin agus lasmuigh dá theorainneacha traidisiúnta. Tá sé mar aidhm ag an modúl seo tuiscint agus muinín i gcoincheap lárnach na dteorann a fhorbairt i gcomhthéacs seichimh, sraitheanna agus feidhmeanna. Trí raon cuimsitheach samplaí oibrithe a thacaíonn le teoiric, tugann an modúl an deis cumas a neartú agus tuiscint a dhoimhniú ar na coincheapa bunúsacha teorann agus leanúnachais agus béim mhór ar fhoghlaim trí dhéanamh sa rang. Tá an modúl oiriúnach d'fhochéimithe matamaitice ginearálta agus speisialtóra. Is réamhtheachtaí nádúrtha é do mhodúil tríú agus ceathrú bliana mar spásanna méadracha, toipeolaíocht, anailís fheidhmiúil, teoiric tomhais chomh maith le hábhair matamaitice airgeadais. Múinfeadh an modúl trí mheán na Gaeilge ach le béim mhór ar theagasc dátheangach chun an rannpháirtíocht agus an tairbhe is mó a chinntiú. Cuirfeadh tascanna agus scrúduithe / tástálacha ar fáil sa Ghaeilge agus i mBéarla, agus tabharfar creidmheas as freagraí i gceachtar (nó sa dá theanga). Rud ríthábhachtach, is í teanga na matamaitice an teanga teagaisc a fhágfaidh go mbeidh an modúl inrochtana go forleathan. Beidh an béim ar an mhata é féin, agus ar dátheangachas ina dhiaidh.</p>				

Learning Outcomes

On successful completion of this module the learner will be able to:

LO1	Míniú a thabhairt ar choincheap bunúsach na dteorann i gcomhthéacs seicheamh, sraith agus feidhm; explain the fundamental concept of limit in the context of sequence, series and function
LO2	nathanna casta loighciúla a léirmhíniú agus a ionramháil; interpret and manipulate complex logical expressions
LO3	raon leathan teorainneacha seicheamh a ríomh ó bhunúsach go neamhchaighdeánach; calculate a broad range of sequence limits from elementary to non-standard
LO4	réasúnaíocht anailíseach a chur i bhfeidhm ar choinbhéirseacht seichimh agus sraith ag úsáid teorimí bunúsacha; apply analytic reasoning to convergence of sequence and series using basic theorems
LO5	measúnú a dhéanamh ar cheart coinbhéirseacht seicheamhach nó sainmhíniú epsilon-delta a úsáid chun feidhmeanna a thástáil le haghaidh leanúnachais; assess whether to use - and then implement - sequential convergence or epsilon-delta definition to test functions for continuity

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Module Content & Assessment

Indicative Content

Anailís

1. Sequences of real numbers: bounded sequences, monotonic sequences, convergent sequences, divergent sequences; special examples of convergent sequences 2. Subsequences; the Bolzano-Weierstrass theorem 3. Sums of series; tests for series convergence; power series 4. Limits of functions; continuity of functions; key theorems on continuity. 5. Analysis beyond the reals. 1. Seichimh réaduimhreacha: seichimh chuimsithe, seichimh aontonacha, seichimh choinbhéirseacha, seichimh dibhéirseacha; samplaí speisialta de sheichimh choinbhéirseacha. 2. Fo-sheichimh; teoirim Bolzano-Weierstrass 3. Suimeanna sraithe; tástálacha ar choinbhéirseacht sraithe; cumhachtsraitheanna. 4. Teorainneacha feidhmeanna; leanúnachas feidhmeanna; teoirimí lánacha ar leanúnachas. 5. Anailís a bhaineann le struchtúir eile.

Written Assessment

Assessment Type	Assessment Description	Outcome addressed	% of total	Marks Out of	Pass Marks	Sitting	Assessment Period	Assessment Date	Duration	Mandatory
Paper 1 - Written	n/a	1,2,3,4,5	70	100	0	First Sitting	Semester 2	n/a	2:00	True
<i>Assessment is marked as bondable but has no matching assessments</i>										
Paper 1 - Written	n/a	1,2,3,4,5	70	100	40	Second Sitting	Autumn	n/a	2:00	True
<i>Assessment is marked as bondable but has no matching assessments</i>										

Continuous Assessment

Assessment Type	Assessment Description	Outcome addressed	% of total	Marks Out of	Pass Marks	Sitting	Assessment Period	Assessment Date	Duration	Mandatory
Continuous Assessment 1	n/a	1,2,3,4,5	30	100	40	First Sitting	Semester 2	n/a	0	True
Continuous Assessment 2	carry-over of mark for continuous assessment from semester 2.	1,2,3,4,5	30	100	40	Second Sitting	Autumn	n/a	0	True

No Oral, Audio Visual or Practical Assessment

No Department-based Assessment

No Research

No Study Abroad

No Computer-based Assessment

The institute reserves the right to alter the nature and timings of assessment

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MA2111: Anailis**Module Workload****Workload: Full Time**

<i>Workload Type</i>	<i>WorkLoad Description</i>	<i>Learning Outcomes</i>	<i>Hours</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	1 hour duration	1,2,3,4,5	24	Per Semester	2.00
Independent & Directed Learning (Non-contact)	No Description	1,2,3,4,5	84	Per Semester	7.00
Tutorial	1 hour duration	1,2,3,4,5	12	Per Semester	1.00
Total Hours					120.00
Total Weekly Learner Workload					10.00
Total Weekly Contact Hours					3.00

This module has no Part Time workload.

Module Resources

Recommended Book Resources

Aisling McCluskey and Brian McMaster 2018, *Undergraduate Analysis a working textbook*, Oxford University Press UK [ISBN: 978-0-19-8817]

This module does not have any article/paper resources

This module does not have any other resources

Module Full Time Equivalent**Module Full Time Equivalent**

<i>Discipline</i>	<i>%</i>
School of Mathematics, Statistics and Applied Mathematics	100

Module Delivered in

Course Stream Code	<i>Course Stream Title</i>
BA1	BA1 Bachelor of Arts Degree (Approved)
BA1	BA1 Bachelor of Arts Degree (Draft)
BA161	BA161 BA (Comhónóracha le Gaeilge) (Approved)
BA163	BA163 BA (Comhónóracha le Gaeilge) (Approved)
BME1	BME1 Bachelor of Arts (Mathematics & Education) (Approved)
BMS1	BMS1 Bachelor of Science (Mathematical Science) (Approved)
BMS2	BMS2 Bachelor of Science (Mathematical Science) Honours (Approved)
BS1	BS1 Bachelor of Science Degree (Undenominated) (Approved)
BS9	BS9 B.Sc. Degree (Undenominated) (Approved)
EH1	EH1 Bachelor of Science (Earth and Ocean Sciences) (Approved)
MR1	MR1 Bachelor of Science (Marine Science) (Approved)

Module Instructors

Module Instructors	
<i>Staff Member</i>	<i>Staff Email</i>
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